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## **Global Diversification of Equity Portfolios: Non-US Perspective**

Kristen L. Ha, Yuli Su, and Yewmun Yip

### **Abstract**

The purpose of this paper is to examine the ex-ante performances of international portfolios from a non-U.S. investor's perspective (i.e., Mexican, Thai, German, and British), and to examine whether controlling for exchange rate risk through the use of currency forwards would allow investors to capture additional gains from international diversification. Portfolio strategies such as minimum variance portfolio and the certainty equivalence portfolio are used to construct global portfolios, and their performances on an ex-ante basis are compared to those for domestic portfolios for each of the four countries. The sample period from 1999 to 2003 is selected so as to examine the effect of the introduction of the euro on the benefits of international portfolio diversification. Our results suggest that during the sample period, international portfolio diversification does not benefit Mexican and Thai investors mainly due to the fact that their domestic market performances dominate the performances using international diversification strategies. On the other hand, German and British investors can benefit from international portfolio diversification. However, hedging against exchange rate risk reduces the benefits of international portfolio diversification. Our result suggests that part of the diversification benefits for investors in developed economies comes from exchange risk exposure. The apparent contradiction to the findings by Driessen and Laeven (2007) could be due to the inability of the ex-ante approach to handle the structural change resulting from the Asian Economic Crisis and Mexican Peso Crisis which occurred during the sample period.

### **I. Introduction**

Similar to a domestic diversified portfolio, the goal of international diversification is to construct an optimal portfolio consisting of securities with low correlations. One may argue that domestic securities tend to be affected by similar economic forces within that country, and thus within country correlation tends to be higher than correlation across countries. The evidence provided by Griffin and Karolyi (1998) shows that only a small percent of the variation of country index returns can be explained by their industrial composition, and hence the benefits of international portfolio diversification cannot be replicated using domestic securities. Undoubtedly, there are great benefits to be gained from international portfolio diversification, and there exists a substantial literature to support the conjecture, such as Lessard (1973), Heston and Rouwenhorst (1994), Bekaert and Urias (1996). However, most studies examine the issue from an U.S. investor's perspective.

Given the current increase in accessibility to global financial markets, it would be interesting to investigate if non-U.S. investors, especially those from emerging countries, can also benefit from international portfolio diversification. Driessen and Laeven (2007) find that investors in developing countries can achieve the greatest benefits from investing abroad

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particularly outside their regional markets even after controlling for currency effects. Their results also show that the gains from international portfolio diversification are the largest for investors in countries with high country risk but the diversification benefits vary as country risk changes over time. However, their portfolios are constructed on an ex-post basis rather than ex-ante. In other words, their portfolios are only investable if you know in advance what next month portfolio weights are.

The fluctuations in exchange rates inherently subject investors to significant foreign exchange risk. Even so, researchers have argued that with proper tools, foreign exchange risk can be effectively managed. It is known that portfolios containing international stocks denominated in different currencies not only can diversify the stock market risk but also the exchange rate risk. Nonetheless, exchange rate risk can be easily diversified away through the use of currency futures or forwards. Izan, Jalleh, and Ong (1991) investigate whether an Australian-based investor could benefit from international diversification. Using an ex-ante approach similar to Eun and Resnick (1988), Izan et al. (1991) documents that an Australian investor can benefit from international diversification, and that greater benefit can be achieved through hedging against foreign currency fluctuations.

Most previous studies on international diversification consider the benefits of international portfolios constructed using developed markets (Eun and Resnick, 1994). However, economists have long maintained that U.S. investors can benefit by diversifying their portfolios with stocks from both developed and emerging markets. Emerging markets are generally characterized as higher returns accompanied with high risk. Consequently, emerging markets could provide investors with potential higher returns as compared to the matured, developed market. For instance, Chile's stock market increased sixty-fold between 1973 and 1980. Contrastingly, Peru posted the worst performance of any of the world's stock markets between the 1940s and 1980s, losing 99% of its value in real terms (Taylor, 2000). On average, the growth of the emerging markets has been stellar since the 1990s (Solnik, 2000).

The development of the European Monetary Union (EMU) and the subsequent introduction of the euro may have lead to greater integration of European stock markets, and hence may have a substantial impact on the benefits of international portfolio diversification. On one hand, the convergence requirement of the EMU promotes one single economic market which could increase the correlations among EMU stock markets. On the other hand, the introduction of a single currency, the euro, eliminates the currency risk for investors in EMU countries. Therefore, the issue of how the introduction of the euro affects investors in their international stock diversification decisions becomes an empirical question.

The purpose of this research is to re-examine the effectiveness of international portfolios and the impact of exchange rate risk from a non-US investor's perspective. Specifically, we intend to explore the following issues. First, do non-U.S. investors benefit from international equity diversification? Second, who benefits the most from international portfolio diversification, investors from developed or emerging economies? Third, does hedging exchange rate risk increase the benefit of international diversification? Fourth, does diversification gain still exist given the introduction of the euro and globalization of security markets? To tackle these issues, we form ex-ante global equity portfolios consisting of stock

indices from both developed markets (France, Germany, Italy, Netherlands, Spain, U.S., U.K., and Japan) and emerging markets (Mexico and Thailand). Unlike most of the previous studies, this paper focuses on the benefits of international portfolio diversification to non-US investors (Mexican, Thai, German, and British). In addition, a forward hedging strategy is utilized to examine the effectiveness of currency hedging in an international portfolio. Finally, our sample period includes both the pre-euro (1994-1998) and post-euro (1999-2003) sub-periods. The impact of the implementation of the euro on international diversification is then analyzed using data from the post-euro sub-period.

The paper is structured as follows. Section 2 presents the literature review. Section 3 discusses the methodology and data collection used in this research. Section 4 presents the empirical results. Section 5 offers concluding comments.

## **II. Literature Review**

### **A. International Diversification**

Since Grubel's (1968) path-breaking work in extending the theoretical concepts of modern portfolio selection to an international environment, extensive empirical studies have been conducted on the advantages of international portfolio diversification. Early studies in the 1970s by Levy and Sarnat (1970), Lessard (1976), and Solnik (1974) concentrate on the performance of ex-post efficient portfolios and show that gains can be made due to the low co-movements between different national markets. However, there are limitations to such studies because all the parameters required for portfolio performance evaluation are based on historical data and are known in advance. To circumvent this problem, Eun and Resnick (1994) evaluate different international strategies utilizing more realistic conditions in an ex-ante or out-of-sample back-testing framework. Potential diversification benefit is still reported in their study. Similarly, DeSantis and Gerard (1997) conclude that international diversification is still beneficial to investors despite evidence pointing to increasing international market integration in recent years.

Since the returns of emerging markets tend to be weakly correlated with those of the developed markets, the high idiosyncratic risk in emerging market investments could be reduced through portfolio diversification. Emerging markets are subject to extreme volatility because these markets are exposed to greater economic and political risks. Given that most of these risks are country specific, diversification with emerging stock markets could enable investors to capture higher expected returns (stemming from the high growth potential of emerging markets) and lower risks (from low correlation with developed stock markets). Nevertheless, investors are cautioned when constructing an international portfolio with emerging stocks market investments. Bekaert, Erb, Harvey, and Viskanta (1998) suggest that detecting the trend of returns in emerging markets is entirely different from that of the developed markets in that the returns for the emerging markets tend to be non-normally distributed and such deviations appear to be time-varying. Saunders and Walter (2002) show that correlations between emerging and developed stock markets have risen over the two sub-periods, 1988-1993 and 1994-1999, when the markets are very volatile. The implication is that, with the increased financial integration, developed markets are no longer immune from the extreme volatilities or the contagion effects of the emerging markets.

## **B. Exchange Rate Risks**

The return of an internationally diversified portfolio consists of two components: the performance of the underlying asset as well as that of the foreign currency. Jorion (1989) suggests that the extra risk from currency fluctuations is rather trivial and can be hedged. Meanwhile, Eun and Resnick (1988) report that during the sample period from 1980 through 1985, exchange rate volatility contributed to 50% of the volatility of dollar returns. The high volatility of exchange rates, in fact, contributes to a higher degree of market segmentation as well as a lower level of correlation between markets.

Studies by Jorion (1985), Eun and Resnick (1988, 1994) and Levy and Lim (1994) demonstrate that currency hedging with forward contracts against foreign exchange risk can lead to remarkable results. Perold and Schulman (1988) argue that currency hedging is a “free lunch” in that it allows an investor to simultaneously increase return and reduce risk in his portfolio. On the other hand, Adjaoute and Tuchschnid (1996) cite that full currency hedging is only optimal if there are no correlations between the exchange rate returns and local returns, and the forward exchange premium must be an unbiased predictor of the future exchange rate returns.

Using an ex-ante portfolio evaluation framework, Eun and Resnick (1994) investigate the performance of an international portfolio, with and without forward hedging. Using ex-ante strategies to control for parameter uncertainty and hedging exchange risk, Eun and Resnick (1994) find that the magnitude of the potential gains from international diversification for a U.S. investor is much greater than that of a Japanese investor. Using a similar framework, Izan, Jalleh, and Ong (1991) also document similar results, finding that an Australian investor can benefit from international diversification and that the hedged strategies outperform their unhedged counterparts.

Another school of thought focuses on developing optimal currency hedging strategies. Studies such as Anderson and Danthin (1981) and Lioui and Poncet (2002) derive an optimal hedge ratio by assuming a time-invariant variance-covariance structure between underlying assets and foreign exchange forward rates. Guo (2003) further extends previous studies by using a time-varying conditional variance-covariance structure to model the multivariate pricing dynamics. Using a VAR-MGARCH model to construct an optimal time-varying strategy, Guo (2003) reports an improvement on the risk-adjusted returns for a portfolio which has a significant currency exposure.

## **C. Introduction of the Euro**

The introduction of the euro in January 1999 was a historical event aimed at unifying the currencies of eleven European countries.<sup>1</sup> Under the new union, the economies in Europe are expected to be integrated into one single market, thus reducing the correlations between EMU stock markets. This seems to reduce the incentive for investors to include different EMU stock markets in an international portfolio. Beckers (1999) documents a statistically significant rising trend in the correlations of the nine EU stock markets with an average increase in correlation of

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<sup>1</sup> Germany, France, Italy, Spain, Belgium, Ireland, Austria, Finland, Portugal, Netherlands and Luxembourg were the first wave to participate in the EMU. Greece later met the requirements and became a member of the EMU, but Denmark, Sweden, and the United Kingdom have so far chosen not to participate.

0.024 per year. Fratzscher (2001) also reports that the unification of a single currency has increased the level of integration of the financial markets, particularly among members who have adopted the euro. These studies seem to suggest that higher integration reduces the opportunity to diversify portfolios within the Euroland. On the other hand, a single European currency unit implies a reduction in foreign exchange rate volatilities which could benefit investors in both EMU and non-EMU countries.

### III. Data & Methodology

#### A. Data

Stock index returns of ten countries are obtained from the Morgan Stanley Capital International, Inc. (MSCI) for the sample period from January 1994 through December 2003. The sample period is then divided into two sub-periods: first sub-period of 1994-1998 and second sub-period of 1999-2003. Each sub-period contains 60 monthly observations. A global equity portfolio is formed using the stock indices from the following ten countries: France, Germany, Italy, Netherlands, Spain, United States, United Kingdom, Japan, Mexico, and Thailand. The monthly exchange rates are taken from the Federal Reserve Bank of New York. The one-month forward rates for the currencies of the above countries against the U.S. dollar are obtained from Datastream to be used for currency hedging. The performances from the hedged portfolios will be compared to the unhedged counterparts to assess the benefits of hedging. It is further assumed that the risk-free rate is zero and short sales, i.e. negative portfolio weights, are not permissible.<sup>2</sup>

#### B. Rates of Return of International Investment Portfolios

Assume that a Mexican investor invests in the  $i^{\text{th}}$  foreign market ( $i = 1, \dots, N$ ). Let  $S_{i,t}^{\text{peso}}$  be the spot exchange rate expressed in terms of Mexican pesos per foreign currency  $i$  at time  $t$ , and  $P_{i,t}$  is the  $i^{\text{th}}$  foreign country stock index value at time  $t$ . Then the peso return rate for a Mexican investor in the  $i^{\text{th}}$  stock market,  $R_{i,t}^{\text{peso}}$ , is defined as:

$$\begin{aligned} R_{i,t}^{\text{peso}} &= \ln \left( \frac{S_{i,t}^{\text{peso}} * P_{i,t}}{S_{i,t-1}^{\text{peso}} * P_{i,t-1}} \right) \\ &= R_{i,t} + e_{i,t}^{\text{peso}} \end{aligned}$$

where  $R_{i,t}$  the local is return on the  $i^{\text{th}}$  stock market and  $e_{i,t}^{\text{peso}}$  is the exchange rate return on the  $i^{\text{th}}$  foreign currency against the Mexican peso.

A hedging strategy using forward contracts is employed to evaluate the benefit of hedging the currency risk in a global equity portfolio. The assumption is that the forward rate is an unbiased predictor of the future spot rate since the foreign exchange market is viewed as

<sup>2</sup> Hentschel and Long (2004) argues that a non-arbitrage condition must hold in order to guarantee a finite gain from portfolio diversification. However, due to the fact that short sales are not allowed in our portfolio construction, the presence of arbitrage opportunities (if any) would not affect our empirical results.

“speculatively efficient” (Izan, Jalleh and Ong, 1991). Let  $F_{i,t}^{peso}$  be the one-month forward rate expressed in terms of Mexican peso per foreign currency  $i$  at time  $t$ . The hedged peso return rate for a Mexican investor in the  $i^{\text{th}}$  stock market,  $R_{i,t}^{peso,H}$ , can be approximated as:

$$R_{i,t}^{peso,H} = R_{i,t}^{peso} + f_{i,t}^{peso}$$

where  $f_{i,t}^{peso} = \ln \frac{F_{i,t}^{peso}}{S_{i,t}^{peso}}$  is the forward premium on the  $i^{\text{th}}$  foreign currency against the Mexican peso.

### C. Ex-Ante Portfolio Strategies

Similar to the procedure used by Eun and Resnick (1994), the optimal ex-ante investment weights are estimated using 60 monthly returns in the portfolio construction period. The following 12 monthly returns are used to evaluate the portfolio performance in the out-of-sample investment period. The estimation and investment evaluation periods are shifted forward by two months each time (similar to Eun and Resnick, 1994), and results in 25 out-of-sample (overlapping) investment periods using 120 months of data.

In this study, we employ two methods to construct the global equity portfolio, namely, the minimum variance portfolio (MVP) and the certainty equivalence tangency portfolio (CET). The MVP strategy identifies the investment weights which will minimize the portfolio’s risk in the estimation period, while the CET strategy estimates the investment weights which will maximize the portfolio’s risk-adjusted return in the estimation period as measured by the Sharpe ratio. We also employ two strategies to manage currency risk, namely an unhedged and a fully-hedged strategy. Altogether, four sets of optimal portfolio weights are estimated for each construction period: Unhedged MVP, Unhedged CET, Hedged MVP, and Hedged CET.

In addition to using the Sharpe ratio to evaluate the out-sample performance of the each of the four strategies, a dominance analysis is also employed to determine the frequency in which one strategy outperforms the other. A strategy is considered to be dominant over another if its Sharpe ratio is higher than the latter by at least 13 out of the 25 investment holding periods (that is, more than 50% of the time).

## IV. Empirical Results

### A. Mexico

Table 1.A and 1.B present the descriptive statistics of stock returns from a Mexican investor’s perspective during the first sub-period of 1994-1998 (pre-euro period) and during the second sub-period of 1999-2003 (post-euro period), respectively. The first sub-period coincides with our first portfolio construction period whereas the second sub-period covers the 25 out-of-sample investment holding periods.

For returns measured in local currency, the Spanish stock market performs the best in the first sub-period with an average monthly return of 1.76%, followed by the U.S. (1.69%), the Netherlands (1.46%) and Italy (1.44%). These returns are accompanied by low to modest

standard deviations. Meanwhile, the Thai market registers the lowest average monthly return of -2.59% together with the highest standard deviation of 14.07%. Although the Mexican stock market posts a positive return of 0.88%, the risk is also remarkably high at 8.86%. However, in the second sub-period, previous winners such as Spain, the U.S., the Netherlands, and Italy now underperform while prior losers such as Thailand and Mexico outperform. It is interesting to observe that developed countries perform better in our first sub-period (pre-euro period) and emerging countries prevail in the second sub-period (post-euro period). The negative returns of Thailand and Mexico during the first sub-period could be attributed to the financial crisis experienced by both countries while the outperformance of these two markets during the second sub-period is an indication of market correction. This performance reversal might have an unconstructive impact on the effectiveness of portfolio diversification.

After taking into account changes in currency values, the Mexican peso returns are higher than the local returns in both sub-periods. A higher peso return means that the Mexican peso has depreciated against all foreign currencies in the sample in both sub-periods. As mentioned before, the depreciation of the Mexican peso in the first sub-period was caused by the 1994 Mexican peso crisis and the data indicates that this trend continues into the second sub-period.

A comparison of Tables 1.A and 1.B shows that correlations between the Mexican market and those of the other countries increase dramatically from the first sub-period to the second sub-period. During the first sub-period, Mexico's stock market is negatively correlated with Germany, the Netherlands, and the U.K, suggesting ample potential for diversification benefits. However, the Mexican stock market is positively correlated to other sampling countries during the second sub-period. Although the correlations among the EMU countries have been high during the pre-euro period, they are even higher after the implementation of the euro. For instance, the correlation between the French and German stock markets increases from 0.82 (pre-euro period) to a near perfect correlation of 0.93 (post-euro period), signifying that these two markets move in tandem. On the other hand, correlations of countries such as Japan, Thailand, the U.K., and the U.S. are lower in the second sub-period.

Table 1.C presents the average portfolio weights for ex-ante investment strategies during the out-of-sample period. For the unhedged strategies, the U.K. accounts for 23.11% of the weight of the MVP portfolio while the U.S. accounts for 19.10% of the CET portfolio. The combined weight for the U.S., the U.K., France, and Mexico is approximately 54% for the MVP portfolio and 62% for the CET portfolio. On a hedged basis, most of the weights are again allocated to the developed markets while only 1% is allocated to the stock market of Thailand.

Table 1.D shows the average out-of-sample performance for different ex-ante strategies as viewed from a Mexican investor's perspective. The Sharpe ratio clearly indicates that a strategy of holding a Mexican domestic portfolio is superior to all other strategies. Both hedged strategies fare better than their unhedged counterparts. The dominance analysis in Table 1.E further supports the results presented in Table 1.D. On an unhedged basis, the domestic Mexican strategy outperforms both the MVP and CET strategies 23 and 22 times, respectively. On a hedged basis, again, the domestic strategy fares the best, although the number of times it outperforms the respective strategies has dropped to 16 each. This empirical result seems to suggest that although hedging improves the performances of MVP and CET strategies,

international diversification fails to enhance portfolio performance for a Mexican investor during the period January 1999 to December 2003.

### **B. Thailand**

Results from Tables 2.A and 2.B show that except for a few European countries, correlations decrease from the first sub-period to the second sub-period. A comparison of the local currency returns with the baht returns indicates that the baht returns are higher than the local returns for a Thai investor. The only exception is in the case of the Mexican stock market. A higher baht return means that the baht has depreciated against all sampling currencies (except for the Mexican peso) in both sub-periods. The depreciation of the baht in the first sub-period was caused by the Asian currency crisis of 1997 and the Thai baht remained weak during the second sub-period. Interestingly, we observe both a recovery of the Thai stock market and a devaluation of the baht during the same sub-period.

Similar to the results reported from a Mexican investor's perspective, the weight allocation has been heavily concentrated in the developed markets. The domestic portfolio outperforms all four international portfolio strategies as it is the only strategy with a positive Sharpe ratio. The dominance analysis data presented in Table 2.E reaffirms this observation. In summary, Thai investors are better off investing domestically during the period January 1999 to December 2003.

### **C. Germany**

From a German investor's viewpoint, during the first sub-period, investing in the Spanish market yields the highest return (1.73%) while an investment in the Thai and Mexican markets would result in negative returns of -3.29% and -0.92%, respectively. However, during the second sub-period, Thailand and Mexico are the only two countries whose returns are positive (1.08% and 0.94%, respectively), but they come with the highest standard deviations. Since Germany is a member of the EMU, there would be no gain or loss from the currency portion of the investment in other EMU countries. During this period, all of our EMU sampling markets have posted negative returns.

Surprisingly, the results in Table 3.C indicate that the global portfolio for a German investor still leans heavily towards the developed markets. Unlike the results found in previous cases, the effect of hedging is nontrivial for a German investor (see Table 3.D). The unhedged CET strategy outperforms both the MVP and domestic strategies. Based on the dominance analysis reported in Table 3.E, the unhedged CET strategy is superior as it dominates both the unhedged MVP and domestic strategies. In general, our results suggest that German investors can capture marginal gains by diversifying their portfolios internationally and leaving their currency risk unhedged.

### **D. United Kingdom**

An examination of the returns in Tables 4.A and 4.B shows an appreciation of the British pound in the first sub-period. In sub-period two, the British pound continues to strengthen against all the other currencies except against the Japanese yen. On average, the correlations have risen from sub-period one to sub-period two. Similar to the findings for Germany, the highest correlations tend to be among the European countries. The average portfolio weights for

a U.K. investor, as shown in Table 4.C, are very similar to those found for a German investor. One interesting observation found in Table 4.D is that the Sharpe ratios of the hedged strategies are similar in magnitude to those of the unhedged strategies. Although hedging seems to be of no benefit to a U.K. investor, he/she can gain from international portfolio diversification.

## V. Conclusions

In this paper, we re-examine the benefits of international portfolio diversification. The purpose of the paper is to develop ex-ante international portfolios from a non-U.S. investor's perspective, and to examine whether controlling for exchange rate risk through the use of currency forwards would allow one to capture additional gains from international diversification for the period 1994 through 2003. Our results suggest that the Thai and Mexican investors would not benefit from investing in a global equity portfolio while the German and British investors could benefit from investing in an international portfolio without forward hedging. However, our results seem to contradict the findings reported by Driessen and Laeven (2007) that investors in developing countries can achieve the greatest benefits from investing abroad particularly outside their regional markets even after controlling for currency effects. One possible explanation is that an ex-ante approach in portfolio formation depends critically on the stationarity of the underlying return distributions. When there is a structural change in the market, the ex-ante optimal portfolio weight is no longer valid. Our empirical results might be period-specific because our sampling period covers two major global financial crises – the Mexican and Asian currency crisis – which definitely trigger structural changes in market conditions. Future studies that analyze data from more recent years (between 2004 and 2008) are likely to reach a different conclusion because of the structural change in the global economy due to several major economic events such as the high oil prices, the sub-prime crisis led credit crunch in the US economy and the substantial depreciation of the dollar.

**Table 1.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, Mexican Perspective**

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Peso		Local	
											ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										2.86	7.03	1.01	5.73
<b>GER</b>	0.82	1									3.00	7.22	1.17	5.59
<b>ITA</b>	0.65	0.64	1								3.30	8.30	1.44	7.28
<b>JAP</b>	0.68	0.62	0.50	1							1.45	8.29	-0.35	5.20
<b>MXN</b>	0.03	-0.07	0.01	0.02	1						0.88	8.86	0.88	8.86
<b>NTH</b>	0.89	0.90	0.64	0.75	-0.01	1					3.31	7.17	1.46	5.18
<b>SPA</b>	0.76	0.69	0.64	0.63	0.20	0.74	1				3.50	6.98	1.76	6.81
<b>THA</b>	0.43	0.46	0.36	0.49	0.26	0.45	0.49	1			-1.49	15.11	-2.59	14.07
<b>U.K.</b>	0.86	0.82	0.57	0.75	-0.03	0.91	0.72	0.45	1		2.92	6.64	0.86	3.76
<b>U.S.</b>	0.78	0.81	0.61	0.71	0.11	0.86	0.71	0.53	0.87	1	3.60	6.82	1.69	4.03

**Table 1.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, Mexican Perspective**

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Peso		Local	
											ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										0.09	6.21	-0.12	6.26
<b>GER</b>	0.93	1									-0.31	8.11	-0.49	8.35
<b>ITA</b>	0.82	0.77	1								-0.20	6.09	-0.41	5.96
<b>JAP</b>	0.39	0.29	0.29	1							0.15	6.12	-0.15	4.92
<b>MXN</b>	0.55	0.59	0.53	0.34	1						1.18	7.02	1.18	7.02
<b>NTH</b>	0.89	0.87	0.77	0.41	0.58	1					-0.45	6.26	-0.63	6.53
<b>SPA</b>	0.85	0.83	0.76	0.31	0.53	0.79	1				0.04	6.76	-0.18	6.47
<b>THA</b>	0.39	0.42	0.29	0.46	0.44	0.47	0.42	1			1.42	12.69	1.22	11.35
<b>U.K.</b>	0.76	0.71	0.60	0.48	0.48	0.79	0.64	0.39	1		-0.17	4.30	-0.43	4.53
<b>U.S.</b>	0.81	0.78	0.58	0.52	0.61	0.77	0.69	0.54	0.78	1	-0.05	4.84	-0.22	5.03

The correlation matrix is provided in peso terms.

ME and SD denote the mean return and standard deviation of returns.

**Table 1.C Average Portfolio Weights for Out-of-Sample Periods: Mexico\***

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.0570	0.1472	0.0845	0.1264
GER	0.0705	0.0505	0.0387	0.0572
ITA	0.0887	0.1246	0.0746	0.1089
JAP	0.1625	0.0221	0.2283	0.0921
MXN	0.1196	0.1274	0.0510	0.0132
NTH	0.0852	0.0722	0.0881	0.1545
SPA	0.0426	0.1063	0.0390	0.0801
THA	0.0082	0.0071	0.0154	0.0062
U.K.	0.2311	0.1515	0.2220	0.1678
U.S.	0.1346	0.1910	0.1584	0.1936

\*Denotes the average of 25 out-of-sample values

**Table 1.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: Mexico\***

	Unhedged Approach			Hedged Approach	
	MVP	CET	Mexico	MVP	CET
ME (%)	-0.39%	-0.47%	0.71%	0.21%	0.11%
SD (%)	4.78%	4.86%	7.14%	4.58%	5.06%
SHP	-0.07	-0.09	0.14	0.09	0.06

\*Denotes the average of 25 out-of-sample values

**Table 1.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: Mexico\***

	Unhedged Approach			Total
	MVP	CET	Mexico	
MVP		11	2	13
CET	14		3	17
Mexico	23	22		45
	Hedged Approach			Total
	MVP	CET	Mexico	
MVP		14	9	23
CET	11		9	20
Mexico	16	16		32

\*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

**Table 2.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, Thai Perspective**

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Baht		Local	
											ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										1.61	7.21	1.01	5.73
<b>GER</b>	0.85	1									1.78	7.77	1.17	5.59
<b>ITA</b>	0.74	0.72	1								2.10	9.30	1.44	7.28
<b>JAP</b>	0.66	0.59	0.54	1							0.16	7.60	-0.35	5.20
<b>MXN</b>	0.54	0.49	0.50	0.43	1						-0.36	13.0	0.88	8.86
<b>NTH</b>	0.90	0.92	0.72	0.71	0.52	1					2.05	7.20	1.46	5.18
<b>SPA</b>	0.78	0.73	0.73	0.63	0.63	0.75	1				2.24	7.38	1.76	6.81
<b>THA</b>	0.32	0.37	0.32	0.38	0.36	0.35	0.38	1			-2.59	14.0	-2.59	14.0
<b>U.K.</b>	0.88	0.85	0.67	0.71	0.53	0.91	0.76	0.33	1		1.64	7	0.86	7
<b>U.S.</b>	0.80	0.84	0.70	0.67	0.62	0.87	0.74	0.40	0.88	1	2.26	6.88	1.69	3.76
												6.84		4.03

Table 2.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, Thai Perspective

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Baht		Local	
											ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										0.04	6.10	-0.12	6.26
<b>GER</b>	0.93	1									-0.35	8.08	-0.49	8.35
<b>ITA</b>	0.82	0.77	1								-0.24	6.09	-0.41	5.96
<b>JAP</b>	0.32	0.24	0.23	1							0.07	5.65	-0.15	4.92
<b>MXN</b>	0.59	0.61	0.59	0.38	1						1.09	7.69	1.18	7.02
<b>NTH</b>	0.89	0.87	0.76	0.34	0.62	1					-0.50	6.09	-0.63	6.53
<b>SPA</b>	0.84	0.83	0.75	0.22	0.56	0.77	1				-0.01	6.54	-0.18	6.47
<b>THA</b>	0.17	0.27	0.05	0.25	0.30	0.26	0.22	1			1.22	11.35	1.22	11.35
<b>U.K.</b>	0.75	0.70	0.60	0.40	0.58	0.77	0.61	0.08	1		-0.22	4.47	-0.43	4.53
<b>U.S.</b>	0.80	0.77	0.58	0.45	0.68	0.76	0.67	0.29	0.78	1	-0.13	4.76	-0.22	5.03

The correlation matrix is provided in Thai Baht terms.

ME and SD denote the mean return and standard deviation of returns.

**Table 2.C Average Portfolio Weights for Out-of-Sample Periods: Thailand\***

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.1071	0.1322	0.0597	0.1484
GER	0.0323	0.0708	0.0659	0.0718
ITA	0.0340	0.1026	0.0631	0.0731
JAP	0.1828	0.0230	0.2135	0.0781
MXN	0.0138	0.0702	0.0348	0.0173
NTH	0.0775	0.0971	0.0717	0.1395
SPA	0.1522	0.1733	0.0475	0.1068
THA	0.0496	0.0229	0.0162	0.0088
U.K.	0.1983	0.1056	0.2331	0.1179
U.S.	0.1524	0.2023	0.1946	0.2383

\*Denotes the average of 25 out-of-sample values

**Table 2.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: Thailand\***

	Unhedged Approach			Hedged Approach	
	MVP	CET	Thailand	MVP	CET
ME (%)	-0.50%	-0.42%	0.13%	-0.53%	-0.55%
SD (%)	4.39%	4.77%	10.43%	4.53%	5.09%
SHP	-0.08	-0.06	0.08	-0.08	-0.08

\*Denotes the average of 25 out-of-sample values

**Table 2.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: Thailand\***

	Unhedged Approach			Total
	MVP	CET	Thailand	
MVP		5	8	13
CET	20		9	29
Thailand	17	16		33
Hedged Approach				
	MVP	CET	Thailand	Total
MVP		11	8	19
CET	14		8	22
Thailand	17	17		34

\*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

**Table 3.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, German Perspective**

											Mark		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										1.04	5.85	1.01	5.73
<b>GER</b>	0.76	1									1.17	5.59	1.17	5.59
<b>ITA</b>	0.65	0.61	1								1.49	8.25	1.44	7.28
<b>JAP</b>	0.50	0.37	0.39	1							-0.43	6.48	-0.35	5.20
<b>MXN</b>	0.55	0.48	0.47	0.42	1						-0.92	12.8	0.88	8.86
<b>NTH</b>	0.84	0.84	0.61	0.56	0.53	1					1.45	5.17	1.46	5.18
<b>SPA</b>	0.76	0.67	0.67	0.56	0.64	0.73	1				1.73	7.28	1.76	6.81
<b>THA</b>	0.37	0.40	0.32	0.43	0.39	0.41	0.44	1			-3.29	14.2	-2.59	14.0
<b>U.K.</b>	0.79	0.72	0.54	0.55	0.58	0.84	0.76	0.40	1		1.00	8	0.86	7
<b>U.S.</b>	0.70	0.71	0.60	0.52	0.66	0.77	0.73	0.49	0.78	1	1.65	5.36	1.69	4.03

**Table 3.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, German Perspective**

											euro		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										-0.12	6.26	-0.12	6.26
<b>GER</b>	0.94	1									-0.49	8.35	-0.49	8.35
<b>ITA</b>	0.82	0.79	1								-0.41	5.96	-0.41	5.96
<b>JAP</b>	0.43	0.35	0.32	1							-0.10	6.60	-0.15	4.92
<b>MXN</b>	0.68	0.67	0.67	0.54	1						0.94	8.74	1.18	7.02
<b>NTH</b>	0.90	0.88	0.78	0.47	0.71	1					-0.63	6.53	-0.63	6.53
<b>SPA</b>	0.84	0.84	0.74	0.32	0.64	0.79	1				-0.18	6.47	-0.18	6.47
<b>THA</b>	0.32	0.38	0.19	0.41	0.43	0.40	0.33	1			1.08	12.29	1.22	11.3
<b>U.K.</b>	0.76	0.72	0.61	0.57	0.71	0.81	0.62	0.30	1		-0.39	5.03	-0.43	4.53
<b>U.S.</b>	0.81	0.77	0.61	0.61	0.77	0.80	0.68	0.46	0.85	1	-0.30	5.79	-0.22	5.03

The correlation matrix is provided in German mark (1994 - 1998) and euro (1999-2003) terms.

ME and SD denote the mean return and standard deviation of returns.

**Table 3.C Average Portfolio Weights for Out-of-Sample Periods: Germany\***

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.1088	0.1682	0.1008	0.1696
GER	0.0865	0.0596	0.0434	0.0989
ITA	0.0589	0.0850	0.0724	0.1047
JAP	0.1606	0.0252	0.1868	0.0600
MXN	0.0140	0.0687	0.0406	0.0093
NTH	0.1476	0.1340	0.0933	0.1414
SPA	0.0746	0.1629	0.0394	0.1361
THA	0.0149	0.0151	0.0125	0.0081
U.K.	0.2271	0.0951	0.2315	0.1024
U.S.	0.1070	0.1863	0.1793	0.1695

\*Denotes the average of 25 out-of-sample values.

**Table 3.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: Germany\***

	Unhedged Approach			Hedged Approach	
	MVP	CET	Germany	MVP	CET
ME (%)	-0.73%	-0.59%	-1.06%	-0.67%	-0.75%
SD (%)	5.20%	5.34%	8.20%	5.02%	5.55%
SHP	-0.11	-0.08	-0.11	-0.10	-0.10

\*Denotes the average of 25 out-of-sample values.

**Table 3.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: Germany\***

	Unhedged Approach			Total
	MVP	CET	Germany	
MVP		5	10	15
CET	20		14	34
Germany	15	11		26
Hedged Approach				
	MVP	CET	Germany	Total
MVP		15	13	28
CET	10		14	24
Germany	12	11		23

\*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

**Table 4.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, British Perspective**

											GBP		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
<b>FRA</b>	1										0.86	5.46	1.01	5.73
<b>GER</b>	0.72	1									0.99	5.26	1.17	5.59
<b>ITA</b>	0.60	0.56	1								1.32	7.79	1.44	7.28
<b>JAP</b>	0.45	0.30	0.32	1							-0.60	6.16	-0.35	5.20
<b>MXN</b>	0.47	0.38	0.41	0.34	1						-1.07	8	0.88	8.86
<b>NTH</b>	0.81	0.82	0.55	0.50	0.45	1					1.26	4.61	1.46	5.18
<b>SPA</b>	0.73	0.62	0.63	0.50	0.59	0.70	1				1.55	6.84	1.76	6.81
<b>THA</b>	0.40	0.44	0.32	0.45	0.38	0.45	0.47	1			-3.40	14.5	-2.59	14.0
<b>U.K.</b>	0.76	0.66	0.46	0.47	0.52	0.78	0.73	0.47	1		0.86	3	0.86	7
<b>U.S.</b>	0.63	0.65	0.53	0.44	0.61	0.70	0.68	0.56	0.70	1	1.50	4.67	1.69	4.03

**Table 4.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, British Perspective**

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	GBP		Local		
											ME (%)	SD (%)	ME (%)	SD (%)	
<b>FRA</b>	1											-0.17	6.56	-0.12	6.26
<b>GER</b>	0.94	1										-0.54	8.58	-0.49	8.35
<b>ITA</b>	0.84	0.80	1									-0.45	6.54	-0.41	5.96
<b>JAP</b>	0.43	0.36	0.34	1								-0.15	6.16	-0.15	4.92
<b>MXN</b>	0.67	0.67	0.66	0.50	1							0.90	8.54	1.18	7.02
<b>NTH</b>	0.91	0.89	0.80	0.47	0.70	1						-0.69	6.79	-0.63	6.53
<b>SPA</b>	0.86	0.85	0.79	0.35	0.65	0.81	1					-0.21	7.15	-0.18	6.47
<b>THA</b>	0.39	0.43	0.29	0.47	0.47	0.47	0.42	1				1.11	12.84	1.22	11.35
<b>U.K.</b>	0.79	0.77	0.66	0.49	0.70	0.84	0.69	0.39	1			-0.43	4.53	-0.43	4.53
<b>U.S.</b>	0.83	0.80	0.65	0.58	0.75	0.81	0.73	0.53	0.84	1		-0.33	5.68	-0.22	5.03

The correlation matrix is provided in GBP terms.

ME and SD denote the mean return and standard deviation of returns.

**Table 4.C Average Portfolio Weights for Out-of-Sample Periods: U.K.\***

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.0953	0.1445	0.1024	0.1668
GER	0.1105	0.0713	0.0542	0.1090
ITA	0.0611	0.0916	0.0614	0.1080
JAP	0.1591	0.0141	0.2086	0.0549
MXN	0.0160	0.0825	0.0356	0.0180
NTH	0.1192	0.1020	0.1000	0.1260
SPA	0.0413	0.1349	0.0377	0.1309
THA	0.0075	0.0187	0.0152	0.0074
U.K.	0.2276	0.1299	0.2199	0.1047
U.S.	0.1625	0.2103	0.1652	0.1744

\*Denotes the average of 25 out-of-sample values

**Table 4.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: U.K.\***

	Unhedged Approach			Hedged Approach	
	MVP	CET	U.K.	MVP	CET
ME (%)	-0.74%	-0.62%	-0.81%	-0.58%	-0.64%
SD (%)	5.34%	5.57%	4.62%	4.66%	5.41%
SHP	-0.11	-0.08	-0.17	-0.11	-0.10

\*Denotes the average of 25 out-of-sample values

**Table 4.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: U.K.\***

	Unhedged Approach			Total
	MVP	CET	U.K.	
MVP		7	16	23
CET	18		19	37
U.K.	9	6		15
Hedged Approach				
	MVP	CET	U.K.	Total
MVP		6	17	23
CET	19		17	36
U.K.	8	8		16

\*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

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## **An Investigation of Board-Registered CFP® Programs at Universities with Insurance/Risk Management Programs**

Stanley R. Adamson, James Philpot, and Kent Ragan

### **Abstract**

We examine course requirements and faculty resources of departments offering both a major in insurance and a CFP® Board-registered financial planning program. Because the financial services industry is becoming increasingly comprehensive, insurance students may wish to add an emphasis in financial planning. We find that, given the overlap in requirements of the two types of programs, insurance students may add a financial planning emphasis to their degree program with little marginal coursework. Universities offering both programs do not appear to strain their faculty resources.

### **I. Introduction**

University insurance education programs continually evolve to reflect the dynamics of the industry. This has always been necessary, as the industry frequently adds new products to its offerings. However, in the recent years following a long round of deregulation of the financial services industry, the insurance business has broadened considerably to include other areas of financial services; thus, insurance professionals now find themselves involved in very diverse activities under the umbrella of financial planning. In response to the need for broad, yet in-depth education for such financial professionals, an increasing number of university finance and insurance departments have designed curricula around the Certified Financial Planner® (CFP®) Board of Standards topics list and registering these curricula with the CFP Board so that students qualify to sit for the CFP examination.

Just as changes in an industry typically raise concerns among industry participants as to how the change will affect them and their firms, university finance/insurance departments may have concerns about the addition of a financial planning program or the modification of an existing program to include more coverage of the broad topics in financial planning. Such concerns legitimately arise due to the specialization of current faculty, challenges in recruiting new faculty, institutional constraints on resource utilization, and uncertainty about how a new program will be received as well as how the new program will affect existing programs. In this study, we investigate United States colleges and universities that have both a CFP Board-registered financial planning program and an insurance and risk management degree program. Specifically, we examine the faculty resources employed by universities with both programs. We consider number of faculty and their professional credentials. We also examine the degree of

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overlap between the two programs. Specifically, we describe the courses necessary for a student majoring in risk management/insurance to complete the financial planning program.

## **II. University Insurance Education**

The insurance industry is a leader in requiring and offering opportunities for continuing education for its professionals. However, historically, the insurance industry (in particular its distribution aspect) has relied heavily on on-the-job or in-house training and proprietary insurance pre-licensing schools to provide initial education for personnel. Traditional university education of agents was not common, but university programs had educated many non-agent insurance industry professionals. Dorfman (1990) examines the role of insurance courses in an undergraduate business curriculum, noting that a minority of Million Dollar Roundtable members (nationwide top insurance sales persons) were college graduates, and a very small minority of those graduates were insurance majors. Dorfman cites two potential reasons for a lack of undergraduate insurance education: AACSB International's emphasis on a broad approach to business education, and the tendency to shift specialized study to graduate schools. He also addresses criticisms that insurance is too narrow a field to merit much academic study at the undergraduate level. For example, Dorfman notes that even the term "risk management" is a misnomer, as his experience suggests that firms heavily rely on insurance in their risk management programs. In a way, the critiques and Dorfman's response to them reflect the broadening nature of the insurance and financial planning industry and academe's response to that change.

### **Integration of New Programs**

Prior work has addressed the effects of changes in finance curricula in response to industry standards. Specifically, these studies examine the incorporation of professional certification standards into finance curricula, focusing on the implementation of the standards and the effects on existing programs. For example, Hamilton and Marshall (1987) note that most finance programs can add content in support of students' pursuit of the Chartered Financial Analyst designation to existing courses without much difficulty. Later, Charleton and Johnson (1999) survey finance departments that offer courses of study for the Chartered Financial Analyst® (CFA®) designation. They note that finance departments adding CFA-related content to their programs reported increased student interest in the finance major and increased placement opportunities for students. Generally, departments noted synergistic effects of incorporating CFA content.

The CFA results are noteworthy because, as Hamilton and Marshall note, few curricular and faculty changes are required to implement that program of study. The addition of a financial planning program to an existing insurance major is another matter, as it may require additional courses and faculty resources, and it may attract students from the insurance major to the financial planning major. As of March 2008, the American Risk and Insurance Association reported 51 colleges and universities in North America that offer programs in insurance and/or risk management. At the same time, the CFP Board of Standards reported over 90 registered university programs that lead to a degree in financial planning. (Graduates of programs registered with the CFP Board automatically meet education requirements to sit for the CFP Certification examination.) As of March 2008, there were ten universities with both an insurance

major program and a CFP Board-registered financial planning program. Table I lists these programs.

When a new program is added to a department's offerings there are often concerns about effects on resource allocation and the potential for "cannibalistic" effects on the department's older offerings. Regarding resource allocation, perhaps the biggest concern is the specialization of department faculty. Insurance is a very specialized field, and it is possible that either an insurance faculty member may need significant re-tooling in order to effectively teach specialized topics in the broader field of financial planning, or new faculty may need to be hired. Either option stretches departmental resources. Thus a question arises: How do these departments deploy faculty, and what is the mix of faculty qualifications within a department?

Another concern is the possibility that a new financial planning program may inordinately draw students from the insurance program. This is a very real possibility because of disparate projected job growth rates in these two areas. According to the Bureau of Labor Statistics' *Occupational Outlook Handbook 2007*, the job categories of "financial analysts and personal financial advisors" is projected to grow by 37% over the decade 2006-2016, a rate BLS calls "much faster than average." On the other hand, insurance sales agent positions are expected to increase by 13% over the same period, or "about as fast as average." While the percentage growth rates may not be indicative of actual job growth in terms of total employment (The Bureau of Labor Statistics reports 436,000 persons employed in insurance sales compared to 147,000 employed as financial analysts and personal financial advisors.), students and career counselors may be influenced by the growth rate disparity in making career decisions or giving career advice. Thus students may cite the potential disparity in placement opportunities in opting for the new financial planning major over the insurance major.

Institutional factors may mitigate any potential migration of students from the insurance program to financial planning. For example, many insurance companies and industry groups have continually been generous supporters of insurance major programs at universities. This support includes general financial support, support for specific faculty positions and support for scholarships. In the cases of the latter two types of support, department positions and scholarships are specifically dedicated to insurance faculty and students majoring in insurance. Thus, if a student opts for a financial planning major, that student may forego significant opportunities with regard to financial aid. Given the possibilities for "major cannibalism" and institutional constraints of student financial aid, another question arises: How can a student major in insurance and still be effectively educated as a financial planner?

### **III. A Look at the Programs**

We examine the ten universities that have programs in both insurance and financial planning. We collect data from the programs, their course offerings and requirements and faculty information from the universities' respective web sites during the spring semester of 2008. Not surprisingly, there is considerable variation in what and how information is reported on the universities' web sites, so we base our discussion and findings on what is available.

## **Faculty Resources**

Table II shows descriptive data for faculty in the ten departments. We count only those faculty identified as teaching in either the insurance or financial planning program or both. Some of these departments are very large and include many faculty members specializing in corporate finance, financial institutions and other specialties. In some cases, a particular faculty member is listed as teaching in both programs, so that individual is counted each way, but that is a small number of cases. The first noteworthy finding in Table II is, insurance and financial planning programs use approximately the same number of faculty members. This may indicate that an otherwise small finance department with a heavy concentration of specialized insurance faculty may need to add positions in order to adequately cover the financial planning offerings. In each program, on average, 72% of the faculty members hold doctoral degrees.

Another interesting finding in Table II has to do with reported professional certifications held by the faculty members. Of the faculty members, in either program at all the universities, only four report holding the CFP certification, and all four of these are listed as faculty teaching in the financial planning program, as opposed to the insurance program or both. Conversely, insurance certifications are more prolific, and faculty members holding insurance certifications teach in each of the two programs at the universities. Not reported in Table II, but of interest, is the typical course load of faculty at these universities. Of the ten universities, six had a maximum faculty load of three sections per semester, three had a four-course maximum load, and one had a faculty member teaching six sections.

We note that it is possible and even common that required courses in an insurance major or a financial planning major might not be taught within a single department. For example, tax planning may be taught in an accounting department, estate planning may be taught in a business law department and employee benefits may be taught in a management department. In such cases, fewer resources are required of the major department, and teaching burden is shifted to the outside department(s). In most cases, the outside department welcomes the additional students, but might object to the increased enrollment if it hampers the outside department's ability to serve its own major students. The alternative, however, is replication of courses already taught by outside departments, which is inefficient and also generally opposed by the outside departments.

## **Course Offerings and Requirements**

The typical insurance major program includes a business administration core curriculum, major required courses, major menu courses (students choose from a list), and electives. Typical major required courses include: Principles of Insurance, Life/Health, Property/Casualty (some programs may break the material into courses in personal lines and commercial lines), Risk Management, and Employee Benefits. Typical major menu courses include: Tax Planning, Personal Selling, Insurance Law, Investments, Financial Planning, Financial Counseling, Actuarial Science, Estate Planning, and advanced courses in property and life insurance.

In order to be registered with the CFP Board, a financial planning program must offer a prescribed course of study that covers the 89 topics on the current CFP Certification Examination

topic list. The topics are divided into seven areas: financial planning principles, insurance planning, employee benefits planning, retirement planning, investments planning, tax planning, and estate planning. Generally, registered programs cover the required topics in six or seven required courses (whose titles closely match the seven topic areas) and the prerequisites for those courses. In addition, some programs require an integrative, case-oriented “capstone” course in financial planning.

Because many of the required courses in financial planning are contained in insurance major requirements or major menu requirements, or are acceptable as electives for a student majoring in insurance, it may be possible for a student to major in insurance and complete required coursework for a financial planning program with minimal extra coursework. This has obvious advantages for students, as they can broaden their education and their employment prospects considerably with minimal extra cost. It also allows an insurance major student to pursue preparation for a career in financial planning while remaining eligible for scholarships designated for insurance majors only. There is an advantage for departments offering both programs, as well, in that counseling a student into such a course of study minimizes the cannibalization problem. Table III shows marginal courses that, when coupled with an insurance major, will allow students from the respective institutions to meet CFP exam education requirements.

A stronger comparison of the two types of programs could be made by comparing the specific learning objectives and learning outcomes of these two tracks. However, not all of the programs we examine publish their learning objectives and outcomes.

#### **IV. Conclusion**

In this paper we discuss how financial deregulation has changed the financial landscape, and the concomitant evolution of finance curricula. Specifically, we explore the schools that offer both insurance majors and a CFP Board registered financial planning program. A number of the required and elective courses in an insurance curriculum (life insurance, employee benefits, estate planning) are useful in meeting the necessary requirements to sit for the CFP Examination. In exploring 10 such schools, we find that students may supplement an insurance major with a financial planning major by completing as few as three additional courses. With proper advisement, students could successfully complete both programs; the areas most commonly lacking in the former and required in the latter are estate planning and taxation.

Some schools have approved CFP-administered courses supplemental to the insurance major in order to sit for the CFP exam. And, other schools require almost the entire financial planning curriculum in addition to the insurance major (such financial planning programs are in one college while risk management and insurance is in the College/School of Business). Ideas for further research include historical analyses of program enrollments, the cannibalizing/synergizing effect on insurance programs and courses when financial planning programs are introduced, placement and career records of graduates, and the industry financial support of programs.

**Table I**

Universities having both an undergraduate program in insurance/risk management and a CFP Board-registered financial planning program

Appalachian State University	Mississippi State University
Baylor University	University of North Texas
California State University – Fullerton	Ohio State University
University of Central Arkansas	Virginia Commonwealth University
University of Georgia	University of Wisconsin – Madison

**Table II**

Descriptive data for faculty in insurance and financial planning programs at ten universities that have both programs, Spring 2008

	Insurance Programs	Financial Planning Programs
Number of Faculty	36	32
Faculty with Doctorate	26 (72%)	23 (72%)
Faculty with CFP Designation	0 (0%)	4 (13%)
Faculty with Insurance Certification (CLU, CPCU, etc.)	7 (19%)	5 (16%)
Faculty with Other Certification (CPA, CFA, etc.)	2 (6%)	3 (9%)

**Table III**

Marginal courses required beyond requirements for an insurance major in order to meet requirements to sit for the CFP Certification examination at 10 universities, Spring 2008. Hours are additional to the requirements for a major in insurance; when an insurance program has free electives, the addition to a student’s total degree hours will be less. In some cases, an assumption is made about menu courses taken in the insurance major.

University	Additional Courses
Appalachian State University	Estate Planning Retirement and Employee Benefit Planning Two of Individual Income Taxation, Survey of Investments, and Financial Planning (one of these must be taken within the insurance program)
Baylor University	Introduction to Personal Financial Planning Investment Analysis Personal and Business Tax Planning Seminar in Personal Financial Counseling
California State University – Fullerton	Introduction to Investments, Real Estate Investment Analysis, Retirement and Estate Planning, Advanced Investment Analysis, Options and Futures, or Investment Management
University of Central Arkansas	Individual Taxation Advanced Income Tax Estate Planning
University of Georgia	Students may complete a Family Financial Planning Certificate by taking five 5-day courses and one 6-day course to become eligible to sit for the CFP® exam
Mississippi State University	This degree program combines Risk Management/Insurance and Financial Planning.

**Table III, continued**

University	Additional Courses
University of North Texas	Students may complete a Family Financial Planning Certificate by taking five 5-day courses and one 6-day course to become eligible to sit for the CFP® exam
Ohio State University	Intermediate Microeconomics Intermediate Macroeconomics Introduction to Financial Institutions and Markets Computerized Management Information Systems Bank Administration
Virginia Commonwealth University	Security Analysis and Portfolio Management Employee Benefit Planning Tax Accounting
University of Wisconsin - Madison	Students may complete the preparation program for the CFP® exam or a Consumer Science Major with Concentration in Personal Finance by completing nine program-specific courses, three hours of electives, 18 credit hours of supportive courses (which may include six hours – Principle of Risk Management and Employee Benefits - from the insurance program), and nine credit hours from a related discipline (which may include six hours – Property Risk Management and Life and Health Insurance - from the insurance program).

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## WACC Misunderstandings

Dean Johnson and Howard Qi

### Abstract

The Weighted Average Cost of Capital (WACC) has become a standard term and tool in finance. Given its broad acceptance and use, individuals are tempted to apply the WACC method without critically considering its theoretical foundation. Specifically, this study explains two common misunderstandings about the WACC method found in industry, literature and textbooks. First, decision makers view the WACC approach as valid only when the capital structure does not change. This is not a true restriction on the application of WACC. Second, many individuals and textbooks view WACC as the appropriate discount rate for NPV calculations if the project has the same risk and leverage as the mother firm without considering the investment horizon of the project. As shown, this can lead to faulty capital budgeting decisions. As such, this paper joins a small but growing stream of research in critically examining capital budgeting tools. It serves as a warning to practitioners in the use of WACC and wakeup call for academics in the instruction of WACC.

### I. Introduction

The weighted average cost of capital (WACC) approach plays an important role in capital budgeting. It has been conveniently used in industry and academia in two major situations. First, when the present value of a firm is known, WACC serves as a steppingstone to back out the required return on equity  $r_E$  (or equity beta  $\beta_E$ ) as a function of the current leverage ratio  $l$  and the opportunity cost of capital  $r_A$  (or the asset return if the firm were all-equity financed). WACC can estimate the new required equity return for changes in firm leverage or the interest on debt  $r_D$ . Second, if a new project or expansion of the firm with similar business risk and capital structure is proposed, the WACC of the mother firm would be the correct discount factor for finding the present value of the forecasted cash flows. Since these two applications are intrinsically consistent with each other, we will mostly focus on the second to explain two common pitfalls regarding the WACC.

In making capital budgeting decisions regarding a project, traditional methodologies include discounting the forecasted cash flows by the WACC and the adjusted present APV approach proposed by (Myers, 1974).<sup>3</sup> The APV approach is also referred to as the valuation-by-components method since it treats the total firm value as two components bundled together: the unlevered firm value ( $V$ ) and the present value of the tax shields (Myers 1974; Brealey,

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<sup>3</sup> The adjusted present value (APV) method says that the levered firm's value is equal to the unlevered firm value plus the present value of the tax shields. It is the application of the value additivity principle.

Myers and Allen, 2005).<sup>4</sup> It is common wisdom that the APV method applies to constant debt level while the WACC method applies to constant leverage ratio situations (Brealey *et al.*, 2005; Ehrhardt and Daves, 1999). Alternatively one can use the cash flow to equity (FTE) method to discount the cash flows to equity holders by the required equity rate of return and then add the debt value. Both the FTE and APV are the direct invocation of the fundamental principle of value additivity.<sup>5</sup>

(Booth, 2002) claims one can always find a WACC by discounting the relevant cash flows to get the known present value of the firm. In other words, WACC is a secondary concept which is useful only when the present value of the firm is known and a similar firm (or project) is to be priced. Thus, at least in capital budgeting decisions, one can use the existing firm's information to find the WACC and use it to price a proposed project.

Given the intuitive appeal of the WACC approach, however, one can easily fall victim to a few pitfalls. Apart from a few well elaborated pitfalls in (Booth, 2002), in this paper, we explain two common misunderstanding and misuse of the WACC approach found in industry, literature and textbooks.

## II. The WACC Approach and Common Misunderstandings

The WACC plays a central role in capital budgeting for its convenience and conceptually straightforwardness. However, its application is far more complex than it appears on the surface. We begin this section by tackling the first misunderstanding. Namely, it is commonly believed and taught that the WACC method is valid only if the firm's capital structure is constantly rebalanced (Brealey *et al.*, 2005). However, this concept is not entirely accurate.

### *1. Pitfall 1 – “the WACC approach is valid only when the capital structure does not change”*

The understanding that the WACC approach is valid only when the firm constantly rebalances its capital structure is widely held in the research literature and by many popular textbooks. For example, see (Ruback, 2002), (Fernández, 2004), (Brealey *et al.*, 2005), and (Brigham and Ehrhardt, 2004). However, this understanding is seriously flawed.

The role of WACC is similar to that of the bond yield-to-maturity which is a flat rate that generates the same market bond price when applied to every cash flows of the bond. Bond yield-to-maturity is actually the cash flow-weighted geometric average of the underlying spot rates. Since the spot discount rates are not observed, and in general, different cash flows are subject to different spot rates, bond yield-to-maturity becomes a convenient simple measure summarizing the spot rates. No matter how different the underlying spot rates are, given the cash flows (i.e., the weights), there always exists one corresponding yield-to-maturity to allow us to arrive at the

<sup>4</sup> Whether the APV approach is appropriate for growth firms is currently under debate (Fernández, 2004, 2005, 2006; Cooper and Nyborg, 2006; and Fieten *et al.*, 2005). This ongoing debate centers on the correct method of estimating the present value of the tax shields.

<sup>5</sup> (Ruback, 2002) proposed the capital cash flow (CCF) valuation method. Ruback considers the case where debt varies in proportion with the total firm value (i.e., constant leverage), thus the discount rate for the risky tax shields is the asset rate of return  $r_A$ . He proved and showed with examples that valuation by WACC and CCF yields the same results. Thus, in this paper, we focus on the WACC and APV approaches.

same market bond price. The WACC serves exactly the same purpose when we deal with valuing a firm or a project.

Rather than depending on the changes in capital structure, the WACC actually depends on the future capital structures the investors are expecting. This understanding is important because it implies that a changing capital structure does not invalidate the WACC method if those changes are the consequences of the same debt policy.

To illustrate this point, we compare two different capital structure policies. In each case, the WACC method is valid when it is properly used. Suppose the firm's free cash flow  $FCF$  is perpetual, debt interest is  $r_D$ , corporate tax rate is  $\tau$ , opportunity cost of capital is  $r_A$ , firm value is  $V_L$  and the debt's market value is  $D$ . Assuming away bankruptcy and financial distress costs, if the firm maintains a constant leverage ratio, then the WACC is (See Appendix A.1)

$$WACC = r_A - r_D \tau \times \frac{D}{D+E} = r_A - r_D \tau \times l, \quad (1)$$

and the implied expected rate of return on equity is given by

$$r_E = r_A + (r_A - r_D) \frac{D}{E}. \quad (2)$$

Eq. (2) is commonly called the MM Proposition II.

For firm following a constant debt policy, the proper discount rate becomes (See Appendix A.2)

$$r = r_A (1 - l \tau). \quad (3)$$

Eq. (3) was proposed by Modigliani and Miller. If we force  $WACC = r$  in (3), then the unlevered expected equity return is given by

$$r_E = r_A + (r_A - r_D) (1 - \tau) \frac{D}{E}. \quad (4)$$

Eq. (4) is sometimes referred to as the Hamada formula.

Formulae in (1) and (3) clearly mean that as long as the firm commits to the same capital structure (or debt) policy, the WACC approach is always valid. This claim holds true independent of whether the firm keeps a constant leverage ratio or not.

## 2. Pitfall 2 – Finite project life

The second WACC pitfall is a more serious inaccuracy. The WACC has been used to value a project independent of the project's life, e.g., (Ruback, 2002), which can lead to critical errors. To avoid this pitfall, one needs to understand the fundamentals of the WACC methodology.

When a new project with similar business risk is to be financed with the same capital structure policy as that of the mother firm, it is generally believed that the WACC method provides the correct pricing approach. In other words, the forecasted cash flows from the proposed project can be discounted at the mother firm's WACC to find the project's NPV. Applying the NPV rule, one makes a decision on the proposed project.

However, this is incorrect if the proposed projects have differing finite lives. In particular, we wish to show that the WACC and the APV methods normally do not agree with each other when the projects have finite lives. We use the following example to demonstrate our point.

Suppose ABC Inc.'s WACC is 9 percent and it follows constant debt policy. The firm decides to value a project of four years financed with constant debt  $D = \$50K$  at an annual interest rate  $R_D = 6\%$ . Further suppose that the opportunity cost of capital implied by Eq. (3) is  $R_a = 12.8\%$ . Table I shows the NPV of the project is  $\$0.9K$ . Both Panels A and B, with the WACC and APV methods, respectively, agree with each other.

However, with the same set of parameters, if the firm is to value another project with a different life, then the WACC and APV methods will diverge. Table II shows the results for a project of six years. The WACC approach (in Panel A) accepts the project with a positive NPV =  $\$0.3K$ , while the APV method (in Panel B) rejects the project with a negative NPV =  $-\$0.4K$ . Had the parameters been such that the two methods agree in Table II, then they would not have agreed in Table I.

The point we wish to make is twofold. First, the two valuation methods typically do not agree with each other as the project's life varies. Second, if the WACC method yields the correct answer (i.e., when it agrees with the APV method) for certain project horizon, then one can expect it to be invalid for other horizons. The second point is important because it does recognize that the WACC approach can be valid in a special case<sup>6</sup> even if the project's life is finite. Conceptually, this is in contrast with some traditional views, for example, (Arditti, 1973) claims that the WACC method is valid only for perpetuities.

### III. Conclusions

WACC has been and will continue to be a mainstay of corporate finance. This paper joins a small body of research examining the relationship between valuation approaches and their advantages/disadvantages. In particular, we document two WACC misunderstandings. Namely, the viewpoint that WACC is limited in its application by the capital structure policy of the firm and the mother firm WACC can be applied to projects with differing finite lives. Going forward, practitioners and academics should be more measured in the application and instruction of WACC principles.

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<sup>6</sup> In our case, the validity of the WACC approach requires not only the proposed project's business risk and capital structure policy match those of the mother firm, but also the horizon structure of the two must match as well.

**Table I. Valuating a four-year project financed with constant debt.** The numbers are in thousands of dollars. Panel A shows the valuation process using the WACC approach. Panel B shows the same analysis using the APV method instead. The parameters (i.e., WACC,  $R_D$ ,  $R_a$ , debt level and corporate tax rate) are chosen such that the two methods yield the same result. In this case, both would accept the project with the same NPV = \$0.9K. In Table II, we show that with the same parameters, these two methods will normally give different answers. Tables I and II demonstrate that there is no single set of parameters that can make the WACC and the APV methods agree with each other as the project horizon varies.

Panel A. The WACC method.

Year		Forecast			
		1	2	3	4
1	Sales	90	95	102	112
2	Cost of goods sold	62	64	65	72
3	Depreciation	9.9	10.6	11.3	11.8
4	EBIT (1-2-3)	18.1	20.4	25.7	28.2
5	Tax (EBIT * 35%)	6.3	7.1	9.0	9.9
6	Profit after tax (4-5)	11.8	13.3	16.7	18.3
7	Investment in fixed assets	14.6	15.5	16.6	15
8	Investment in working capital	0.5	0.8	0.9	0.5
9	Free cash flow (6+3-7-8)	6.6	7.6	10.5	14.6
10	PV Free cash flow, years 1-4	30.9	(discounted at WACC = 9%)		
11	Initial investment	30			
12	<b>Project's NPV (10-11)</b>	<b>0.9</b>			

Panel B. The APV method.

1	Free cash flow		6.6	7.6	10.5	14.6
2	PV Free cash flow, years 1-4	28.1	(discounted at $R_a = 12.8\%$ )			
3	Debt		50	50	50	50
4	Interest (at 6%)		3	3	3	3
5	Tax shield (interest * 35%)		1.05	1.05	1.05	1.05
6	PV of tax shields at $R_D = 6\%$	2.8				
7	Initial investment	30				
8	<b>Project's NPV (2+6-7)</b>	<b>0.9</b>				

**Table II. Valuating a six-year project financed with constant debt.** The numbers are in thousands of dollars. Panels A and B show the valuation process using the WACC and APV approach, respectively. The parameters (i.e., WACC,  $R_D$ ,  $R_a$ , debt level and corporate tax rate) are the same as in Table I. The initial investment is assumed to be \$44.8K in this case. The WACC approach (in Panel A) results in a positive NPV while the APV method rejects the project with a negative NPV equal to  $-\$0.4K$  (in Panel B). We use Tables I and II to show that there is normally no single set of parameters that can make the WACC and the APV methods agree with each other as the project horizon varies.

Panel A. The WACC method.

Year		Forecast						
		1	2	3	4	5	6	
1	Sales	90	95	102	112	123	135	
2	Cost of goods sold	62	64	65	72	88	103	
3	Depreciation	9.9	10.6	11.3	11.8	13.1	9	
4	EBIT (1-2-3)	18.1	20.4	25.7	28.2	21.9	23.0	
5	Tax (EBIT * 35%)	6.3	7.1	9.0	9.9	7.7	8.1	
6	Profit after tax (4-5)	11.8	13.3	16.7	18.3	14.2	15.0	
7	Investment in fixed assets	14.6	15.5	16.6	15	13.9	13.9	
8	Investment in working capital	0.5	0.8	0.9	0.5	0.4	0.4	
9	Free cash flow (6+3-7-8)	6.6	7.6	10.5	14.6	13.0	9.7	
10	PV Free cash flow, years 1-4	45.1						
11	Initial investment	44.8	(discounted at WACC = 9%)					
12	<b>Project's NPV (10-11)</b>	<b>0.3</b>						

Panel B. The APV method.

1	Free cash flow	6.6	7.6	10.5	14.6	13.0	9.7
2	PV Free cash flow, years 1-6	40.0	(discounted at $R_a = 12.8\%$ )				
3	Debt	50	50	50	50	50	50
4	Interest (at 6%)	3	3	3	3	3	3
5	Tax shield (interest * 35%)	1.05	1.05	1.05	1.05	1.05	1.05
6	PV of tax shields at $R_d = 6\%$	4.4					
7	Initial investment	44.8					
8	<b>Project's NPV (2+6-7)</b>	<b>-0.4</b>					

## Appendix

### A. WACC, APV and Capital Structure Policy

#### A.1. Constant Leverage

Assume the firm follows a debt policy of maintaining a constant leverage ratio forever. The tax shield each year  $r_D D \tau$  shall fluctuate with firm value  $V_L$ , given the debt policy.<sup>7</sup> As argued in (Ruback, 2002) in the spirit of the APV approach, the proper discount rate is the opportunity cost of capital  $r_A$  (also referred to as the asset return) for both  $FCF$  and the tax shields. Therefore, the firm value is given by

$$V_L = \frac{FCF}{r_A} + \frac{r_D D \tau}{r_A}. \quad (A1)$$

Since the cash flows are not constant, it is important to view them as the expected amounts. According to the WACC methodology, we have

$$V_L = \frac{FCF}{r_A} + \frac{r_D D \tau}{r_A} \equiv \frac{FCF}{WACC}. \quad (A2)$$

Eq. (A2) says that instead of valuing each cash flow stream separately, one can gross up the tax shields in an overall discount factor called WACC such that we will arrive at the same firm value  $V_L$ . Therefore, to satisfy Eq. (A2), WACC must take the following form,

$$WACC = r_A - r_D \tau \times \frac{D}{D+E} = r_A - r_D \tau \times l. \quad (A3)$$

where  $l = \frac{D}{V_L}$  is the leverage ratio. According to the definition of WACC,

$$WACC = r_D (1 - \tau) \frac{D}{E+D} + r_E \frac{E}{E+D}, \quad (A4)$$

where  $E$  is equity value and  $r_E$  is the required rate of return on equity. Eqs. (A3) and (A4) imply that the equity holders would require a rate of return given below,

$$r_E = r_A + (r_A - r_D) \frac{D}{E}. \quad (A5)$$

Eq. (A4) and (A5) are (1) and (2) in the paper, respectively. Eq. (A5) is the familiar MM proposition II. As long as the firm does not deviate from its capital structure policy, the debt-equity ratio will remain constant, and thereby  $r_E$  will remain the same as time goes.

#### A.2. Constant Debt

If the firm maintains the same debt level  $D$  in dollar amount, then the debt and the associated debt tax shields are certain cash flows. The proper discount rate for the tax shields becomes the cost of debt  $r_D$ . Following the APV spirit, the firm value is given by

$$V_L = \frac{FCF}{r_A} + \frac{r_D D \tau}{r_D} = \frac{FCF}{r_A} + D \tau. \quad (A6)$$

Rewrite Eq. (A6),

<sup>7</sup> The firm can lose part of or the entire tax shield if it does not have enough income to deduct tax interest payments.

$$V_L \left( 1 - \frac{D\tau}{V_L} \right) = V_L (1 - l\tau) = \frac{FCF}{r_A}. \quad (A7)$$

And by the definition of the WACC methodology,

$$V_L = \frac{FCF}{r_A (1 - l\tau)} \equiv \frac{FCF}{WACC}, \quad (A8)$$

Thus the proper discount rate is

$$r = WACC = r_A (1 - l\tau). \quad (A9)$$

Eq.(A9) was proposed by Modigliani and Miller. Combining Eqs. (A4) and (A8), we have

$$r_E = r_A + (r_A - r_D)(1 - \tau) \frac{D}{E}. \quad (A10)$$

Eqs. (A9) and (A10) are (3) and (4) in the paper, respectively. Eq. (A10) is sometimes referred to as the (Hamada, 1972) formula. Comparing Eqs. (A5) and (A10), one can see that  $r_E$  is higher in the constant leverage ratio case given everything else being equal. This is because the present value of the tax shields is worth less when discounted by  $r_A$  in Eq. (A2) rather than a lower rate of  $r_D$  in Eq. (A6),<sup>8</sup> and equity holders bear this reduction in firm value, implying a higher expected equity required rate of return.

A major difference between Eqs. (A5) and (A10) is that  $r_E$  in (A10) changes over time due to a changing debt-equity ratio because the firm does not continuously rebalance its capital structure.

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<sup>8</sup> See (Cooper and Nyborg, 2006).

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## **An Option Valuation Analysis of the Value of Tax Shields for Risky Debt**

Tom W. Miller

### **Abstract**

Several different models for the appropriate discount rate for the tax shields and the present value of the tax shields resulting from the use of debt have appeared in the finance literature. This research uses an option valuation framework to develop models for the appropriate discount rate for the risky tax shields, the present value of the tax shields, and the probability of default resulting from the use of debt. Relationships between cash flows and their present values for firms with constant, perpetual growth are developed. The reinvestment required to support the constant, perpetual growth is incorporated in the expressions for the relationships between cash flows and present values. This analysis using option valuation theory and relationships between cash flows and their present values provides a framework for unifying the major apparently dissimilar results for the appropriate discount rate for the tax shields and the present value of the tax shields that have appeared in the finance literature.

### **I. Introduction**

Different models for the appropriate discount rate for the tax shields and the present value of the tax shields resulting from the use of debt have appeared in the finance literature. This research uses an option valuation framework to develop models for the appropriate discount rate for the tax shields, the present value of the tax shields, and the probability of default resulting from the use of debt. Analysis using option valuation theory provides a framework that unifies the major apparently dissimilar results that have appeared in the finance literature. Section 2 of the paper presents the major models for the appropriate discount rate for the tax shields and the present value of the tax shields resulting from the use of debt that have appeared in the finance literature. Models showing the relationships between cash flows and present values are developed in Section 3. Section 4 applies option valuation analysis to securities that are claims or options on the value of the firm. In this formulation, the underlying asset for the contingent claim is the value of the firm's operating assets. Debt and equity are valued as contingent claims on the value of the firm's operating assets. In Section 4, the option valuation model is developed when there are no taxes. Section 5 extends the models of Section 4 to a business environment with taxes. This section provides a framework for unifying the major results for the appropriate discount rate for the tax shields and the present value of the tax shields that have appeared in the finance literature. A numerical illustration of the relationships between the relative amount of debt and the probability of default, the beta coefficient for risky debt, the appropriate discount rate for risky debt and risky tax shields, and the present value of the tax shields is presented in Section 6 and the accompanying tables and figures. Section 7 provides a summary of the results of this study and conclusions with respect to the major models for the appropriate discount rate for the tax shields and the present value of the tax shields resulting from the use of debt.

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## II. Previous Models for the Appropriate Discount Rate and the Present Value for the Tax Shields Resulting from the Use of Debt

Some of the different models for the present value of the tax shields ( $V_{TS,0}$ ) resulting from the use of debt that have appeared in the finance literature are presented in this section of the paper. For companies with constant perpetual cash flows, the discounted value of the tax shields is given by (Modigliani and Miller 1963)

$$V_{TS,0} = \frac{D_0 \cdot T_C \cdot R_F}{R_F} = D_0 \cdot T_C \quad (1)$$

where  $D_0$  is the present value of debt,  $T_C$  is the corporate income tax rate, and  $R_F$  is the risk-free rate.

Technically,  $V_{TS,0}$  is not a cash flow's present value. It is the difference between the present value of the tax stream for the company without debt which should be discounted at the unlevered cost of equity,  $R_U$ , and the present value of the tax stream for the company with debt which should be discounted at the levered cost of equity,  $R_L$ . The difference between the present value of the tax stream for the company without debt and the present value of the tax stream for the company with debt provides the following expression for the present value of the tax shields when there is constant, perpetual growth.

$$V_{TS,0} = \frac{TAX_{U,1}}{R_U - g} - \frac{TAX_{L,1}}{R_L - g} \quad (2)$$

where  $TAX_{U,1}$  is the tax for the unlevered firm for time 1,  $TAX_{L,1}$  is the tax for the levered firm for time 1, and  $g$  is the constant growth rate. For companies with constant perpetual growth, even though the present value of the tax shields is the difference between the present values of two different tax streams, its value is given by (Lewellen and Emery 1986; Fernandez 2002 and 2004)

$$V_{TS,0} = \frac{D_0 \cdot T_C \cdot R_U}{R_U - g} \quad (3)$$

In this formulation, this result does not mean that the unlevered cost of equity is the appropriate discount rate for the tax shields. The cash flow stream being discounted here is larger than the stream of tax savings resulting from the interest expenses.

Another position holds that since the difference in the taxes is caused by the use of debt financing, the risk of the tax saving from the use of debt is the same as the risk of debt and the discounted value of the tax shields due to interest payments should be calculated using (Inselbag and Kaufold 1997; Luehrman 1997; Myers 1974; Ruback 2002)

$$V_{TS,0} = \frac{D_0 \cdot T_C \cdot R_D}{R_D - g} \quad (4)$$

where  $R_D$  is the risk-adjusted required rate of return for debt.

A different point-of-view is that the risk of the tax savings from the use of debt is the same as the risk of the taxes of the unlevered firm and the discounted value of the tax shield due to interest payments should be calculated using (Harris and Pringle 1985; Ruback 1995; Taggart 1991)

$$V_{TS,0} = \frac{D_0 \cdot T_C \cdot R_D}{R_U - g} \quad (5)$$

A variant of this model that treats the tax savings from the use of debt as having the same risk as the taxes of the unlevered firm is (Miles and Ezzell 1980)

$$V_{TS,0} = \left( \frac{D_0 \cdot T_C \cdot R_D}{R_U - g} \right) \cdot \left( \frac{1 + R_U}{1 + R_D} \right) \quad (6)$$

In these models, there is disagreement about whether the appropriate discount rate for the tax shields is the risk-free rate, the risk-adjusted discount rate for debt, or the discount rate for unlevered equity. There is also disagreement about how the numerator of the model for the present value of the tax shields should be formulated.

### III. Relationships between Cash Flows and Present Values

This section of the paper examines relationships between cash flows and their present values for firms with constant, perpetual growth. Growth requires reinvestment. The reinvestment required to support the constant, perpetual growth is incorporated in the expressions developed for the relationships between cash flows and present values. The relationships for free cash flows, required capital reinvestment, the present value of the unlevered firm, and the present value of the taxes for the unlevered firm are presented. The relationships for debt cash flows, required debt reinvestment, the present value of the debt, and the present value of the interest also are developed. In addition, the relationships for equity cash flows, required equity reinvestment, the present value of equity, and the present value of the taxes for the levered firm are provided. These relationships are used later in the paper to develop models for the present value of the tax shields resulting from using debt.

#### A. Free Cash Flows and Their Present Values

For growing perpetuities, the free cash flows for the firm are

$$FCF_{t+1} = (1 - T_C) \cdot EBIT_{t+1} - g \cdot BVC_t \quad (7)$$

where  $FCF_{t+1}$  is the free cash flow for time  $t + 1$ ,  $T_C$  is the corporate income tax rate,  $EBIT_{t+1}$  is the earnings before interest and taxes for time  $t + 1$ ,  $g$  is the constant perpetual growth rate, and  $BVC_t$  is the book value of capital at time  $t$ . The constant return on capital before taxes is defined as

$$ROC = \frac{EBIT_{t+1}}{BVC_t} \quad (8)$$

The constant reinvestment rate for capital is defined as

$$b_U = \frac{g \cdot BVC_t}{EBIT_{t+1}} \quad (9)$$

which implies that

$$g \cdot BVC_t = b_U \cdot EBIT_{t+1} \quad (10)$$

and

$$FCF_{t+1} = (1 - T_C) \cdot EBIT_{t+1} - b_U \cdot EBIT_{t+1} \quad (11)$$

$b_U$  denotes the reinvestment rate for the unlevered firm. The growth rate is related to the reinvestment rate for capital and the return on capital by

$$g = b_U \cdot ROC = \frac{g \cdot BVC_t}{EBIT_{t+1}} \cdot \frac{EBIT_{t+1}}{BVC_t} \quad (12)$$

and the reinvestment rate for capital is related to the growth rate and the return on capital by

$$b_U = \frac{g}{ROC} \quad (13)$$

which shows that the free cash flow is

$$FCF_{t+1} = (1 - T_C) \cdot EBIT_{t+1} - \left( \frac{g}{ROC} \right) \cdot EBIT_{t+1} \quad (14)$$

The present value of the free cash flows at time  $t$  is

$$V_{FCF,t} = \frac{(1 - T_C) \cdot EBIT_{t+1} - \left( \frac{g}{ROC} \right) \cdot EBIT_{t+1}}{R_U - g} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_{EBIT,t} \quad (15)$$

where the present value of the earnings before interest and taxes is given by

$$V_{EBIT,t} = \frac{EBIT_{t+1}}{R_U - g} \quad (16)$$

The taxes for the unlevered firm for time  $t + 1$  are

$$\text{TAX}_{U,t+1} = T_C \cdot \text{EBIT}_{t+1} \quad (17)$$

and their present value at time  $t$  is

$$V_{\text{TAX}_{U,t}} = \frac{T_C \cdot \text{EBIT}_{t+1}}{R_U - g} \quad (18)$$

### B. Debt Cash Flows and Their Present Values

For growing perpetuities, the debt cash flows for the debt holders are

$$\text{DCF}_{t+1} = \text{INT}_{t+1} - g \cdot \text{BVD}_t \quad (19)$$

where  $\text{DCF}_{t+1}$  is the debt cash flow for time  $t + 1$ ,  $\text{INT}_{t+1}$  is the interest for time  $t + 1$ ,  $g$  is the constant perpetual growth rate, and  $\text{BVD}_t$  is the book value of debt at time  $t$ . The constant return on debt is defined as

$$\text{ROD} = \frac{\text{INT}_{t+1}}{\text{BVD}_t} \quad (20)$$

The constant reinvestment rate for debt is defined as

$$b_D = \frac{g \cdot \text{BVD}_t}{\text{INT}_{t+1}} \quad (21)$$

where  $b_D$  denotes the reinvestment rate for the debt holders. The growth rate is related to the reinvestment rate for debt and the return on debt by

$$g = b_D \cdot \text{ROD} = \left( \frac{g \cdot \text{BVD}_t}{\text{INT}_{t+1}} \right) \cdot \left( \frac{\text{INT}_{t+1}}{\text{BVD}_t} \right) = \frac{g \cdot \text{BVD}_t}{\text{BVD}_t} \quad (22)$$

which implies that

$$g \cdot \text{BVD}_t = b_D \cdot \text{INT}_{t+1} \quad (23)$$

and

$$\text{DCF}_{t+1} = \text{INT}_{t+1} - b_D \cdot \text{INT}_{t+1} = (1 - b_D) \cdot \text{INT}_{t+1} \quad (24)$$

Since the reinvestment rate for debt is related to the growth rate and the return on debt by

$$b_D = \frac{g}{ROD}, \quad (25)$$

$$DCF_{t+1} = \left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot INT_{t+1}. \quad (26)$$

The present value of the debt cash flows at time  $t$  is

$$V_{DCF,t} = \frac{DCF_{t+1}}{R_D - g} = \frac{\left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot INT_{t+1}}{R_D - g} = \left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot \left( \frac{INT_{t+1}}{R_D - g} \right) = \left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot V_{INT,t} \quad (27)$$

where

$$V_{INT,t} = \frac{INT_{t+1}}{R_D - g} \quad (28)$$

is the present value of the interest. When  $ROD = R_D$ ,

$$V_{DCF,t} = \left( \frac{ROD - g}{ROD} \right) \cdot \left( \frac{INT_{t+1}}{R_D - g} \right) = \frac{INT_{t+1}}{R_D} \quad (29)$$

and  $BVD_t = V_{DCF,t}$ .  $V_{DCF,t}$  is the present value of the firm's debt at time  $t$ .

### C. Equity Cash Flows and Their Present Values

The equity cash flows for growing perpetuities for the equity holders are

$$ECF_{t+1} = (1 - T_C) \cdot (EBIT_{t+1} - INT_{t+1}) - g \cdot BVE_t \quad (30)$$

where  $ECF_{t+1}$  is the equity cash flow for time  $t + 1$ ,  $T_C$  is the corporate income tax rate,  $EBIT_{t+1}$  is the earnings before interest and taxes for time  $t + 1$ ,  $INT_{t+1}$  is the interest for time  $t + 1$ ,  $g$  is the constant perpetual growth rate, and  $BVE_t$  is the book value of equity at time  $t$ . Since

$$BVE_t = BVC_t - BVD_t, \quad (31)$$

$$ECF_{t+1} = (1 - T_C) \cdot (EBIT_{t+1} - INT_{t+1}) - g \cdot (BVC_t - BVD_t). \quad (32)$$

Since

$$g \cdot BVC_t = b_U \cdot EBIT_{t+1} \quad (33)$$

and

$$g \cdot BVD_t = b_D \cdot INT_{t+1}, \quad (34)$$

$$ECF_{t+1} = (1 - T_C) \cdot (EBIT_{t+1} - INT_{t+1}) - (b_U \cdot EBIT_{t+1} - b_D \cdot INT_{t+1}). \quad (35)$$

Since the reinvestment rate for capital is related to the growth rate and the return on capital by

$$b_U = \frac{g}{ROC} \quad (36)$$

and the reinvestment rate for debt is related to the growth rate and the return on debt by

$$b_D = \frac{g}{ROD}, \quad (37)$$

the equity cash flow is given by

$$ECF_{t+1} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot EBIT_{t+1} - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot INT_{t+1}. \quad (38)$$

The present value of the equity cash flows at time t is

$$V_{ECF,t} = \frac{ECF_{t+1}}{R_L - g} = \frac{\left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot EBIT_{t+1} - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot INT_{t+1}}{R_L - g} \quad (39)$$

which also equals

$$V_{ECF,t} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot \left( \frac{EBIT_{t+1}}{R_U - g} \right) - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot \left( \frac{INT_{t+1}}{R_D - g} \right). \quad (40)$$

The present value of the growing perpetuity of earnings before interest and taxes and the present value of the growing perpetuity of interest payments, the income tax rate, the reinvestment rate for capital [ $b_U = (g / ROC)$ ], and the reinvestment rate for debt [ $b_D = (g / ROD)$ ] determine the value of the equity for the levered firm.

$$V_{ECF,t} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_{EBIT,t} - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot V_{INT,t} \quad (41)$$

The taxes for the levered firm for time t + 1 are

$$\text{TAX}_{L,t+1} = T_C \cdot (\text{EBIT}_{t+1} - \text{INT}_{t+1}) \quad (42)$$

and their present value at time  $t$  is

$$V_{\text{TAX}_{L,t}} = \frac{\text{TAX}_{L,t+1}}{R_L - g} = \frac{T_C \cdot (\text{EBIT}_{t+1} - \text{INT}_{t+1})}{R_L - g} = T_C \cdot (V_{\text{EBIT},t} - V_{\text{INT},t}). \quad (43)$$

The present value of the tax shields is the difference between the present values of two different cash flows each with its own risk, the taxes paid by the unlevered firm and the taxes paid by the levered firm. Using relationships between cash flows and present values shows that the present value of the tax shields can be calculated as the present value of the tax savings from the interest.

$$V_{\text{TAX}_{U,t}} - V_{\text{TAX}_{L,t}} = T_C \cdot V_{\text{EBIT},t} - T_C \cdot (V_{\text{EBIT},t} - V_{\text{INT},t}) = T_C \cdot V_{\text{INT},t} = \frac{T_C \cdot \text{INT}_{t+1}}{R_D - g} = V_{\text{TS},t}. \quad (44)$$

#### IV. An Option Valuation Framework for the Firm

Option valuation analysis can be applied to securities that are claims or options on the value of the firm (Merton 1974). The underlying asset for the contingent claim is the value of the firm's operating assets. Debt and equity are valued as contingent claims on the value of the firm's operating assets. Suppose the firm has only two types of claims on the value of the firm: equity and zero-coupon debt which prohibits payment of dividends until after the face value of the debt is paid at maturity. The zero-coupon debt will be rolled over perpetually (paid off and reissued) creating an infinite stream of interest expenses for the firm and interest income for the debt holders. Assume that there are no taxes. Let the value of the underlying asset at time  $t$  for the option pricing model be denoted by  $V_t$ , the value of the equity at time  $t$  for the option pricing model be denoted by  $E_t$ , and the value of the debt at time  $t$  for the option pricing model be denoted by  $D_t$ . Conceptually,  $V_t$  in the option pricing model equals  $V_{\text{EBIT},t}$  in the cash flow model for growing perpetuities,  $E_t$  in the option pricing model equals  $V_{\text{EBIT},t}$  minus  $V_{\text{INT},t}$  in the cash flow model for growing perpetuities, and  $D_t$  equals  $V_{\text{INT},t}$  in the cash flow model for growing perpetuities. Let the face value of the debt for the option pricing model be denoted by  $B$  and the time until maturity for the debt be denoted by  $T$ . If the value of the firm's operating assets ( $V_T = V_{\text{EBIT},T}$ ) exceeds or equals the face value of the debt when the debt matures ( $V_T \geq B$ ), the debt holders will receive the face value of the debt ( $B$ ) and the equity holders will receive the residual ( $V_T - B$ ). If the value of the firm's operating assets is less than the face value of the debt when the debt matures ( $V_T < B$ ), the equity holders will exercise their limited liability option and default on the promised debt payment and surrender the firm to the debt holders. In this analysis, default on the firm's debt and surrender of the firm to the debt holders does not create any costs paid to third parties. The debt holders will receive the value of the firm's operating assets ( $V_T$ ) and the equity holders will receive nothing. The table shows the payoffs when the debt matures for this case.

	Default (Out of the Money)	No Default (At or In the Money)
$V_T$	$< B$	$\geq B$
$D_T$	$V_T$	$B$
$E_T$	$0$	$V_T - B$
$D_T + E_T$	$V_T$	$V_T$

### A. Value of the Equity

When the debt matures, the equity will be worth the greater of  $V_T - B$  or zero:

$$E_T = \max(V_T - B, 0). \quad (45)$$

The equity for this type of levered firm is a European call option on the value of the firm's operating assets ( $V_T$ ). The exercise price is equal to the face value of the zero-coupon debt ( $B$ ). The time until expiration is equal to the time to maturity for the debt ( $T$ ). The present value of the equity is given by the Black-Scholes solution for a European call option (Black and Scholes 1973; Merton 1973).

$$E_0 = V_0 \cdot N(d_1) - B \cdot e^{-rT} \cdot N(d_2), \quad (46)$$

$$d_1 = \frac{\ln\left(\frac{V_0}{B}\right) + \left[r + \left(\frac{\sigma^2}{2}\right)\right] \cdot T}{\sigma \cdot \sqrt{T}}, \quad (47)$$

and

$$d_2 = d_1 - \sigma \cdot \sqrt{T}. \quad (48)$$

$N(d)$  is the cumulative normal probability distribution and  $r$  (equals  $R_F$ ) is the risk-free rate of return. The stockholders have given ownership of the firm to the debt holders until the debt matures while keeping a call option to buy the firm back by paying the face value of the debt when the debt matures.  $V_0$  for this option pricing model equals the value of  $V_{EBIT,0}$  and  $E_0$  for this option pricing model gives the value of  $V_{EBIT,0}$  minus  $V_{INT,0}$ .

### B. Value of the Risky Debt

When the debt matures, the debt holders will receive the smaller of the value of the firm's operating assets or the face value of the debt.

$$D_T = \min(V_T, B). \quad (49)$$

The value of the firm's debt is also contingent on the value of the firm's operating assets. The present value of the risky debt is given by the Black-Scholes solution for the equity and the identity requiring that  $V_0 = D_0 + E_0$  in this case.

$$D_0 = V_0 - E_0 = V_0 - V_0 \cdot N(d_1) + B \cdot e^{-rT} \cdot N(d_2) = V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2). \quad (50)$$

$D_0$  for this option pricing model gives the value of  $V_{INT,0}$ .

### C. Value of the Firm with Risky Debt

The present value of the firm with risky debt,  $VF_0$ , is equal to the sum of the present value of the equity plus the present value of the debt.

$$VF_0 = D_0 + E_0 \quad (51)$$

$$VF_0 = V_0 [1 - N(d_1)] + B e^{-rT} N(d_2) + V_0 N(d_1) - B e^{-rT} N(d_2) = V_0. \quad (52)$$

In this situation, the use of debt affects the value of the equity and the value of the debt, but does not affect the value of the firm.

### V. Valuation with Corporate Taxes

The valuation expressions from the cash flow model for growing perpetuities and the values for  $E_0$  and  $D_0$  produced by the option pricing model along with the requirement that  $V_0 = V_{EBIT,0}$  are used to determine the value of the firm's equity when there are corporate income taxes, the value of the firm's debt when there are corporate income taxes, the value of the firm when there are corporate income taxes, and the value of the firm's tax shields when there are corporate income taxes.

#### A. Value of the Equity when there are Corporate Income Taxes

When there are corporate income taxes, the value of the equity is equal to the present value of the equity cash flows and is given by

$$V_{ECF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_{EBIT,0} - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot V_{INT,0}. \quad (53)$$

The value of  $V_{INT,0}$  is given by  $D_0$  in the Black-Scholes option pricing model indicating that

$$V_{ECF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_0 - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot D_0. \quad (54)$$

Substituting the Black-Scholes solution for  $D_0$  into the expression for the value of the equity,  $V_{ECF,0}$ , gives

$$V_{ECF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_0 - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot \{ V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2) \}. \quad (55)$$

#### B. Value of the Debt when there are Corporate Income Taxes

The value of the firm's debt with corporate income taxes is also contingent on the value of the firm. When there are corporate income taxes, the value of the debt is equal to the present value of the debt cash flows and is given by

$$V_{DCF,0} = \left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot V_{INT,0} \quad (56)$$

The value of  $V_{INT,0}$  is given by  $D_0$  in the Black-Scholes option pricing model. Substituting the Black-Scholes solution for  $D_0$  into the expression for the value of the debt,  $V_{DCF,0}$ , gives

$$V_{DCF,0} = \left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot \{V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2)\} \quad (57)$$

for the value of risky debt when there are corporate income taxes.

### C. Value of the Firm when there are Taxes

The present value of the levered firm when there are taxes is equal to the present value of the equity cash flows plus the present value of the debt cash flows so that

$$V_{ECF+DCF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_{EBIT,0} - \left[ (1 - T_C) - \left( \frac{g}{ROD} \right) \right] \cdot V_{INT,0} + \left[ 1 - \left( \frac{g}{ROD} \right) \right] \cdot V_{INT,0} \quad (58)$$

which indicates that

$$V_{ECF+DCF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_{EBIT,0} + T_C \cdot V_{INT,0} \quad (59)$$

Using the Black-Scholes option pricing model solution for the value of  $V_{INT,0}$  and  $V_0$  for the value of  $V_{EBIT,0}$  indicates that

$$V_{ECF+DCF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_0 + T_C \cdot \{V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2)\} \quad (60)$$

$V_{ECF+DCF,0}$  gives the value of the levered firm when there are corporate income taxes. The value of the unlevered firm when there are corporate income taxes is equal to the present value of the free cash flows and is given by

$$V_{FCF,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_{EBIT,0} = \left[ (1 - T_C) - \left( \frac{g}{ROC} \right) \right] \cdot V_0 \quad (61)$$

### D. Present Value of the Tax Shields for the Firm

The taxes for the unlevered firm for time  $t + 1$  are

$$TAX_{U,t+1} = T_C \cdot EBIT_{t+1} \quad (62)$$

and their present value at time 0 is

$$V_{TAX_U,0} = T_C \cdot V_{EBIT,0} \quad (63)$$

Using  $V_0$  as the value of  $V_{EBIT,0}$  gives

$$V_{TAX_U,0} = T_C \cdot V_0 \quad (64)$$

for the present value of the taxes for the unlevered firm at time 0. The taxes for the levered firm for time  $t + 1$  are

$$TAX_{L,t+1} = T_C \cdot (EBIT_{t+1} - INT_{t+1}) \quad (65)$$

and their present value at time 0 is

$$V_{TAX_L,0} = T_C \cdot (V_{EBIT,0} - V_{INT,0}) \quad (66)$$

The present value of the taxes for the levered firm is equal to the present value of the earnings before interest and taxes less the present value of the interest multiple by the corporate income tax rate. Since the value of  $V_{EBIT,0}$  minus  $V_{INT,0}$  is given by the solution for  $E_0$  from the Black-Scholes option pricing model,

$$V_{TAX_L,0} = T_C \cdot E_0 \quad (67)$$

The present value of the tax shields is equal to the present value of the taxes for the unlevered firm minus present value of the taxes for the levered firm.

$$V_{TS,0} = V_{TAX_U,0} - V_{TAX_L,0} = T_C \cdot V_0 - T_C \cdot E_0 = T_C \cdot V_0 - T_C (V_0 - D_0) = T_C \cdot D_0 \quad (68)$$

Substituting the solution from the Black-Scholes option pricing model for  $D_0$  gives

$$V_{TS,0} = V_{TAX_U,0} - V_{TAX_L,0} = T_C \cdot \{V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2)\} \quad (69)$$

for the present value of the tax shields. The present value of the tax shields is also equal to the present value of the levered firm minus present value of the unlevered firm.

$$V_{TS,0} = V_{ECF+DCF,0} - V_{FCF,0} \quad (70)$$

Using the expressions for the value of the levered firm when there are corporate income taxes and the value of the unlevered firm when there are corporate income taxes indicates that

$$V_{TS,0} = \left[ (1-T_c) - \left( \frac{g}{ROC} \right) \right] \cdot V_0 + T_c \cdot \{V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2)\} - \left[ (1-T_c) - \left( \frac{g}{ROC} \right) \right] \cdot V_0. \quad (71)$$

Simplifying this expression for the present value of the tax shields gives

$$V_{TS,0} = V_{ECF+DCF,0} - V_{FCF,0} = T_c \cdot D_0 = T_c \cdot \{V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot N(d_2)\}. \quad (72)$$

Both ways of calculating the present value of the tax shields show that the present value of the tax shields equals the income tax rate times the solution from the Black-Scholes option pricing model for  $D_0$ . The present value of the tax shields should be calculated as the present value of the tax savings resulting from the risky debt.

### E. Beta Coefficient and Appropriate Discount Rate for Risky Debt and Risky Tax Shields

The present value of the risky debt in the Black-Scholes option pricing model,  $D_0$ , is equal the present value of risk-free debt less the present value of a European put option with an exercise price of  $B$  and time until expiration equal to  $T$ .

$$D_0 = B \cdot e^{-rT} - \{V_0 \cdot [1 - N(d_1)] + B \cdot e^{-rT} \cdot [1 - N(d_2)]\} = B \cdot e^{-rT} - P_0. \quad (73)$$

The appropriate discount rate for the risky debt and the risky tax shields is the discount rate for a portfolio consisting of a long position in risk-free debt and a short position in a European put option. The beta coefficient from the capital asset pricing model for a portfolio is equal to the value-weighted average of the beta coefficients for the components of the portfolio. The beta coefficient for the appropriate discount rate for the risky debt and the risky tax shields is given by

$$\beta_D = \left( \frac{B \cdot e^{-rT}}{D_0} \right) \cdot \beta_{RF} - \left( \frac{P_0}{D_0} \right) \cdot \beta_P = \left( \frac{B \cdot e^{-rT}}{D_0} \right) \cdot 0 - \left( \frac{B \cdot e^{-rT} - D_0}{D_0} \right) \cdot \beta_P = - \left( \frac{B \cdot e^{-rT} - D_0}{D_0} \right) \cdot \beta_P \quad (74)$$

where  $\beta_D$  is the beta coefficient for risky debt,  $\beta_{RF}$  is the beta coefficient for risk-free debt, and  $\beta_P$  is the beta coefficient for the put option. Since the beta coefficient for risk-free debt equals zero, the beta coefficient for the risky debt and the risky tax shields depends on the beta coefficient for the European put option and the difference in the present values of the risk-free debt,  $B \cdot e^{-rT}$ , and the risky debt,  $D_0$  (the reduction in the present value of debt due to its risk). When the present value of the firm's risky debt equals the present value of risk-free debt ( $D_0 = B \cdot e^{-rT}$ ), the beta coefficient for risk-free debt equals zero and the appropriate discount rate for the risky debt and the risky tax shields is the risk-free rate (Modigliani and Miller 1963). This will be approximately true for small relative amounts of debt. For larger amounts for debt, the appropriate discount rate for the risky debt and the risky tax shields is determined by the beta coefficient for the European put option and the difference in the present values of the risk-free

debt and the risky debt. The beta coefficient for the European put option is given by (Jarrow and Rudd 1983)

$$\beta_P = \left( \frac{V_0}{P_0} \right) \cdot [N(d_1) - 1] \cdot \beta_U = \left( \frac{V_0}{B \cdot e^{-rt} - D_0} \right) \cdot [N(d_1) - 1] \cdot \beta_U \quad (75)$$

where  $\beta_U$  is the beta coefficient for the firm's unlevered equity. For very large relative amounts of debt, the beta coefficient for the European put option equals minus one times the beta coefficient for the firm's operating assets (unlevered equity). The beta coefficient for the risky debt and the risky tax shields is given by

$$\beta_D = - \left( \frac{B \cdot e^{-rt} - D_0}{D_0} \right) \cdot \left( \frac{V_0}{B \cdot e^{-rt} - D_0} \right) \cdot [N(d_1) - 1] \cdot \beta_U = \left( \frac{V_0}{D_0} \right) \cdot [1 - N(d_1)] \cdot \beta_U \quad (76)$$

When all of the firm's financing is provided by debt [ $D_0 = V_0$  and  $N(d_1) = 0$ ], the beta coefficient for the risky debt and the risky tax shields is equal to the beta coefficient for the firm's operating assets (unlevered equity) and the appropriate discount rate for the risky debt and the risky tax shields is the cost of unlevered equity (Fernandez 2002 and 2004). For intermediate relative amounts of debt, the beta coefficient for the risky debt and the risky tax shields increases from zero to the beta coefficient for the firm's operating assets (unlevered equity) as the relative amount of debt increases from relatively low levels to relatively high levels. The appropriate discount rate for the risky debt and the risky tax shields increases from the risk-free rate (Modigliani and Miller 1963) to the unlevered cost of equity (Fernandez 2002 and 2004) as the relative amount of debt increases from relatively low levels to relatively high levels. In general, the appropriate discount rate for the tax shields from using debt is the required rate of return for risky debt which is somewhere between the risk-free rate and the unlevered cost of equity (Myers 1974).

## VI. Effects of Using Debt when there are Taxes

The values of parameters shown in Table 1 are used to illustrate relationships between the relative amount of debt used and the probability of default, the beta coefficient for risky debt and risky tax shields, the required rate of return for risky debt and risky tax shields, and the present value of the tax shields. **All of the tables and figures used to show these relationships are presented at the end of this paper.**

### A. Probability of Default, Beta Coefficient for Risky Debt and Risky Tax Shields, and Required Rate of Return for Risky Debt and Risky Tax Shields

Table 2 shows the relationships between the relative amount of debt used and the probability of default, the beta coefficient for risky debt and risky tax shields, and the required rate of return for risky debt and risky tax shields. In this table, the relative amount of debt is measured by  $D_0 / V_0$  where  $D_0$  is the solution for risky debt from the Black-Scholes option pricing model. For the constant growth firm,  $D_0$  represents  $V_{INT,0}$  and  $V_0$  represents  $V_{EBIT,0}$  which is the present value of the underlying asset for the contingent claims. The relative amount of debt is increased by increasing the face value of the debt ( $B$ ) in the Black-Scholes option pricing model which increases  $D_0$ . Table 2 shows how the probability of default [ $1 - N(d_1)$ ] increases

from zero to one as the relative amount of debt used increases. Table 2 and Figure 1 show how the beta coefficient for risky debt and the risky tax shields increases from zero to  $\beta_U$  as the relative amount of debt used increases. Table 2 and Figure 2 show how the required rate of return for risky debt and the risky tax shields increases from the risk-free rate to the required rate of return for unlevered equity as the relative amount of debt increases. The information provided in Table 2, Figure 1, and Figure 2 illustrate the general nature of the relationships between the relative amount of debt used and the probability of default, the beta coefficient for risky debt and the risky tax shields, and the required rate of return for risky debt and risky tax shields.

### B. Present Value of the Tax Shields

Table 3 shows the relationships between the relative amount of debt used and the probability of default and the present value of the tax shields. Figure 3 show the relationship between the relative amount of debt used and the present value of the tax shields. As the relative amount of debt increases from zero to 100 percent, the probability of default increases from zero to one and the present value of the tax shields increases from zero to  $T_C D_0$  where  $D_0 = V_{INT,0}$  is the solution for risky debt from the Black-Scholes option pricing model.

## VII. Summary and Conclusions

The finance literature contains several different models for the appropriate discount rate for the tax shields and the present value of the tax shields resulting from the use of debt. This research uses an option valuation framework to develop models for the appropriate discount rate for the risky tax shields, the present value of the tax shields, and the probability of default resulting from the use of debt. Relationships between cash flows and their present values for firms with constant, perpetual growth are developed so that the reinvestment required to support the growth is incorporated in the expressions. Analysis using option valuation theory and the relationships between cash flows and their present values provides a framework for unifying the major apparently dissimilar results for the appropriate discount rate for the tax shields and the present value of the tax shields in the finance literature. This research indicates that if all of the firm's financing is provided by debt, the beta coefficient for the risky debt and the risky tax shields is equal to the beta coefficient for the firm's operating assets (unlevered equity) and the appropriate discount rate for the risky debt and the risky tax shields is the cost of unlevered equity (Fernandez 2002 and 2004). For this boundary condition, the tax shields should be discounted using the unlevered cost of equity. For intermediate relative amounts of debt, the beta coefficient for the risky debt and the risky tax shields increases from zero to the beta coefficient for the firm's operating assets (unlevered equity) as the relative amount of debt increases from relatively low levels to relatively high levels and the appropriate discount rate for the risky debt and the risky tax shields increases from the risk-free rate (Modigliani and Miller 1963) to the unlevered cost of equity as the relative amount of debt increases from relatively low levels to relatively high levels (Myers 1974). This study shows that the appropriate discount rate for the tax shields is always the appropriate discount rate for risky debt and this rate changes as the relative amount of debt changes so that the risk-free rate is the appropriate discount rate for low levels of relative debt and the unlevered cost of equity is the appropriate discount rate for extremely high levels of relative debt. The appropriate discount rate for the tax shields is not a constant rate. It is a discount rate that is a function of the relative amount of debt utilized. It can be the risk-free rate and it can be the unlevered cost of equity, but these are extremes (boundary conditions).

Table 1. Parameters Used in the Illustrative Example

$r$	0.06
$\sigma$	0.35
$T$	1.00
$V_0$	100
$R_U$	0.11
$\beta_U$	1.00
$RP_M$	0.05
$T_C$	0.35
ROC	0.25
$g$	0.04

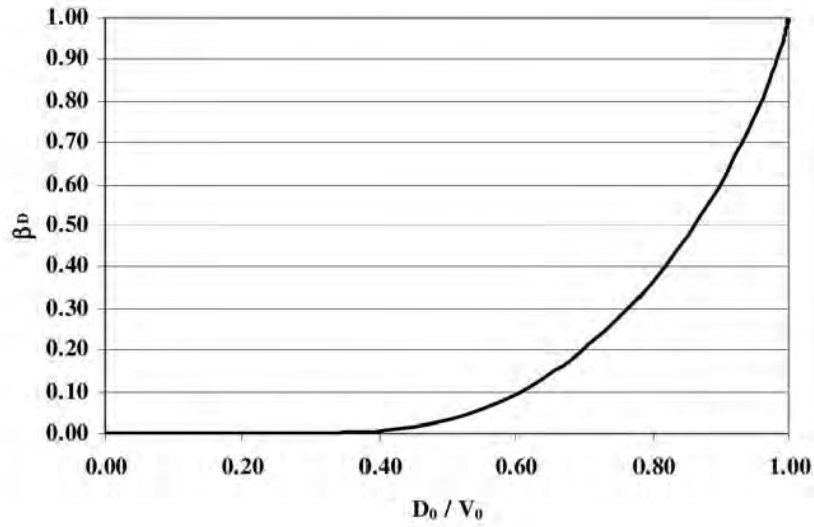
Table 2. Probability of Default, Beta Coefficient, and Required Rate of Return for Risky Debt and Risky Tax Shields

$D_0 / V_0$	$1 - N(d_1)$	$\beta_D$	$R_D$
0.000	0.000	0.000	0.060
0.009	0.000	0.000	0.060
0.011	0.000	0.000	0.060
0.013	0.000	0.000	0.060
0.016	0.000	0.000	0.060
0.019	0.000	0.000	0.060
0.024	0.000	0.000	0.060
0.028	0.000	0.000	0.060
0.034	0.000	0.000	0.060
0.040	0.000	0.000	0.060
0.048	0.000	0.000	0.060
0.055	0.000	0.000	0.060
0.064	0.000	0.000	0.060
0.073	0.000	0.000	0.060
0.083	0.000	0.000	0.060
0.093	0.000	0.000	0.060
0.105	0.000	0.000	0.060
0.117	0.000	0.000	0.060
0.129	0.000	0.000	0.060
0.143	0.000	0.000	0.060
0.157	0.000	0.000	0.060
0.172	0.000	0.000	0.060
0.187	0.000	0.000	0.060
0.204	0.000	0.000	0.060
0.221	0.000	0.000	0.060
0.238	0.000	0.000	0.060
0.257	0.000	0.000	0.060
0.276	0.000	0.000	0.060
0.295	0.000	0.000	0.060
0.316	0.000	0.001	0.060
0.337	0.001	0.002	0.060
0.359	0.001	0.003	0.060
0.381	0.002	0.004	0.060
0.405	0.003	0.007	0.060
0.428	0.005	0.011	0.061
0.453	0.007	0.017	0.061
0.478	0.011	0.024	0.061
0.503	0.017	0.033	0.062
0.529	0.024	0.045	0.062
0.554	0.033	0.060	0.063
0.580	0.045	0.078	0.064
0.606	0.060	0.099	0.065
0.632	0.078	0.123	0.066
0.658	0.099	0.150	0.067
0.683	0.123	0.180	0.069
0.708	0.150	0.212	0.071
0.731	0.181	0.247	0.072
0.754	0.214	0.283	0.074
0.776	0.250	0.322	0.076
0.797	0.288	0.361	0.078
0.817	0.328	0.401	0.080
0.836	0.369	0.441	0.082
0.853	0.410	0.481	0.084
0.869	0.452	0.520	0.086
0.884	0.494	0.559	0.088
0.898	0.535	0.596	0.090
0.910	0.575	0.632	0.092
0.921	0.614	0.666	0.093
0.931	0.650	0.699	0.095
0.940	0.685	0.729	0.096
0.948	0.718	0.757	0.098
0.955	0.749	0.784	0.099
0.962	0.777	0.808	0.100
0.967	0.803	0.830	0.102
0.972	0.827	0.850	0.103
0.976	0.848	0.869	0.103
0.980	0.867	0.885	0.104
0.983	0.885	0.900	0.105
0.986	0.900	0.913	0.106
0.988	0.914	0.925	0.106
0.990	0.926	0.935	0.107
0.992	0.937	0.945	0.107
0.993	0.946	0.953	0.108
0.994	0.954	0.960	0.108
0.995	0.961	0.966	0.108
0.996	0.967	0.971	0.109
0.997	0.972	0.975	0.109
0.997	0.976	0.979	0.109
0.998	0.980	0.982	0.109
0.998	0.983	0.985	0.109
0.998	0.986	0.988	0.109
0.999	0.988	0.990	0.109
0.999	0.990	0.991	0.110
0.999	0.992	0.993	0.110
0.999	0.993	0.994	0.110
0.999	0.995	0.995	0.110
1.000	0.995	0.996	0.110
1.000	0.996	0.997	0.110
1.000	0.997	0.997	0.110
1.000	0.997	0.998	0.110
1.000	0.998	0.998	0.110
1.000	0.998	0.998	0.110
1.000	0.999	0.999	0.110
1.000	0.999	0.999	0.110
1.000	0.999	0.999	0.110
1.000	0.999	0.999	0.110
1.000	1.000	1.000	0.110
1.000	1.000	1.000	0.110

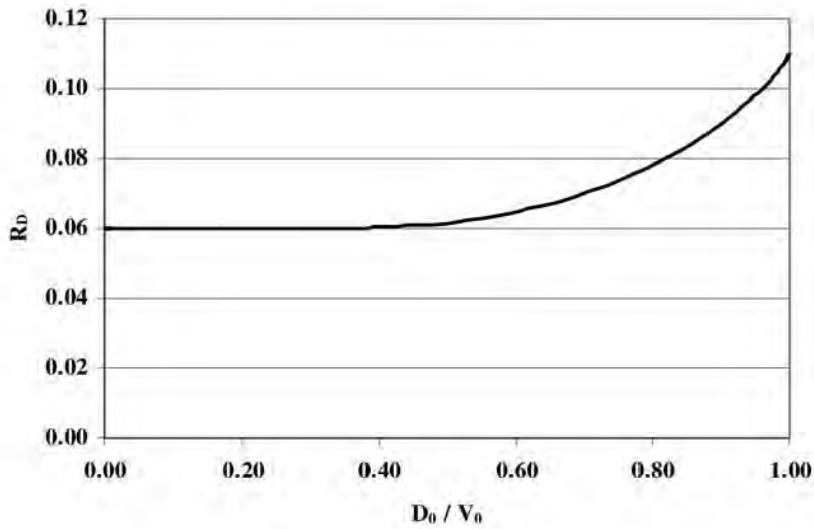
Table 3. Present Value of the Tax Shields

$D_0 / V_0$	$1 - N(d_1)$	$V_{TS,0}$	$D_0 / V_0$	$1 - N(d_1)$	$V_{TS,0}$	$D_0 / V_0$	$1 - N(d_1)$	$V_{TS,0}$
0.000	0.000	0.000	0.405	0.003	14.162	0.980	0.867	34.293
0.009	0.000	0.330	0.428	0.005	14.994	0.983	0.885	34.402
0.011	0.000	0.379	0.453	0.007	15.846	0.986	0.900	34.496
0.013	0.000	0.453	0.478	0.011	16.715	0.988	0.914	34.576
0.016	0.000	0.552	0.503	0.017	17.601	0.990	0.926	34.645
0.019	0.000	0.676	0.529	0.024	18.498	0.992	0.937	34.703
0.024	0.000	0.824	0.554	0.033	19.404	0.993	0.946	34.752
0.028	0.000	0.997	0.580	0.045	20.315	0.994	0.954	34.794
0.034	0.000	1.195	0.606	0.060	21.226	0.995	0.961	34.829
0.040	0.000	1.417	0.632	0.078	22.131	0.996	0.967	34.858
0.048	0.000	1.665	0.658	0.099	23.027	0.997	0.972	34.883
0.055	0.000	1.937	0.683	0.123	23.907	0.997	0.976	34.903
0.064	0.000	2.233	0.708	0.150	24.766	0.998	0.980	34.920
0.073	0.000	2.555	0.731	0.181	25.601	0.998	0.983	34.935
0.083	0.000	2.901	0.754	0.214	26.405	0.998	0.986	34.946
0.093	0.000	3.271	0.776	0.250	27.176	0.999	0.988	34.956
0.105	0.000	3.667	0.797	0.288	27.909	0.999	0.990	34.964
0.117	0.000	4.087	0.817	0.328	28.602	0.999	0.992	34.971
0.129	0.000	4.532	0.836	0.369	29.253	0.999	0.993	34.976
0.143	0.000	5.002	0.853	0.410	29.861	0.999	0.995	34.981
0.157	0.000	5.496	0.869	0.452	30.424	1.000	0.995	34.984
0.172	0.000	6.016	0.884	0.494	30.943	1.000	0.996	34.987
0.187	0.000	6.559	0.898	0.535	31.418	1.000	0.997	34.990
0.204	0.000	7.128	0.910	0.575	31.850	1.000	0.997	34.992
0.221	0.000	7.721	0.921	0.614	32.242	1.000	0.998	34.993
0.238	0.000	8.339	0.931	0.650	32.594	1.000	0.998	34.995
0.257	0.000	8.982	0.940	0.685	32.910	1.000	0.999	34.996
0.276	0.000	9.649	0.948	0.718	33.191	1.000	0.999	34.996
0.295	0.000	10.341	0.955	0.749	33.440	1.000	0.999	34.997
0.316	0.000	11.058	0.962	0.777	33.659	1.000	0.999	34.998
0.337	0.001	11.798	0.967	0.803	33.852	1.000	0.999	34.998
0.359	0.001	12.563	0.972	0.827	34.020	1.000	1.000	34.999
0.381	0.002	13.351	0.976	0.848	34.166	1.000	1.000	35.000

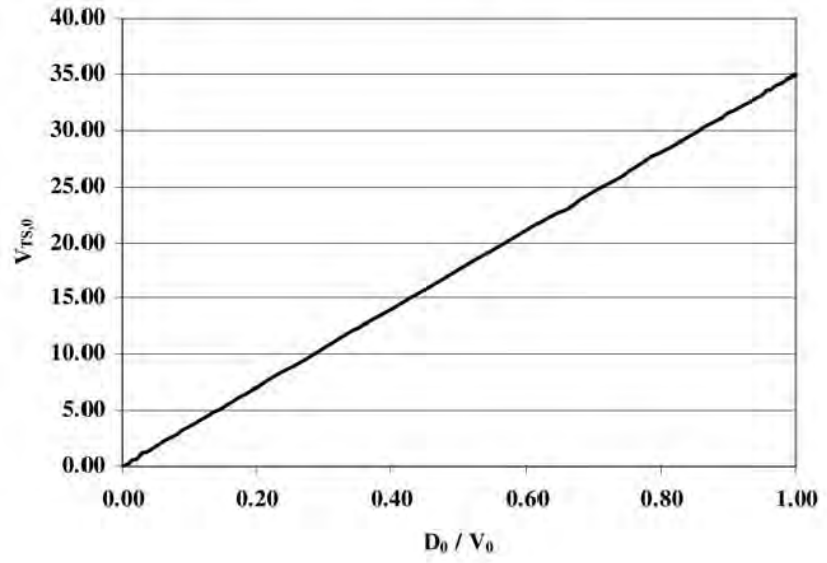
**Figure 1**  
Beta Coefficient for Risky Debt  
and Risky Tax Shields



**Figure 2**  
Required Rate of Return for Risky Debt  
and Risky Tax Shields



**Figure 3**  
**Present Value of the Tax Shields**



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# **An Empirical Test about Differential Board Monitoring and CEO Compensations in High-Tech vs. Traditional Firms**

Aidong Hu

## **Abstract**

I examine how firm characteristics and CEO compensation contract affect the independent board monitoring activities between high-tech and traditional firms. Corporate board monitoring activities are measured by annual board meetings, and the propensity to hold board meetings is significantly and positively associated with the size of the firm and is significantly and negatively associated with Return on Equity (ROE) as predicted by corporate governance under managerial entrenchment hypothesis. Using data on 1,735 corporations during 1992-2000, I find evidence that high-tech firms use different compensation plans to motive CEOs and exhibit different attributes from those of traditional firms. CEOs in both high-tech and traditional firms who have long tenure, high level of cash compensation are less likely to hold frequent board meetings. However, the existence of executive stock options and CEO long-term incentive plan may increase the frequency of board meetings. My model performs well in predicting number of board meetings for high-tech and traditional firms using out-of-sample period of year 2001 and 2002. My results extend and refine the growing literature on the relation of executive compensation, board activities and corporate governance.

## **I. Introduction**

In recent years, the monitoring role and effectiveness of corporate boards of directors has been a central issue in both academic and business communities. Various reforms have been proposed to achieve better corporate governance. In line with the proposed corporate governance reforms, the board meeting frequency has important implications for corporate governance because it is easier and cheaper for a firm to change its board meeting activities than to change the size, composition, or ownership characteristics of its board of directors.

Jensen (1993) suggests that generally boards of directors should stay inactive. However, corporate boards are under pressure to become more active in response to increasing problems with stakeholders and government regulations. Conger et al. (1998) argue that board meeting frequency is an important factor in improving board effectiveness. According to this viewpoint, corporate boards that meet more frequently could perform better in satisfying shareholders' interests. To address these conflicting views of board activities, Vafeas (1999) studies the connection between board meeting frequency and firm performance. Vafeas finds a weak relationship between board meeting frequency and the number of directorships held by independent directors. Moreover, corporate boards meeting more frequently have lower market values. However, the industry effect and the association between the frequency of board meetings and characteristics of CEOs are not addressed in Vafeas (1999).

One of the main functions of corporate boards is to select and evaluate the effectiveness of CEOs. On the other hand, it is the CEOs themselves who are the ones who usually set the board

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meeting agenda and determine the pace and progression of its coverage. Hermalin and Weisbach (1998) present a model that CEO influence over corporate board increases with the CEO's tenure in the firm. Hence overlooking the relation between board meeting frequency and CEO characteristics can lead to misspecification problem. Fluck and Khanna (2006) propose a model that active board monitoring can reduce executive compensation, and shareholders will be better off under an optimally compensated CEO with inactive corporate board. Hence it appears that the less active board monitoring (or less frequent board meeting) is related to better firm performance. In a recent research, Boone et al. (2007) find that board independence is negatively related to the power of a CEO and is positively related to the constraints on the CEO's influence.

In this research, I explore the differential impact of firm and CEO characteristics between high-tech and traditional firms on the frequency of board meetings for the era before the introduction of Sarbanes-Oxley in July 2002. According to Raheja (2005), corporate board structure will change with a firm's life cycle. This may be due to the amount of public information available about the firm or the fact that the verification cost of the firm's investment project decreases as the firm matures. To further explore the firm life cycle effect in different industry sectors, I study the characteristics of firm size and past performance in my research.

My analysis extends and refines the growing literature on the relation of firm attributes to corporate board activities. I study the impact of executive compensation on the board meeting frequency directly. I find that CEO stock options and long-term incentive plans have different effects for high-tech firms and for firms in traditional industries. Thus, the negative relation of executive incentive compensation and board meeting frequency documented in the literature (Vafeas (1999)) does not hold across industries.

The rest of the paper is organized as follows. Section 2 sets up the empirical test design. Section 3 describes the data and the sample. Section 4 presents the results of the Tobit regressions and conducts the out-of-sample validation tests. Section 5 concludes.

## II. Empirical Test Design

Consistent with the theoretical literature (e.g., Stulz (1988), Stulz (1990), Zwiebel (1996), Fluck (1999)), my empirical test design relates number of board meetings to the notion of managerial-types. The manager's type is quantified as being proportional to the likelihood of value-maximizing behavior. More productive managers have a higher likelihood of taking value-maximizing investment decisions due to some combination of having better growth opportunities, being less entrenched, and having better incentive alignment with shareholder interests. Conversely, less productive managers are less likely to take value-maximizing investment decisions due to some combination of having inferior investment opportunities, being more entrenched, and having poor incentive alignment with shareholder interests.

I model the unobservable managerial type in a manner that facilitates econometric implementation of the entrenchment model. The unobservable managerial entrenchment is denoted by a real-valued parameter  $t^*$ . Higher  $t^*$ -values indicate more productive managers. The managerial type  $t^*$  is readily related to the decision of proposing board meetings. The theoretical models predict a negative relation between the magnitude of board activities and the strength of

the managerial-type, conditional on the firm characteristics. Therefore, I estimate the following specification based on Tobit model:

$$(1) \quad Y^* = \alpha_1 + \beta_1' t^* + \varepsilon_1$$

$$(2) \quad \log(\text{meetings}) = \begin{cases} Y^* & \text{if } Y^* > 0 \\ 0 & \text{if } Y^* \leq 0 \end{cases}$$

To accommodate non-linearity, I use logarithm of number of board meetings during a year as the depended variable. I recognize Equation (1) as a univariate quantitative response model (see, e.g., Amemiya (1981)). Because of the censoring problem associated with the dependent variable, it is appropriate for us to use Tobit model to conduct the empirical analysis. The hypothesis here is that the observed log (meetings) is a non-decreasing function of  $t^*$ .

## II. 1. Estimation of Managerial Types

I assume the manager's type is a linear function of the form:

$$(3) \quad t^* = \alpha_2 + \beta_2' X + \varepsilon_2.$$

Here  $X$  is a vector that consists of a series of observable indicators reflecting the type of the manager, and  $\varepsilon_2$  is a random error.

Combining the above three equations, I have the empirical specification of the Tobit model as:

$$(4) \quad \log(\text{meetings}) = \alpha_3 + \beta_3' X + \varepsilon_3$$

The vector  $X$  should include variables, taken to be exogenous in the short- to medium-run, that determine the strength of the managerial type. Consistent with the foregoing discussion,  $X$  includes *three* classes of variables that proxy for: (1) the CEO's level of entrenchment based on her power over internal governance and monitoring mechanisms, (2) the CEO's incentives for shareholder value-maximization, and (3) the characteristics of the firm. I proxy the CEO's level of internal entrenchment and incentive compensation through the following six variables derived from the corporate governance literature.

*CEO service length:* This variable impacts managerial type in two ways. First, organizational theorists argue that tenure is positively related to the CEO's internal power (e.g., Finkelstein and Hambrick (1989)). Secondly, Murphy (1986, 1999) shows that CEOs nearing retirement have a shorter career horizon, relatively limited outside employment opportunity, and greater accumulated wealth tied to her equity interest in the firm. In addition, Berger et al. (1997) show that CEO tenure has significant effect on firm's debt policy. All these arguments suggest a positive association between tenure and the level of entrenchment. In my study, a CEO's service length is calculated as logarithm of number of years credit to retirement reported by *ExecuComp*.

*CEO Compensations (salary and bonus):* Following Jensen and Murphy (1990), cash salary and bonus provide relatively low-powered incentives. Furthermore, recent evidence indicates that entrenched CEOs tend to have a large share of their compensation paid though non-

contingent compensation (e.g., Core et al. (1999)). Higher amount of a CEO's cash compensation (i.e., salary and bonus) in her annual compensation indicates the level of entrenchment of a manager.

*CEO stock ownership:* The CEO's personal stock ownership in the firm provides high-powered incentives. However, higher CEO stock ownership also appears to increase CEO power. For example, Dennis et al. (1997) show that top-management ownership has a significant and negative impact on CEO replacement and turnover. In this study, I take the logarithm of market value of total shares owned by a CEO in the beginning of year  $t$  as a measure of top-management stock ownership. Moreover, I calculated the percentage of share ownership as number of shares owned by CEO divided by total number of shares outstanding at the beginning of year  $t$ .

*Executive stock options:* Executive stock options have become increasingly prominent means of delivering high-powered incentives to management. I consider the value of executive stock options awarded to the CEO in the beginning of year  $t$ <sup>9</sup>. Moreover, the log of a CEO's long-term incentive plan is also introduced into my research.

*Duality:* I include variables related to board structure that appear to enhance the CEO's internal power. I include a dummy variable to identify whether a CEO is also a chairman of the board (*Duality*). Jensen (1993) and Boyd (1994) argue that CEO "duality" diminishes the independence and effectiveness of the board in governing the CEO.

Since a manager's power in a firm is related to the characteristics of the firm, I also introduce firm attributes into my study. I use the logarithm of firm asset as a measure that indicates the stage of a firm's life cycle; I also calculate *market-to-book ratio of equity* as a proxy for the quality of investment opportunity set.

Next, I use the *asset structure*. This variable is introduced to control for differential structure of firms with different level of intangible assets. The measure is calculated as book value of property, plant and equipment divided by the book value of asset at the beginning of year  $t$ . According to Smith & Watts (1992), managers and shareholders are less likely to engage in wealth-transferring projects when a greater portion of assets is fixed. A lower value of asset structure implies greater agency conflict between shareholders and debt-holders and greater managerial entrenchment.

In addition, firm performance measures are introduced as return on equity (ROE) in previous two years (i.e., year  $t-1$  and year  $t-2$ ). Exhibit 1 provides a precise definition of these variables and also their predicted sign with respect to board monitoring measured by board meetings.

There is a potential look-ahead bias if I use independent variables obtained from the end of the period, rather than the beginning of this period. In general, using end-of-the-period values are likely to overstate the explanatory power of the model. To control for this effect, all independent variables are taken to be the beginning-of-the-year values.

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<sup>9</sup> I use the method outlined in Murphy (1999) to calculate option values using the stated exercise price and year-end stock prices. Data required to execute calculations are typically disclosed, but for cases where details are omitted, vesting is assumed to occur two years after the grant, and the exercise period is assumed to be the same as that for the most recent option where an exercise period is provided.

I also consider several control variables in my analysis to address the potential omitted variable problem. Firm age and size of the firm are positively correlated (e.g., Audretsch (1995)), and smaller firms are more likely to have a greater proportion of asset value in growth options. Empirically, older or more mature firms have diminishing growth opportunities and tend to have higher payout yield (e.g., Fama and French (2001)). To address the age effect, I calculated the age of a firm as the difference between the reporting year in the sample and the stock listing date of the firm. The listing date is obtained through CRSP monthly file. The second variable is *debt ratio*. According to the entrenchment literature (e.g., Zwiebel (1996), Fluck (1999)), highly entrenched managers use more debt to control themselves from taking non-value-maximizing behaviors *voluntarily*. I use the ratio of book value of debt to the sum of book value of debt and market value of equity as a proxy for a firm's debt policy.

### III. Data and Sample Selection

The data are taken from the 2001 S&P *ExecuComp* database. This database contains records of 3,746 top-managers from publicly traded companies that are included in various S&P indices, covering the period from 1992 to 2000. For each firm in the database, I take the annual board meeting frequency and compensation records for the CEO, and also obtain the firm's accounting and financial information from the S&P *Compustat* file. I include all firms in the *ExecuComp* database from 1992 through 2000, but exclude financial service (SIC code 4900 to 4999) corporations and utility (SIC code 6000 to 6999) corporations. My final sample in this study consists of 6,294 firm-year records. The whole sample is classified into high-tech and traditional industries according to the 6-digit North American Industrial Classification System (NAICS) code published by the Bureau of Census. In my sample, high-tech industries are defined as makers or creators of technology, whether they are in the form of products, communications or services. There are five broad sectors in my research: Aerospace technology, Biotechnology, Information technology, Nanotechnology and Robotics. Based on the 2002 NAICS codes, there are 46 industrial groups selected as high-tech industries in this research.

Table 1 reports firm characteristics in terms of board meeting frequencies for high-tech and traditional firms. Comparing to high-tech firms, traditional firms are larger, are more profitable, are paying higher cash dividends, have more debts and tangible assets; meanwhile, firms holding board meetings more frequently are larger, more profitable, have more debt and tangible assets compared to firms holding board meetings less frequently. These findings are consistent with other studies (e.g., Vafeas(1999)). However, there is no linear relation between board meetings and the growth opportunities measured by market-to-book ratio.

### IV. Results of Multivariate Analysis

To address the non-linear relationship in the model, I use logarithm of number of board meetings in year  $t$  as dependent variable. I estimate the Tobit model given in Equation (4) above, assuming a symmetric distribution of the random disturbance  $\epsilon_3$ . I parameterize  $F(\epsilon_3)$  as the cumulative distribution functions of the normal distributions. Note that Equation (4) gives the likelihood of board meeting frequencies. Examining the right hand of side of this equation, I see that if the estimate for the coefficient of  $\beta_j$  for any independent variable  $X_j$  is positive

(negative), then that variable is positively (negatively) related to the likelihood of holding board meetings.

#### IV.1. Analysis of the Baseline Model

Table 2 reports the results of my basic model. I find that the likelihood of board meetings is significantly related to firm and CEO characteristics for both high-tech and traditional firms, as predicted by the empirical framework. *Ceteris paribus*, the board meeting frequency decreases significantly with a CEO's total cash compensation (i.e., salary and bonus), and market value of stock ownership. All of these factors are significant at the 1% level and are positively associated with the power of a CEO in the firm. These factors are indicators of managerial entrenchment. Conversely, the frequency of board meetings is positively associated with a CEO's duality and the level of executive stock options.

In addition, I find there are significant differences between high-tech and traditional firms. For traditional firms, board meeting frequency has positive and significant association with a CEO's service length, but this effect is negative and insignificant for high-tech firms; the coefficient for percentage of CEO share ownership is negative for traditional firms but positive for high-tech firms; the coefficient for long-term incentive plan is positive for traditional firms but negative and significant for high-tech firms. These effects do show differential board monitoring in different industries.

Furthermore, I find that for both high-tech and traditional firms, board meeting frequency is positively related to firm size, measured by the book value of assets, and negatively related to firm performance, measured by return on equity (ROE), in the previous year. These effects are consistent with results reported in Vafeas (1999). Interestingly, I also find that there are significant differences between high-tech firms and traditional firms: growth opportunity, measured by market-to-book ratio of equity, will significantly decrease the propensity of board meetings for traditional firms but will increase the propensity of board meetings for high-tech firms.

My new study shows that board monitoring activities, measured by board meeting frequency, have significant association with industrial sectors. Meanwhile, a top manager's internal power and compensation plans play an important role in corporate board monitoring. My basic model is highly significant from the perspective of likelihood-ratio tests: the chi-square test-statistics have p-values less than 0.001, and McFadden pseudo- $R^2$  yields 26.1%<sup>10</sup> for the pooled sample. I emphasize that the apparent success of the basic model in addressing board meeting frequencies with respect to industrial sectors should be interpreted with caution. The predictive power of the models can only be reliably tested with out-of-sample forecast tests. These tests are implemented in Section 4.2 below.

As a robustness check, I introduce three variables that are related to a firm's life cycle (firm age) and capital structure (debt ratio) as additional control variables into my analysis. The results are shown in Table 3. Clearly, there is no significant impact from firm age. It is interesting to that a firm's debt policy exhibits significant influence on the firm's board monitoring activities –

<sup>10</sup> Only a small fraction of observations is censored in my model, the OLS regression will give us quite the same effects comparing to Tobit model qualitatively.

corporate board tends to hold more meetings when the firm uses more debt, this is the case for both high-tech and traditional firms. Overall, I still have effects that are discovered in the baseline model. My results show that, there is no relation between board activities, measured by board meeting frequency, and several firm attributes including firm age in this study. One possible explanation is that other firm attributes considered in the study, i.e., firm size measured by book value of assets, asset structure reported as fraction of tangible asset, and firm performance measured by return on equity in the previous two years, have outperformed the omitted effect.

#### **IV.2. Out-of-sample Predictive Power**

In this section I examine the predictive power of the basic model using out-of-sample forecast tests. I designate the 1992-2000 period as the in-sample period and 2001-2002 as the out-of-sample period. I first estimate the specification of baseline Tobit model (cf. Table 2) using the cross-sectional and time-series data for high-tech and traditional firms during the in-sample period. Using these estimated coefficients, I then compute the predicted likelihood of board meetings on a *firm-by-firm* basis for both in-sample period and out-of-sample years. That is, for each firm I use the independent variable values for 2001-2002 in Equation (4) to compute the likelihood of log (meetings). The predictive performance is reported using two measurements, mean squared prediction error (MSPE) and mean absolute prediction errors (MAPE).

Table 4 compares the predictions from the specification with actual board meeting records reported in the *ExecuComp* database. For both the in-sample period of 1992-200 and out-of-sample period of 2001-2002, the table cross-tabulates the predictions of the model regarding predicted board meetings against the actual board meeting frequencies. For both in-sample period and out-of-sample period, the predicted values in Table 4 show vary close approximation to the actual board meeting frequencies. I also have similar results measured by mean absolute prediction errors (MASE). The resulting MSPE and MAPE show little difference between in-sample period and out-of-sample period, this means that the model's prediction power is non-decreasing for the out-of-sample period.

#### **V. Summary and Conclusions**

The theoretical and empirical literature on corporate governance and managerial entrenchment makes a number of relatively unambiguous refutable predictions regarding corporate board activities. I extend this framework to allow for the role of managerial compensation contracts. The predictions are then that (*ceteris paribus*) the likelihood of board meeting frequency is negatively related to the level of managerial entrenchment and firm performance, and positively related to firm size set and the power of performance-based managerial incentives. Since I generally face active managers in practice, I should consider the role of corporate board monitoring when managers are in control. In this case, my empirical framework under managerial entrenchment is distinct from traditional studies about board activities. In particular, I directly incorporate the strength of internal corporate governance mechanisms and firm characteristics in my study.

Consistent with theoretical literature, my empirical test design views observed board meeting frequency to be driven by the likelihood of managers to take non-value-maximizing

decisions. My results support the theoretical predictions of the management entrenchment literature. I have several principal findings. As predicted by the corporate governance hypothesis, board meeting frequency is significantly and negatively associated with the likelihood of non-value-maximizing behavior by top-management for both high-tech and traditional firms. Other things held equal, firms exhibiting greater CEO power attributes, such as longer CEO tenure and larger amount of compensation paid in cash salary and bonus — are significantly less likely to hold as many board meetings. Such firms also tend to be larger, have better performance records and possess more intangible assets. The superior performance of the Tobit model is robust, applying to both in-sample fit and out-of-sample forecast tests.

There are significant differences about CEO compensation policies between high-tech and traditional firms in my research. For traditional firms, board meeting frequency has positive and significant association with a CEO's service length, but this effect is negative and insignificant for high-tech firms; the coefficient for percentage of CEO share ownership is negative for traditional firms but positive for high-tech firms; the coefficient for long-term incentive plan is positive for traditional firms but negative and significant for high-tech firms. These differential board monitoring activities in different industries have not been addressed in academic literature.

I examine CEO power measured by CEO duality, defined as the same manager being both president and chairman, does significantly affect the likelihood of board meeting frequency. With a larger sample covering the 1992-2000 period, I find that CEO duality are significant determinants of board meeting frequency for firms in traditional industries, but not significant determinants for high-tech firms – a phenomenon that has not previously been addressed in the academic literature. These effects do show differential board monitoring in different industries. Overall, my analysis confirms that executive characteristics are significant factors in determining board meeting frequency.

### Exhibit 1. Definition of Variables

I define the dependent and independent variables. For the independent variables, I also indicate their theoretically predicted sign in Tobit regressions. A positive (negative) sign implies that increases in variable value increase (decrease) the likelihood of board meeting frequency, holding other things fixed. All independent variables are taken the beginning of the year.

Dependent variable		Definition
log (meetings)		Log (number of board meetings) during year $t$ . The number of board meetings is extracted from ExecuComp database.
Independent variables	Predicted Sign	Definition
CEO Service Length	Negative	Log (1+CEO years credit to service history). CEO years credit to service is defined as number of years recognized for her retirement plan in her firm. Records are extracted from ExecuComp database.
Cash Compensation	Negative	Log (1+ value of salary and bonus given to a CEO in a certain year). Records are extracted from ExecuComp database.
MV of CEO shares	Negative	Log (1+Market value of shares owned by a CEO). The price of stock is taken from CRSP at the beginning of year $t$ ; the number of shares owned by a CEO is obtained through ExecuComp database.
CEO stock ownership (%)	Negative	(Number of shares owned by CEO)/(Total number of shares outstanding in the market). The number of shares owned by a CEO is taken at the beginning of year $t$ and obtained through ExecuComp database.
Executive stock options	Positive	Log (1+value of executive stock options). Records are extracted from ExecuComp database.
Long-term incentive plan	Positive	Log (1+long-term incentive plan). Records are obtained from ExecuComp database.
Duality	Positive	A dummy variable equals to 1 if a CEO is also the chairman of the board of the directors, otherwise 0.
Return on Equity in year $t-1$	Negative	(Operating Income in year $t-1$ )/(Annual Common Equity in year $t-1$ ). Records are obtained from Compustat database.
Return on Equity in year $t-2$	Negative	(Operating Income in year $t-2$ )/(Annual Common Equity in year $t-2$ ). Records are obtained from Compustat database.
Value of assets	Positive	Log (1+Book value of assets). Book value of assets is taken at the beginning of year $t$ . Records are available through Compustat.
Market to book ratio	Positive	(Market value of equity)/(Book value of equity).Records are taken at the beginning of year $t$ , records are obtained from Compustat.
Asset Structure	Negative	Book value of Properties, Plants and Equipment divided by the book value of assets at the beginning of year $t$ . Records are obtained from Compustat.
Other control variables considered		Definition
Hi-tech Dummy	—	A dummy variable equals to 1 if a firm is classified as hi-tech company, otherwise 0.
Debt ratio	—	Book value of total debt divided by book value of debt + market value of equity at the beginning of year $t$ .
Firm age	—	Firm age equal to the current reporting year minus the beginning date of a firm's listing year obtained through CRSP monthly file.

**Table 1. Annual Board Meetings and Firm Characteristics**

Variables	High-tech Firms			Traditional Firms				
	Observations	Mean	Median	Std. Dev	Observations	Mean	Median	Std. Dev
<b>Book value of assets (millions of dollars)</b>								
Less than 5 meetings	328	1082.13	367.838	2555.16	603	1613.97	529.367	4452.45
5 to 10 meetings	1834	3353.24	797.304	7686.29	2649	3381.21	972.921	14603.7
More than 10 meetings	421	6193.23	1529.70	12251.9	459	8642.74	1325.30	33413.1
<b>Fraction of Tangible Assets</b>								
Less than 5 meetings	328	0.485	0.369	0.433	603	0.553	0.526	0.315
5 to 10 meetings	1834	0.544	0.542	0.381	2649	0.608	0.565	0.385
More than 10 meetings	421	0.545	0.424	0.407	459	0.629	0.567	0.367
<b>Return on Equity</b>								
Less than 5 meetings	328	17.210	13.808	94.299	603	12.715	13.857	16.578
5 to 10 meetings	1834	5.716	13.052	91.331	2649	11.179	13.371	166.083
More than 10 meetings	421	1.281	10.877	76.851	459	11.165	10.323	226.000
<b>Debt-to-equity</b>								
Less than 5 meetings	328	0.198	0.119	0.214	603	0.267	0.256	0.231
5 to 10 meetings	1834	0.279	0.240	0.453	2649	0.355	0.358	0.216
More than 10 meetings	421	0.289	0.369	0.268	459	0.394	0.405	0.247
<b>Market-to-book value of equity</b>								
Less than 5 meetings	328	4.675	3.206	6.332	603	3.320	2.439	3.995
5 to 10 meetings	1834	4.321	2.869	11.556	2649	3.401	2.325	14.236
More than 10 meetings	421	4.319	2.909	4.781	459	3.399	2.114	6.525
<b>Dividend Yield</b>								
Less than 5 meetings	328	0.376	0	0.836	603	0.936	0.423	1.254
5 to 10 meetings	1834	0.900	0	1.332	2649	1.329	0.965	1.469
More than 10 meetings	421	1.184	0	4402	459	2.015	1.203	11.830

**Table 2. The baseline models of industry effect on the likelihood of board meetings.**

I classify all observations into high-tech group and traditional industry group according to sample firms' six-digit NAICS code. I identify 46 industry sectors as hi-tech industry; all other observations are classified into traditional industry sector. The Tobit model estimates are provided for the high-tech and traditional industries of the sample. The value of *t*-statistic is reported in the parenthesis. McFadden *pseudo-R*<sup>2</sup> is calculated as  $1 - L_M/L_0$ , where  $L_M$  is the log-likelihood for the estimated model, and  $L_0$  is the log-likelihood in the model with only an intercept.

Explanatory variables	Predicted sign	High-tech firms	Traditional firms	Pooled Sample
Intercept	—	1.628 (4.64)***	1.784 (3.89)***	1.701 (6.15)***
Cash Compensation	Negative	-0.075 (-3.36)***	-0.131 (-5.23)***	-0.109 (-6.62)***
CEO Service Length	Negative	-0.138 (-0.30)	1.531 (3.16)***	0.786 (2.39)**
MV of CEO Shares	Negative	-0.0233 (-7.45)***	-0.019 (-5.41)***	-0.021 (-9.47)***
CEO stock ownership (%)	Negative	0.035 (0.20)	-0.258 (-2.36)**	-0.197 (-2.20)**
Executive stock options	Positive	0.003 (1.05)	0.009 (0.98)	0.005 (1.02)
Long-term incentive plan	Positive	-0.707 (-2.71)***	1.099 (3.11)***	0.018 (0.09)
Duality	Positive	0.0187 (1.40)	0.027 (1.84)*	0.025 (2.49)***
Return on equity in year t-1	Negative	-0.213 (-2.12)**	-0.531 (-3.67)***	-0.365 (-4.44)***
Return on equity in year t-2	Negative	-0.204 (-2.05)**	0.025 (0.56)	-0.012 (-0.30)
Value of assets	Positive	0.074 (15.86)***	0.038 (6.42)***	0.057 (15.92)***
Market-to-book	Positive	0.067 (1.07)	-0.265 (-1.71)*	0.039 (0.66)
Asset structure	Negative	-0.003 (-0.16)	0.014 (0.94)	-0.001 (-0.09)
Hi-tech Dummy		—	—	0.0536 (5.35)***
Estimated Sigma		0.338	0.353	0.347
Log Likelihood		-1143.42	-1100.78	-2292.67
Num. of Observations		2583	3711	6294
Pseudo R2		27.3%	25.9%	26.7%

Asterisks \*, \*\*, \*\*\* indicate *t*-statistic significance at 10%, 5%, and 1% levels, respectively

**Table 3. The effect of omitted variables on the likelihood of board meetings.**

I classify all observations into high-tech group and traditional industry group according to sample firms' six-digit NAICS code. I identify 46 industry sectors as hi-tech industry; all other observations are classified into traditional industry sector. The Tobit model estimates are provided for the high-tech and traditional industries of the sample. The value of  $t$ -statistic is reported in the parenthesis. McFadden  $pseudo-R^2$  is calculated as  $1 - L_M/L_0$ , where  $L_M$  is the log-likelihood for the estimated model, and  $L_0$  is the log-likelihood in the model with only an intercept.

Explanatory variables	Predicted sign	High-tech firms	Traditional firms	Pooled Sample
Intercept	—	1.639 (4.56)***	1.769 (3.80)***	1.701 (5.96)***
Cash Compensation	Negative	-0.075 (-3.31)***	-0.137 (-5.42)***	-0.112 (-6.69)***
CEO Service Length	Negative	-0.001 (-0.29)	0.013 (2.60)***	0.007 (2.11)**
MV of CEO Shares	Negative	-0.022 (-7.03)***	-0.017 (-4.78)***	-0.021 (-8.96)***
CEO stock ownership (%)	Negative	-0.012 (-0.07)	-0.284 (-2.58)***	-0.214 (-2.37)**
Executive stock options	Positive	0.003 (1.01)	0.007 (0.98)	0.005 (1.00)
Long-term incentive plan	Positive	-0.006 (-2.59)***	0.011 (3.05)***	0.001 (0.08)
Duality	Positive	0.017 (1.29)	0.026 (1.76)*	0.023 (2.33)***
Return on equity in year t-1	Negative	-0.020 (-1.93)*	-0.049 (-3.35)***	-0.035 (-4.21)***
Return on equity in year t-2	Negative	-0.019 (-1.93)*	0.003 (0.62)	-0.001 (-0.22)
Value of assets	Positive	0.073 (14.18)***	0.031 (4.89)***	0.055 (13.77)***
Market-to-book	Positive	0.001 (1.22)	-0.002 (-1.24)	0.001 (0.92)
Asset structure	Negative	-0.001 (-0.08)	0.012 (0.78)	-0.002 (-0.24)
Debt-to-equity		0.078 (1.88)*	0.105 (2.73)***	0.057 (2.05)**
Firm Age		-0.011 (-1.31)	0.009 (1.12)	0.001 (0.12)
Hi-tech Dummy	—	—	—	0.0601 (6.21)***
Estimated Sigma		0.338	0.353	0.347
Log Likelihood		-1138.37	-1221.53	-2100.41
Num. of Observations		2583	3711	6294
Pseudo R2		26.8%	26.3%	26.1%

Asterisks \*, \*\*, \*\*\* indicate  $t$ -statistic significance at 10%, 5%, and 1% levels

**Table 4: Out-of-sample prediction performance of the Tobit model for 2001-2002**

The baseline model's prediction performance is measured by Mean Squared Prediction Error (MSPE) and Mean Absolute Prediction Error (MAPE). Using coefficients estimated from 1992-2000 sample (cf. Table 2), the predicted values of  $\hat{y}$  are calculated for the period 2001-2002, and the performance measures for both in-sample period and out-of-sample period are constructed as:

$$MSPE = \frac{\sum (y - e(y))^2}{n - p} \qquad MAPE = \frac{\sum |y - e(y)|}{n - p}$$

Panel A. High-tech Firms

	Mean of log (meetings)	Predicted Mean of log (meetings)	MSPE (Std. Dev)	MAPE (Std. Dev)	Number of observations
In-sample period, 1992~2000	1.857	1.869	0.112 (0.218)	0.223 (0.216)	2583
Out-of- sample period, 2001~2002	1.862	1.910	0.128 (0.232)	0.257 (0.305)	646

Panel B. Traditional Firms

	Mean of log (meetings)	Predicted Mean of log (meetings)	MSPE (Std. Dev)	MAPE (Std. Dev)	Number of observations
In-sample period, 1992~2000	1.872	1.881	0.127 (0.209)	0.272 (0.234)	3711
Out-of- sample period, 2001~2002	1.866	1.893	0.141 (0.215)	0.295 (0.294)	970

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**Using Forecasts to Trigger Portfolios Rebalancing:  
Can Forecasts Reduce the Gap Between Expected and Actual Returns?**

Thomas J. Kopp, Ph.D.

**Abstract**

This research finds considerable support for the notion that “buy and hold” investor’s will attain superior performance if they select portfolios using forecasted returns within the traditional mean variance approach. Portfolios comprised of the U.S. and five foreign i-Shares were generated using both historical and forecasted returns. Over the course of five holding periods, the portfolios generated using forecasted returns consistently outperformed those generated using the traditional mean-variance approach as well as the U.S. only, “home biased” portfolio. This suggests that buy and hold investors can attain the benefits of international diversification without the constant monitoring and rebalancing necessary to attain the expected performance of portfolios generated using historical returns.

**I. Introduction**

This research seeks to determine whether the application of forecasting techniques offer a mechanism which will allow American investors to pursue a buy and hold strategy while reaping the gains available from international portfolio diversification. In doing so it addresses explanations that attribute the observed lack of international portfolio diversification to the need for constant monitoring and rebalancing of international portfolios (Jorion 1985; Kopp 2004).

While a significant body of research has suggested that American investors have not internationally diversified despite opportunities for significant gains (Lewis 1999), the root cause has not been identified. Supporting the notion that this lack of diversification is irrational, Solnik (1995) demonstrated that the returns of internationally diversified portfolios exhibited one-tenth the variation of domestically diversified portfolios. Other research has suggested that diversified portfolios comprised of the equities of U.S. international companies do not achieve the same effect as international portfolio diversification (Russell 1998). Despite this and similar research, a significant home bias in portfolio allocation continues to exist. In the past, this was attributed to tax policies, exchange regulation and capital flow regulation. As capital flow liberalization has largely removed such barriers, some research has suggested that the gains from international diversification have significantly diminished (Errunza, Hogan & Hung 1999). Investors may also perceive that such barriers continue to exist; inhibiting international portfolio diversification (Russell 1998) or the cause may be a mispricing of foreign equities (Pastor 2000).

To explain this apparent bias against international diversification, research by Bekaert and Urias (1996), and DeSantis and Gerard (1997) focused on the size of available gains. They found that the gains available from international diversification were not statistically significant. In addition, Jorion (1985) demonstrated that there are barriers to the practical application of the mean-variance approach of optimal portfolio selection while Gorman and Jorgensen (2002) concluded “that observed portfolio allocation weights were not significantly different than an optimal allocation.”

This suggests that the tendency of U.S. investors to hold portfolios dominated by U.S. equities may be rational. However, work by Sarkar and Li (2002) continue to find significant

diversification benefits for international investors. Building on Jorion (1985), Kopp (2004) determined that the performance of international equity portfolios that comprise the efficient investment frontier degraded rapidly over time. This suggests that accessible international equity portfolios do not offer an advantage to investors who pursue a buy and hold strategy since they must continually attempt the difficult task of timing the market (Butler, Domian, and Simonds 1995). Therefore, for such investors domestic portfolios may be rational unless a viable method to select international diversified portfolios that maintain their effectiveness over time is available. Development of such a method is the focus of this research.

## II. The Data

This research uses the five MSCI Barra (2007) stock market gross indexes (pre-tax returns with dividends) for foreign equity markets for which investment iShares are traded and MSCI Barra's United States equity market iShare. Originally created by Morgan Stanley, these indexes and their associated iShares are essentially exchange-traded index funds that track price fluctuations in the underlying markets. Of the eighteen indexes which existed for the entire span of this study, the five foreign iShares identified by Kopp (2004) are used. That work identified those five foreign iShares and the U.S. iShare as significant components of the iShare efficient frontier for the 1970's. The finding that efficient portfolios can be constructed with only six funds is consistent with O'Neil (1997), Fant and O'Neil (1999) and Louton and Hakan (2006). They found that well diversified portfolios could be constructed with six mutual funds. Therefore, limiting this research to six iShares is expected to reduce the transactions cost and the forecasting effort required to implement the strategies identified without harming performance. This makes construction of the portfolios of exchange traded funds identified within this research easily accessible to U.S. investors.

The iShares and their associated equity markets in this study are those of Austria, Hong Kong, Japan, Sweden, United Kingdom, and the United States. This study uses the monthly gross indexes from December 1969- December 2004, to calculate the corresponding monthly return series for January 1970-December 2004. This resulted in five, five year holding periods as described in Table I below.

## III. The Model

Traditionally, it is assumed that most investors are risk averse. Therefore, investors will only consider portfolios which maximize expected return for a given level of risk. This research identifies the combination of equity indices that if purchased by investors are expected to yield the maximum return per unit of risk. Expected return (ER) of any portfolio (p) is expressed as:

$$ER(p) = \sum_{i=1}^n w_i ER(i)$$

where n represents the total number of equity indices included in the portfolio and i represents a particular equity index, and  $w_i$  represents the proportion of the total portfolio made up of index i.

Portfolio risk ( $\sigma_p$ ) is quantified using the standard deviation of recent index returns ( $\sigma_i$ ), the weights of the indices in the portfolio ( $w_i$ ), and the correlation coefficient ( $\rho_{i,j}$ ) between pairs of the individual markets. It can be expressed as:

$$\sigma_p = \sqrt{\sum_{i=1}^n w_i^2 \sigma_i^2 + 2 \sum_{i=1}^{n-1} \sum_{j=i+1}^n w_i w_j \rho_{i,j} \sigma_i \sigma_j}$$

Using linear programming, the portfolio which maximized the ratio of return to risk is identified under the constraints that the weights sum to 1, and that they are individually greater than or equal to zero (no short selling). The calculation of portfolios and an evaluation of their performance will be conducted through a sequential procedure. The returns, standard deviations and correlations of the historic data for period one will be used to calculate the portfolio which is expected to maximize the return per unit of risk ( $ER(p)/\sigma_p$ ). Then the performance of this portfolio will be evaluated over the five year holding period as indicated in the right hand column of Table I. The performance of this portfolio over the five-year holding period is evaluated using actual returns, standard deviations and correlations for that period. At the end of this period, a new portfolio, which will be held for five years, is calculated using the prior ten years of data (period 2's historical data). This portfolio's performance over the next five years will then be evaluated as the process continues through the five holding periods.

<b>Data to Identify Portfolios &amp; as Input in Forecasting</b>	<b>5 Year Portfolios Holding Period</b>
Period 1 January 1970-December 1979	January 1980-December 1984
Period 2 January 1975-December 1984	January 1985-December 1989
Period 3 January 1980-December 1989	January 1990-December 1994
Period 4 January 1985-December 1994	January 1995-December 1999
Period 5 January 1990-December 1999	January 2001-December 2004

In addition to using the traditional mean-variance approach to identifying portfolios that maximize return per unit risk the, this research uses the underlying gross indexes for each of the ten year historic periods to forecast the index's performance for the next five year holding period. Those forecasts are then used to calculate a forecasted monthly return series. Those series of returns and their correlations are then used, to identify portfolios which are expected to maximize return per unit of risk. The performance of this portfolio over the five-year holding period is then evaluated using actual returns, standard deviations and correlations for that period. As suggested by in Table I, this process results in the identification of ten portfolios, five resulting from the standard application of the mean-variance approach using ten years of historic data and five using forecasts based upon those same ten-year historic series within the mean variance approach.

#### **Mean-Variance Portfolios –The Traditional Approach**

Using monthly returns sequentially for each of the five periods identified in column 1 of Table I, five portfolios were identified using the traditional mean variance approach. Each of these portfolios, presented in Table II, is expected to maximize expected return per unit of risk in the period which it will be held (column 2 of Table I). As noted in prior research (Kopp 2004) the composition of these portfolios varies significantly over time. For example using period one data, the portfolio that is expected to maximize return per unit of risk is heavily weighted towards the Austrian index. However, using period two data, that weight is zero, and is only non-zero when period four data is used to identify portfolio composition for holding period four. While this tells us nothing about the performance of these portfolios during the holding period, it

does support the notion that optimal portfolio allocation requires continual monitoring when this approach is utilized.

### **Mean-Variance Portfolios Using Forecasted data**

The next phase of this research required each stock index be forecasted for the holding period. Using the gross indices for the data periods identified in Table I, each of the underlying stock indices were forecasted using Crystal Ball Predictor (Oracle Crystal Ball Global Business Unit, 2007). Returns generated from those forecasts and their correlations were then used within the traditional mean-variance portfolio selection model to identify the portfolio that will be held.

The forecasting techniques used within Crystal Ball are called exponential smoothing techniques (Chatfield 1978 & 2001). They attempt to smooth out random and other variation present in the data to identify the patterns hidden within. The data is smoothed by taking weighted averages of: the data itself to remove randomness, sequential estimates of its trend, and sequential estimates of its seasonal behavior. (Assuming all three characteristics exist within the data.) While the sizes of the weights vary, larger weight is always given to the most recent data, since it is assumed most relevant to future events. The sizes of the weights are determined by the smoothing parameters (alpha for the data, beta for trend and gamma for season). The techniques are called "exponential" since the weights diminish exponentially over time. For example a beta close to 1 would mean that recent estimates of trend are given a very high weight, and those weights diminish quickly, so that earlier estimates will receive almost no weight. Conversely, a very low beta indicates that the weights while still favoring the most recent estimates of trend diminish much more slowly. Thus many of the more historic estimates of trend are used in creating the weighted average forecast.

Using data from the historic periods identified in Table I, each technique uses different weighted average combinations of the data, as well as estimates of its trend and season to duplicate the patterns found within the historic period. Once those patterns are identified, Crystal Ball selects the technique whose forecasts for the historic period were the most accurate. Then, using only the historic data, the weights that had been identified are used to predict values of the data for the forecast period. Crystal ball has eight forecasting techniques to select from. Table III identifies the forecasting technique automatically selected by the software to make each forecast, as well as the associated smoothing parameters. In general, techniques which are based upon weighted averages of both trend and season dominate the list. This is consistent with the behavior of the data which generally exhibited strong trend during these time periods.

Having forecasted each of the gross index time series, those forecasts were used to generate the corresponding monthly return series for each holding period. Their mean return and their correlations were then used to generate the portfolios which are expected to yield the highest return per unit of risk for each period. Those portfolios as well as expected portfolio return and risk for each period are also presented in Table II. (It should be noted that since forecasting techniques generate relatively constant variation, the standard deviation of the historic series was used as estimates of each series' risk.)

#### **IV. Comparison of Performance**

Having identified portfolios based upon traditional application of the mean-variance approach and by using forecasts of expected performance for the period we now turn to evaluating the performance of each portfolio. To do this, each portfolio's actual performance was ascertained by entering the actual returns, standard deviations and correlations that occurred during the period that the portfolios were held. These performance characteristics are included in Table II and are summarized in Table IV. As these Tables demonstrate, the traditional mean variance approach identified portfolios whose return was lower than expected in four of the five periods, and whose risk was higher than expected in three of the five periods. This caused their return per unit of risk to be lower than expected in four out of the five periods. In comparison, when portfolios were generated using forecasts of expected returns, actual portfolio returns were higher than expected during four of the five periods. In addition, risk was also higher than expected in four of the five periods resulting in return per unit of risk being lower than expected in three of the five periods.

When comparing the relative performance of each technique's portfolios, we see that forecasting provided superior results. Those portfolios exhibited superior actual returns in all five periods. The return per unit of risk of the forecasted portfolios was higher than portfolios selected through the traditional mean variance approach in all periods except period two, when they were essentially the same. Thus the use of forecasting offers investors significant opportunities to improve the performance of portfolios that will be held over time. However, to demonstrate that international portfolio allocation based forecasts provides a superior alternative to domestic non-internationally diversified portfolios we need to compare performance to the U.S. only portfolio. Table V presents the returns and return per unit of risk for the U.S. only iShare portfolio versus those portfolios identified within this research.

As we can see, the U.S. only portfolios outperformed the traditionally derived mean variance portfolios in all but one period. This result suggests that investors who only periodically wish to reallocate their portfolios will benefit from "home bias" when using traditional portfolio allocation techniques. However, the clear superior performance of portfolios derived by using forecasted returns indicates that there is a viable alternative for these investors. Forecast based portfolios outperformed the U.S. only portfolio on a risk adjusted basis in all but the first period and in general offered higher returns. This suggests the benefits of international diversification can be attained without the constant portfolio reallocation.

#### **V. Conclusion**

This research finds considerable support for the notion that "buy and hold" investor's will attain superior performance if they select portfolios using forecasted returns within the traditional mean variance approach. Investors who do not wish to constantly monitor their portfolios for reallocation will be able to attain the benefits of international diversification with such a procedure. Rather than attempt to "time the market" through reallocation of their portfolio as conditions change, the use of forecasted returns yields portfolios whose performance persists over time. Therefore, buy and hold investors can avoid the effort and cost associated maintaining the returns of internationally diversified portfolios without resorting to "home bias". Instead, they can construct forecast based portfolios that achieve the superior performance available from international diversification, while pursuing a buy and hold strategy.

**Table II: Optimal Portfolios and Performance**

<b>Period 1: Portfolio to be held January 1980 to December 1984</b>					
<b>Traditional Mean Variance</b>			<b>Forecasted Mean Variance</b>		
<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>	<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>
U.S.=8.80%			U.S.=22.24%		
U.K.=1.08%	Return=.0128	Return=-.0034	U.K.=0.00%	Return=0.0045	Return=0.0280
Sweden=2.59%	Risk=.0378	Risk=.0382	Sweden=0.00%	Risk=0.0334	Risk=0.1419
Austria=78.84%	Re/Rsk=.3378	Re/Rsk=-.088	Austria=77.76%	Re/Rsk=0.1351	Re/Rsk=0.1271
Japan=0.00%			Japan=0.00%		
H. K.=8.69%			H.K.=0.00%		

<b>Period 2: Portfolio to be held January 1985 to December 1989</b>					
<b>Traditional Mean Variance</b>			<b>Forecasted Mean Variance</b>		
<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>	<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>
U.S.=36.20%			U.S.=25.31%		
U.K.=6.28%	Return=0.1367	Return=0.0253	U.K.=0.00%	Return=0.0026	Return=0.0311
Sweden=18.28%	Risk=.0373	Risk=0.0428	SW=0.00%	Risk=0.0008	Risk=0.0520
Austria=0.00%	Re/Rsk=.3666	Re/Rsk=0.5922	AS=47.92%	Re/Rsk=3.0857	Re/Rsk=0.5976
Japan=39.24%			JAP=26.76%		
H. K.=0.00%			H.K.=0.00%		

<b>Period 3: Portfolio to be held January 1990 to December 1994</b>					
<b>Traditional Mean Variance</b>			<b>Forecasted Mean Variance</b>		
<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>	<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>
U.S.=17.55%			U.S.=50.06%		
U.K.=0.00%	Return=0.0220	Return=0.0045	U.K.=0.00%	Return=0.0056	Return=0.0064
SW=38.89%	Risk=0.0426	Risk=0.0510	SW=19.13%	Risk=0.0215	Risk=0.0223
AS=0.00%	Re/Rsk=.5165	Re/Rsk=0.0880	AS=30.80%	Re/Rsk=0.2603	Re/Rsk=0.2880
JAP=43.56%			Jap=0.00%		
H. K.=0.00%			H.K.=0.00%		

<b>Period 4: Portfolio to be held January 1995 to December 1999</b>					
<b>Traditional Mean Variance</b>			<b>Forecasted Mean Variance</b>		
<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>	<b>Index Allocation</b>	<b>Expected Performance</b>	<b>Actual Performance</b>
U.S.=18.10%			U.S.=35.54%		
U.K.=0.00%	Return=0.0194	Return=0.0182	U.K.=0.00%	Return=0.0057	Return=0.0388
SW=34.07%	Risk=0.0484	Risk=0.0489	SW=0.00%	Risk=0.0167	Risk=0.0561
AS=16.59%	Re/Rsk=0.4020	Re/Rsk=0.3723	AS=28.50%	Re/Rsk=0.3436	Re/Rsk=0.6926
JAP=0.00%			JAP=35.96%		
H. K.=31.24%			H.K.=0.00%		

<b>Table II: Optimal Portfolios and Performance (cont'd)</b>					
<b>Period 5: Portfolio to be held January 2000 to December 2004</b>					
<b>Traditional Mean Variance</b>			<b>Forecasted Mean Variance</b>		
<b><u>Index</u></b> <b><u>Allocation</u></b>	<b><u>Expected</u></b> <b><u>Performance</u></b>	<b><u>Actual</u></b> <b><u>Performance</u></b>	<b><u>Index</u></b> <b><u>Allocation</u></b>	<b><u>Expected</u></b> <b><u>Performance</u></b>	<b><u>Actual</u></b> <b><u>Performance</u></b>
U.S.=80.05%			U.S.=1.00%		
U.K.=7.47%	Return=0.0154	Return=-0.0009	U.K.=5.27%	Return=0.0092	Return=0.0084
SW=7.32%	Risk=0.0383	Risk=0.0479	SW=35.29%	Risk=0.0006	Risk=0.0496
AS=0.00%	Re/Rsk=0.4029	Re/Rsk=-0.0185	AS=40.21%	Re/Rsk=16.26	Re/Rsk=0.1685
JAP=0.00%			JAP=2.53%		
H.K.=5.17%			H.K.=15.71%		

**Table III: Forecast Techniques and Parameters for each Period**

<b>Period 1 January 1970-December 1979 to Forecast January 1980 to December 1984</b>					
<b>Index</b>	<b>Forecast Techniques</b>	<b>Alpha</b>	<b>Beta</b>	<b>Gamma</b>	
US	Holt-Winters' Multiplicative	0.999	0.001	0.001	
UK	Holt-Winters' Additive	0.999	0.001	0.001	
Sweden	Holt-Winters' Additive	0.852	0.001	0.001	
Austria	Holt-Winters' Multiplicative	0.989	0.001	0.001	
Japan	Holt-Winters' Additive	0.999	0.001	0.001	
HK	Holt-Winters' Multiplicative	0.999	0.001	0.001	
<b>Period 2 January 1975-December 1984 to Forecast January 1985 to December 89</b>					
<b>Index</b>	<b>Forecast Techniques</b>	<b>Alpha</b>	<b>Beta</b>	<b>Gamma</b>	
US	Holt-Winters' Multiplicative	0.999	0.001	0.001	
UK	Holt-Winters' Additive	0.959	0.001	0.001	
Sweden	Holt-Winters' Multiplicative	0.753	0.311	0.096	
Austria	Holt-Winters' Multiplicative	0.999	0.001	0.001	
Japan	Holt-Winters' Multiplicative	0.999	0.001	0.001	
HK	Holt-Winters' Multiplicative	0.999	0.001	0.001	
<b>Period 3 January 1980-December 1989 to Forecast January 1990 to December 1994</b>					
<b>Index</b>	<b>Forecast Techniques</b>	<b>Alpha</b>	<b>Beta</b>	<b>Gamma</b>	
US	Holt-Winters' Multiplicative	0.999	0.001	0.001	
UK	Holt-Winters' Multiplicative	0.865	0.001	0.001	
Sweden	Double Exponential Smoothing	0.999	0.039	NA	
Austria	Seasonal Multiplicative	0.992	NA	0.999	
Japan	Double Exponential Smoothing	0.979	0.028	NA	
HK	Holt-Winters' Additive	0.986	0.001	0.001	
<b>Period 4 January 1985-December 1994 to Forecast January 1995 to December 1999</b>					
<b>Index</b>	<b>Forecast Techniques</b>	<b>Alpha</b>	<b>Beta</b>	<b>Gamma</b>	
US	Holt-Winters' Additive	0.884	0.001	0.001	
UK	Holt-Winters' Multiplicative	0.858	0.001	0.001	
Sweden	Holt-Winters' Multiplicative	0.999	0.001	0.001	
Austria	Holt-Winters' Additive	0.999	0.001	0.001	
Japan	Holt-Winters' Multiplicative	0.999	0.001	0.001	
HK	Holt-Winters' Additive	0.999	0.001	0.001	
<b>Period 5 January 1990-December 1999 to Forecast January 2000 to December 2004</b>					
<b>Index</b>	<b>Forecast Techniques</b>	<b>Alpha</b>	<b>Beta</b>	<b>Gamma</b>	
US	Double Exponential Smoothing	0.907	0.045	NA	
UK	Holt-Winters' Multiplicative	0.999	0.001	0.001	
Sweden	Holt-Winters' Multiplicative	0.999	0.202	0.001	
Austria	Holt-Winters' Multiplicative	0.769	0.001	0.001	
Japan	Seasonal Multiplicative	0.985	NA	0.001	
HK	Holt-Winters' Additive	0.999	0.001	0.001	

**Table IV: Comparisons of Performance of Portfolios for Each Data Period**

	<u>Traditional Portfolio Actuals Relative to Expected</u>	<u>Forecasted Portfolio Actuals Relative to Expected</u>	<u>Forecasted Portfolios Actual Returns Compared to Traditional Portfolios Actual</u>
Period 1 held January 1980 to December 1984	Return lower Risk same Re/Rsk=lower	Return higher Risk higher Re/Rsk lower	Return higher Risk higher Re/Rsk higher
Period 2 held January 1985 to December 1989	Return higher Risk higher Re/Rsk higher	Return higher Risk higher Re/Rsk lower	Return higher Risk higher Re/Rsk same
Period 3 held January 1990 to December 1994	Return lower Risk higher Re/Rsk lower	Return higher Risk same Re/Rsk higher	Return higher Risk lower Re/Rsk higher
Period 4 held January 1995 to December 1999	Return lower Risk same Re/Rsk lower	Return higher Risk higher Re/Rsk higher	Return higher Risk higher Re/Rsk higher
Period 5 held January 2000 to December 2004	Return lower Risk higher Re/Rsk lower	Return lower Risk higher Re/Rsk lower	Return higher Risk same Re/Rsk higher

**Table V: U.S. Domestic versus Internationally Diversified Portfolios**

	<u>Domestic U.S. Only Index Performance</u>	<u>Standard Mean Variance Performance</u>	<u>Forecasted Portfolio Performance</u>
Period 1 held January 1980 to December 1984	Return .0123 Re/Rsk=.2906	Return=-.0034 Re/Rsk=-.088	Return=0.0280 Re/Rsk=0.1271
Period 2 held January 1985 to December 1989	Return .0165 Re/Rsk .3235	Return=0.0253 Re/Rsk=0.5922	Return=0.0311 Re/Rsk=0.5976
Period 3 held January 1990 to December 1994	Return .0080 Re/Rsk .2230	Return=0.0045 Re/Rsk=0.0880	Return=0.0064 Re/Rsk=0.2880
Period 4 held January 1995 to December 1999	Return .0228 Re/Rsk .5625	Return=0.0182 Re/Rsk=0.3723	Return=0.0388 Re/Rsk=0.6926
Period 5 held January 2000 to December 2004	Return -.0016 Re/Rsk -.0016	Return=-0.0009 Re/Rsk=-0.0185	Return=0.0084 Re/Rsk=0.1685

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## **Accession to the EU: A Comparative Economic Analysis of Turkey and Bulgaria**

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### **Abstract**

This paper examines the European Union membership classification of both Turkey and Bulgaria with respect to other 11 longstanding European Union (EU) member countries based on their economic profiles. Turkey's most recent effort to enter the European Union has been denied, while Bulgaria and Romania were admitted to the EU. Turkey's situation is so unique both geographically and politically that it offers a very interesting paradigm for economic integration analysis. Turkey's drive to join the EU has faced many impediments and confronted numerous challenges. The basic inspiration for European Union integration is to establish a single market for goods, services, and capital among the member nations. Since this is the motto, we have examined Turkey and Bulgaria on the basis of their economic profiles for integration into the union by analyzing the similarities/differences. Multivariate analyses of Mahalanobis  $D^2$ , canonical correlation, and canonical discriminant analysis show that Turkey may not yet have earned an economic status to be a member of EU on the basis of five economic factors that we have considered in this paper. However, given that Bulgaria also classified in a separate group than that of those existing EU members provides an opportunity for an argument in favor of Turkey.

### **I. Introduction and Background**

Turkey has been aspiring to become a member of the European Union for nearly four decades. Its desire to enter Single Market Europe was intensified in recent years with the enlargement of the EU. Turkey's most recent effort to enter the EU in 2002 has been denied by the EU at the Copenhagen Summit in December of 2002. Although, countries such as Poland, Hungary, Czech Republic, Greece, Cypress, Slovenia, Malta, and many others entered the EU in May of 2004. Bulgaria and Romania also got admitted to EU effective January 1, 2007 while Turkey still remains outside the union.

Turkey's position is so unique geographically and politically that it offers us a unique and interesting case for economic integration analysis. Turkey has been a staunch, loyal NATO member. Its capital city is located in Europe. Turkey's long standing economic relationship with the western world is undeniable. In 1963, European Community signed an association agreement with Turkey that envisioned the mutual lowering of trade and migration barriers. In 1973, a protocol addendum was signed and a joint commission was established for removing migration barriers between the EC and Turkey by 1986. But, no advancement has been made to lower trade and migration barriers until 1982 due to a military coup that took place in 1980. As a result, the EC suspended its relations with Turkey in 1982. In spite of all these negative developments, Turkey applied for EU membership in 1987 and it was rebuffed by the EU in 1989. Turkey's latest attempt to join EU foiled in December 2002 at the Copenhagen Summit. However, EU pledged Turkey that if it carries out certain criteria on human rights and democracy by December 2004, accession talks could begin "without further delay." Although, at

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the same summit in Copenhagen EU added 10 new members to their list of nations while denying entry to Turkey. The basic motivation for European integration is to establish a single market for goods, services, and capital among the member nations of the EU. If this is the premise on which the EU expansion drive is advanced, then Turkey's economic profile should be compared to that of Bulgaria.

Turkey's drive to join the EU is not without hurdles or challenges. There is no certainty among the current EU members to accept Turkey. The grounds for this discord are varied and many. Valery Giscard d'Estaing, a former French president and an architect of EU's constitution, objected to Turkish membership because Turkey has "a different culture, a different approach, and a different way of life." Blocking Turkey from entering the EU contradicts the Union's motto: "Unity in Diversity." Resistance for Turkey's entry into EU comes from many directions. Some are culturally based and others are based on socio-political dynamics. At the center of this issue lies the concern about the continuing disharmony among Turks as to the cultural and social structure of their society. Turkey is a Muslim country with a majority of Sunni population. Turkey adopted a strict separation of State and religion. Under Turkey's brand of secularism, the state strictly controls the practice of religion. In the 1920s, Turkey was shaped by the ideology of Kemalism, after Mustafa Kemal Ataturk. The Kemalist ideology embraces republicanism, nationalism, statism, secularism, revolutionism (the quest for modernity) and populism. The rift between Kemalists and Islamists continues to exist and opens up wide from time to time. Kemalists seem to want to build a Turkish society that respects secularism as practiced by their European neighbors while the majority of Islamists interpret secularism as religious freedom to practice Sharia law in public. The issue came into the open when the parliament passed a law approving the female students wearing head scarf. The law was challenged by Kemalists in the court and the court struck down the law. In addition, the EU is concerned about how Turkey deals with the minority groups such as the Armenians and Kurds. Turkey is considered by many as a secular Muslim democracy. The courts and major institutions are dominated by the Kemalists while the Islamists dominate the military ranks. Kemalists petitioned the court to dissolve the current government for disobeying the secular constitution. The court wisely rejected the petition respecting the democratically elected government. This demonstrates that Turkey, in spite of the appearance of social disharmony, upholds the basic principles of secularism and democracy. These developments motivated the authors to examine Turkey's entry into EU purely on the basis of economic considerations.

Turkey ranks as the seventh largest economy in the Council of Europe and 15<sup>th</sup> largest economy in the world. It is one of the G-20 industrial nations. Turkey is a founding member of OECD. Turkey's GDP growth rate averaged 7.4% annually between 2002 and 2007. World Bank forecast a 5.4% rate of growth in 2008 and slightly higher growth rate for 2009. The rate of consumer inflation is running at the rate of 9% for 2008, which is higher than most countries in Europe. Its unemployment rate is about 10%. It has an ongoing negative balance in Current Account. Turkey's budget (deficit) balance as % of GDP is about 3% and is expected to rise. Foreign direct investment is falling and the currency is declining in value. Turkey's economic trends were shaping up positively during the last few years.

While there are some sociopolitical dynamics at play on both sides of the issue, this paper sets aside the non-economic considerations.

Bulgaria spent nearly five centuries under Ottoman rule before a constitutional monarchy took over in 1878. After World War II, it became a communist state as part of the Eastern Bloc. In 1990, Bulgaria transitioned to democracy and free-market capitalism. Bulgaria is currently governed by a parliamentary democracy under a unitary constitutional republic. It has been a member of NATO since 2004 and entered the EU in 2007. Bulgaria's attempt to join EU was not exactly a cakewalk either. Just as Turkey did, Bulgaria also made a discernible progress on the economic front and in advancing democracy. Bulgaria made a successful transition to a relatively peaceful and stable democracy in a shorter timeframe than did Turkey. After signing its accession treaty in April 2005, its march towards stable and peaceful nation was not without hurdles. It had a difficult parliamentary election in 2006. After the parliament convened, it worked very hard and pushed towards achieving the EU membership with series of negotiations with the EU. The overarching goal of the EU enlargement process has been the achievement of peace and stability in Europe, and especially in the Balkans. Apparently, EU was satisfied with Bulgaria's progress towards this end. On September 26, 2006, European Commission issued an official report indicating Bulgaria's readiness to become EU member state. The EC president, in his address to European Parliament, stated that Bulgaria and Romania are ready to "take responsibility of EU membership." Thus Bulgaria and Romania entered the EU on January 1, 2007. The decision to accept the two countries into the EU was based on the presumption that the two nations will continue to make progress on overcoming some deficiencies in the areas of crime and corruption.

The paper examines the issue purely on the basis of economic profiles of Turkey and Bulgaria. Although Turkey has been negotiating with the EU for much longer period to get into EU, it was denied EU membership while Bulgaria and Romania were given the nod to enter EU effective January 1, 2007. There are multidimensional differences among these countries' economic profiles. The purpose of this paper is to compare Turkey and Bulgaria in terms of their economic profiles and see if they differentiate themselves on economic dimension. Perhaps, it is even more important to study which one of these two countries is closer to the EU members' states in terms of their economic profile. We exclude Romania from our analysis primarily due to inadequate economic data available for the time line considered in this paper.

## **II. Data and Variable Descriptions**

This paper compares Turkey and Bulgaria with the eleven longstanding members of the EU to see if they are cohesive enough in their economic profiles to fit well in the Union. Economic profile of each nation is created and assessed using the following five economic characteristics:

- 1) Growth Rate of GDP
- 2) Current Account Balance (% of GDP)
- 3) Inflation Rate
- 4) Unemployment Rate
- 5) Long-term Interest Rate

The data set for this study was obtained from "The Economist" and "OECD". Annual data of these thirteen countries for five different economic factors above were obtained and analyzed. Summary statistics for these data were reported in Table 1 for the period of 2002-2006.

Data analysis is carried out in two steps. First, we compare Turkey's economic profile with the seasoned members of the EU. Similar comparison is then made for Bulgaria. This comparative analysis was done by applying univariate test for mean comparison to see if Turkey's (or Bulgaria's) average economic profile is similar or dissimilar to the average economic profile of the other 11 nations in the EU. We also analyzed pair-wise correlation between countries' economic characteristics to observe the closeness of economic profiles. Second, closeness of these countries economy on multidimensional scale was tested using Mahalanobis squared distance  $D^2$  to incorporate multivariate assessment of these countries economic profiles.

### III. Multivariate Methodologies

Multivariate analyses of Hotelling's  $T^2$  or Mahalanobis  $D^2$  can be used to observe the similarities or differences between the EU countries and Turkey-Bulgaria based on five economic factors, namely Growth Rate of GDP, Current Account Balance (% of GDP), Inflation Rate, Unemployment Rate, and Long-term Interest Rate. Then, Canonical Discriminant Analysis was used to group similar countries together based on these economic characteristics.

Let us consider  $x_{i1}, x_{i2}, \dots, x_{iN_i}$  are random samples from two multivariate normal populations,  $N_p(\mu_i, \Sigma_i)$  for  $i=1,2$ . Then, the test statistic Hotelling's  $T^2$  to test the difference between two mean vectors is defined as,

$$T^2 = \frac{N_1 N_2}{N_1 + N_2} (\hat{\mu}_1 - \hat{\mu}_2)' \hat{\Sigma}^{-1} (\hat{\mu}_1 - \hat{\mu}_2) \quad \text{and} \quad \hat{\Sigma} = \frac{(N_1 - 1)\hat{\Sigma}_1 + (N_2 - 1)\hat{\Sigma}_2}{N_1 + N_2 - 2}; \quad \text{where}$$

$\mu_1$  and  $\mu_2$  are the two mean vectors from two different populations and  $\Sigma$  is the pooled variance-covariance matrix (see Johnson 1998, p.420 for further details). Note that Hotelling's  $T^2$  is proportional to the Mahalanobis  $D^2$  to measure the distance between two mean vectors  $\mu_1$  and  $\mu_2$ . Therefore, Mahalanobis  $D^2$  measure alone is sufficient to perform the multivariate analysis and test the difference between two mean vectors at a multidimensional level. Consequently, only Mahalanobis  $D^2$  measure was used in this paper for the assessment of similarity/differences of these countries economic profiles. In addition, canonical correlation also aid into the classification decision making process.

These methodologies were used to observe the similarities and differences between two countries economic profiles on the basis of five economic factors collectively. Canonical discriminant analysis (a dimension reduction technique) was then used to classify countries that grouped together and worthy of belonging to the European Union on the basis of their economic characteristics. Thus, this device (or technique) classified countries according to their economic similarities and clustered them together into one group and at the same time keep them separated from another group of countries that have dissimilar economies. The resulting clusters of countries should then exhibit high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity. Accordingly, if the classification is successful, countries within the cluster will be closer together in-terms of their economy, and countries between clusters will be further apart.

#### IV. Empirical Classification Analysis

In this study, we examined the phenomenon of country classification in two phases. In the first phase, we have calculated the mean vectors of size five for five economic factors for each of the 13 different countries and their correlation (pair-wise) matrix to identify possible similarities or differences between countries in-terms economic characteristics by using univariate analysis as shown in Table 2 and Table 4. These preliminary analyses encouraged us to conduct multivariate analyses using Mahalanobis  $D^2$  and Canonical Correlation. Analyses were done using SAS programming software and the results were reported in Table 3 and Table 5. Results show that Mahalanobis  $D^2$  is consistently higher with Turkey and Bulgaria compared to other 11 countries considered in this paper. On occasion Portugal and Netherlands also exerted some higher values on these statistics. This leads us to employ Canonical Discriminant Analysis using SAS to separate and cluster countries that are together according to their economy. Results of univariate mean comparison tests (top half of Table 4) by economic factors reveal that all five economic factors are significantly differentiating country specific means with the most significant ones being GDP growth, Current Account Balance, and Unemployment rate with F statistics of 21.88 (p-value < 0.0001), 19.63 (p-value < 0.0001), and 19.58 (p-value < 0.0001) respectively. Country differences are found to be most widely separated according to their economic profiles by the first canonical function (Can1). Which is a linear combination of economic factors as follows:  $0.6513798 \text{ GDP growth rate} - 0.1946843 \text{ Current Account Balance} + 0.4562219 \text{ Inflation} + 0.54310126 \text{ Unemployment Rate} - 0.0931799 \text{ Long-term Interest Rate}$  with a high  $R^2$  of 0.936812 between this canonical variable and the country classification variable. Next we analyzed the eigenvalues and likelihood ratio test statistics to determine the dimensionality of the canonical space. Although, the first four canonical functions are statistically significant, first two functions alone account for 81.66% of the total variability and the eigenvalues of these two functions are greater than one. Therefore, these thirteen countries means seem to fall into a two-dimensional subspace within the five-dimensional space of economic factors. These two canonical variables were estimated to be

$$\begin{aligned} \text{CAN1} &= 0.6513798 \text{ GDP growth rate} - 0.1946843 \text{ Current Account Balance} + 0.4562219 \\ &\text{Inflation} + 0.54310126 \text{ Unemployment Rate} - 0.0931799 \text{ Long-term Interest} \quad \text{and} \\ \text{CAN2} &= 0.4410642 \text{ GDP growth rate} - 0.0238839 \text{ Current Account Balance} - 0.1213042 \\ &\text{Inflation} - 0.5711502 \text{ Unemployment Rate} + 0.1373904 \text{ Long-term Interest.} \end{aligned}$$

These functions were then calculated (also known as z-scores, see Hair et. al., 1998, p.263) for each country and plotted in Graph 1 to observe the clustered outcome of countries. This suggested that there are two different distinct clusters formation by the first canonical function. One formed by Turkey and Bulgaria and the other cluster formed by rest of the EU countries. This result is also supported by higher Mahalanobis  $D^2$  for Turkey and Bulgaria as reported in Table 3. Second canonical function provides classification between Turkey and Bulgaria themselves. It is interesting to note that the first canonical variable which discriminates Turkey-Bulgaria with respect to other EU countries accounts for 66.20% of the total variation. Also note that the distance between clusters formed by the first canonical function (Can1) is much greater than the distance between clusters formed by the second canonical function (Can2) as can be seen with respect to axis (x and y) in Graph 1. However, second canonical function also formed another separation between Turkey and Bulgaria. This probably indicates that Turkey may not have achieved the necessary economic status to enter the EU for the time period considered in this paper.

## V. Discussion and Conclusion

Turkey's position is so unique both geographically and politically that it offers a very interesting instance for economic integration analysis. Economic relationship of Turkey with the western world is exceptionally long and mutually beneficial to both. Turkey's drive to join the EU has faced many impediments and confronted numerous challenges. Financial Times, a venerable European news paper endorsed EU membership for Turkey. In spite of that, there is some hesitancy among the current EU members to accept Turkey into the union. Bulgaria and Romania were accepted into the union in 2007. The basic motivation for European Union integration is to establish a single market for goods, services, and capital among the member nations. Therefore, this paper examined and compared the economic profiles of Turkey and Bulgaria to see how similar or dissimilar these two countries on the economic dimensions.

This paper applied the classification and clustering (integration) methodology to economic data collected for 13 European countries. Multivariate analyses that included Mahalanobis  $D^2$ , canonical correlation, and canonical discriminant analysis revealed that Turkey may not be classified as a member of EU yet on the basis of five economic factors that we have considered in this paper. However, Bulgaria is also classified as a separate cluster with respect to other EU members. This provides an opportunity for the Turkey's economic policy makers to align their country's economy for future consideration for acceptance into the EU. Specifically, Turkey would like to place a considerable emphasis on the long-term stabilization of their interest rate and inflation. If the policy makers concentrate on these economic factors and implement necessary policies, Turkey may eventually achieve an economy that is similar to the long-lasting EU member nations. At that stage Turkey can legitimately lay a claim for EU membership.

TABLE I: Summary Statistics of Factors by Countries

Countries	Factors	Mean	Std Dev	Minimum	Maximum
Austria	GDP	1.9	0.9137833	0.9	3.1
	CB	0.9016	1.5426812	-0.965	3.2
	INF	1.78	0.3898718	1.4	2.3
	UNMP	5.8552	1.6100196	4	7.2
	I-RATE	4.0910	0.5824679	3.38	4.9
Belgium	GDP	1.92	0.9121403	1	3
	CB	3.36	1.0734757	2	4.59
	INF	1.98	0.501996	1.6	2.8
	UNMP	11.48	1.89	8.30	12.80
	I-RATE	4.054	0.5586389	3.365	4.89
Finland	GDP	3.1	1.4747881	1.6	5.3
	CB	6.174	3.5858444	0.5	10.22
	INF	1.02	0.5932959	-0.2	1.6
	UNMP	8.6064	0.5631628	7.717	9.08
	I-RATE	4.0716	0.5990036	3.35	4.98
France	GDP	1.82	0.4764452	1.1	2.3
	CB	-0.4522	1.0370796	-1.41	0.819
	INF	1.82	0.2683282	1.5	2.1
	UNMP	9.035	0.1269843	8.9	9.175
	I-RATE	4.0595	0.5336601	3.41	4.860
Germany	GDP	1.46	1.3164346	-0.2	2.9
	CB	4.314	1.4479744	1.9	5.69
	INF	1.7	0.3674235	1.1	2
	UNMP	10.341	1.1008541	9.2	11.68
	I-RATE	4.00	0.5227919	3.35	4.78
Greece	GDP	4.3	0.509902	3.7	4.9
	CB	-6.424	1.8531676	-9.62	-4.91
	INF	3.36	0.304959	2.9	3.6
	UNMP	9.872	0.6264743	8.9	10.5
	I-RATE	4.260	0.5558113	3.585	5.12
Ireland	GDP	5	0.7615773	4.3	5.9
	CB	-2.68	2.2603318	-5.13	0
	INF	3.34	1.0454664	2.2	4.7
	UNMP	4.448	0.1275539	4.3	4.65
	I-RATE	4.056	0.6091289	3.32	4.98
Italy	GDP	0.7	0.7582875	0.1	1.9
	CB	-1.416	0.7108657	-2.56	-0.77
	INF	2.3	0.2915476	2	2.7
	UNMP	7.925	0.7373941	6.775	8.6
	I-RATE	4.238	0.533942	3.55	5.03
Netherlands	GDP	1.88	1.0329569	0.3	3
	CB	7.592	1.2475857	5.49	8.57
	INF	1.58	0.4207137	1.1	2.1
	UNMP	3.5284	0.827475	2.267	4.325
	I-RATE	4.0526	0.557263	3.37	4.89
Portugal	GDP	0.64	0.8234076	-0.7	1.3
	CB	-8.206	1.4317577	-9.7	-6.13
	INF	2.94	0.5683309	2.3	3.6
	UNMP	6.646	1.063875	5.08	7.65
	I-RATE	4.136	0.5692919	3.43	5.00
Spain	GDP	3.44	0.3130495	3.1	3.9
	CB	-6.71	2.2928476	-8.8	-3.49
	INF	3.06	0.4335897	2.4	3.5
	UNMP	9.7396	1.2771377	8.5	11.38
	I-RATE	4.0716	0.5795121	3.38	4.95
Turkey	GDP	6.68	1.4788509	5.2	8.9
	CB	-5.972	1.7914017	-7.87	-3.35
	INF	13	6.9274815	8.5	25.3
	UNMP	10.235	0.2288558	9.875	10.5
	I-RATE	31.06	18.228357	15.6	59.5
Bulgaria	GDP	6.04	0.6107373	5	6.6
	CB	-8.084	7.7790186	-18.36	2.3
	INF	5.62	2.0992856	2.3	7.4
	UNMP	12.521	3.4538319	9	17.8
	I-RATE	4.84	1.3635065	3.34	6.75

**TABLE 2A: Correlations (pair-wise) of GDP Growth by Countries.**

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Turkey	Bulgaria
Austria	1.00	0.88	0.98	0.17	0.68	0.03	0.55	0.87	0.50	0.67	0.36	-0.44	0.44
Belgium	0.88	1.00	0.89	-0.23	0.25	0.17	0.44	0.93	0.05	0.84	0.05	-0.42	0.19
Finland	0.98	0.89	1.00	0.13	0.63	0.10	0.40	0.93	0.44	0.64	0.19	-0.44	0.44
France	0.17	-0.23	0.13	1.00	0.65	0.31	0.23	-0.17	0.89	-0.58	0.56	0.50	0.87
Germany	0.68	0.25	0.63	0.65	1.00	-0.25	0.39	0.36	0.92	0.09	0.61	-0.32	0.57
Greece	0.03	0.17	0.10	0.31	-0.25	1.00	-0.13	0.14	0.00	-0.31	-0.25	0.77	0.63
Ireland	0.55	0.44	0.40	0.23	0.39	-0.13	1.00	0.16	0.39	0.47	0.87	-0.09	0.25
Italy	0.87	0.93	0.93	-0.17	0.36	0.14	0.16	1.00	0.12	0.72	-0.14	-0.50	0.22
Netherlands	0.50	0.05	0.44	0.89	0.92	0.00	0.39	0.12	1.00	-0.22	0.68	0.07	0.78
Portugal	0.67	0.84	0.64	-0.58	0.09	-0.31	0.47	0.72	-0.22	1.00	0.08	-0.73	-0.32
Spain	0.36	0.05	0.19	0.56	0.61	-0.25	0.87	-0.14	0.68	0.08	1.00	0.02	0.38
Turkey	-0.44	-0.42	-0.44	0.50	-0.32	0.77	-0.09	-0.50	0.07	-0.73	0.02	1.00	0.51
Bulgaria	0.44	0.19	0.44	0.87	0.57	0.63	0.25	0.22	0.78	-0.32	0.38	0.51	1.00

**TABLE 2B: Correlations (pair-wise) of Current Account Balance by Countries.**

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Turkey	Bulgaria
Austria	1.00	-0.88	-0.33	-0.79	0.56	-0.85	-0.84	-0.80	0.06	-0.86	-0.73	-0.63	0.33
Belgium	-0.88	1.00	0.67	0.94	-0.87	0.75	0.96	0.86	-0.53	0.76	0.95	0.92	-0.06
Finland	-0.33	0.67	1.00	0.64	-0.67	0.23	0.59	0.46	-0.77	0.53	0.73	0.84	0.54
France	-0.79	0.94	0.64	1.00	-0.86	0.52	0.99	0.65	-0.54	0.73	0.98	0.94	0.16
Germany	0.56	-0.87	-0.67	-0.86	1.00	-0.53	-0.86	-0.75	0.83	-0.37	-0.93	-0.93	-0.04
Greece	-0.85	0.75	0.23	0.52	-0.53	1.00	0.60	0.95	-0.12	0.58	0.53	0.46	-0.65
Ireland	-0.84	0.96	0.59	0.99	-0.86	0.60	1.00	0.72	-0.50	0.73	0.97	0.92	0.05
Italy	-0.80	0.86	0.46	0.65	-0.75	0.95	0.72	1.00	-0.43	0.54	0.71	0.67	-0.47
Netherlands	0.06	-0.53	-0.77	-0.54	0.83	-0.12	-0.50	-0.43	1.00	-0.01	-0.67	-0.76	-0.36
Portugal	-0.86	0.76	0.53	0.73	-0.37	0.58	0.73	0.54	-0.01	1.00	0.66	0.62	0.09
Spain	-0.73	0.95	0.73	0.98	-0.93	0.53	0.97	0.71	-0.67	0.66	1.00	0.98	0.17
Turkey	-0.63	0.92	0.84	0.94	-0.93	0.46	0.92	0.67	-0.76	0.62	0.98	1.00	0.29
Bulgaria	0.33	-0.06	0.54	0.16	-0.04	-0.65	0.05	-0.47	-0.36	0.09	0.17	0.29	1.00

**TABLE 2C: Correlations (pair-wise) of Inflation Rate by Countries.**

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Turkey	Bulgaria
Austria	1.00	0.84	-0.50	-0.16	-0.10	-0.11	0.00	-0.55	-0.23	-0.72	0.85	0.09	-0.06
Belgium	0.84	1.00	-0.47	-0.50	0.28	-0.15	0.23	-0.77	-0.56	-0.88	0.65	-0.38	0.49
Finland	-0.50	-0.47	1.00	0.11	-0.48	0.50	0.67	0.14	0.48	0.75	-0.76	0.47	-0.16
France	-0.16	-0.50	0.11	1.00	-0.76	0.68	-0.59	0.89	0.03	0.62	0.18	0.65	-0.66
Germany	-0.10	0.28	-0.48	-0.76	1.00	-0.74	0.02	-0.49	-0.34	-0.61	-0.09	-0.94	0.76
Greece	-0.11	-0.15	0.50	0.68	-0.74	1.00	0.05	0.51	-0.24	0.55	-0.03	0.48	-0.17
Ireland	0.00	0.23	0.67	-0.59	0.02	0.05	1.00	-0.63	0.25	0.03	-0.50	0.00	0.33
Italy	-0.55	-0.77	0.14	0.89	-0.49	0.51	-0.63	1.00	0.08	0.74	-0.14	0.43	-0.52
Netherlands	-0.23	-0.56	0.48	0.03	-0.34	-0.24	0.25	0.08	1.00	0.51	-0.44	0.62	-0.68
Portugal	-0.72	-0.88	0.75	0.62	-0.61	0.55	0.03	0.74	0.51	1.00	-0.64	0.62	-0.52
Spain	0.85	0.65	-0.76	0.18	-0.09	-0.03	-0.50	-0.14	-0.44	-0.64	1.00	0.02	-0.13
Turkey	0.09	-0.38	0.47	0.65	-0.94	0.48	0.00	0.43	0.62	0.62	0.02	1.00	-0.90
Bulgaria	-0.06	0.49	-0.16	-0.66	0.76	-0.17	0.33	-0.52	-0.68	-0.52	-0.13	-0.90	1.00

**TABLE 2D: Correlations (pair-wise) of Unemployment Rate by Countries.**

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Turkey	Bulgaria
Austria	1.00	-0.05	-0.66	0.97	-0.80	-0.18	-0.68	-0.73	0.85	0.85	-0.26	-0.59	-0.85
Belgium	-0.05	1.00	0.72	-0.01	-0.41	0.79	0.13	0.69	0.35	-0.23	0.36	0.80	0.27
Finland	-0.66	0.72	1.00	-0.56	0.16	0.82	0.53	0.99	-0.33	-0.83	0.64	0.93	0.83
France	0.97	-0.01	-0.56	1.00	-0.82	-0.05	-0.60	-0.64	0.84	0.73	-0.10	-0.53	-0.76
Germany	-0.80	-0.41	0.16	-0.82	1.00	-0.40	0.73	0.23	-0.72	-0.43	-0.27	0.20	0.40
Greece	-0.18	0.79	0.82	-0.05	-0.40	1.00	0.04	0.77	0.00	-0.60	0.86	0.67	0.61
Ireland	-0.68	0.13	0.53	-0.60	0.73	0.04	1.00	0.53	-0.30	-0.47	-0.09	0.65	0.41
Italy	-0.73	0.69	0.99	-0.64	0.23	0.77	0.53	1.00	-0.40	-0.85	0.60	0.93	0.86
Netherlands	0.85	0.35	-0.33	0.84	-0.72	0.00	-0.30	-0.40	1.00	0.76	-0.32	-0.13	-0.77
Portugal	0.85	-0.23	-0.83	0.73	-0.43	-0.60	-0.47	-0.85	0.76	1.00	-0.73	-0.62	-0.99
Spain	-0.26	0.36	0.64	-0.10	-0.27	0.86	-0.09	0.60	-0.32	-0.73	1.00	0.34	0.72
Turkey	-0.59	0.80	0.93	-0.53	0.20	0.67	0.65	0.93	-0.13	-0.62	0.34	1.00	0.62
Bulgaria	-0.85	0.27	0.83	-0.76	0.40	0.61	0.41	0.86	-0.77	-0.99	0.72	0.62	1.00

**TABLE 2E: Correlations (pair-wise) of Interest Rate by Countries.**

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Turkey	Bulgaria
Austria	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.93	0.97
Belgium	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.97
Finland	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.97
France	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.94	0.97
Germany	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.97
Greece	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.93	0.94
Ireland	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.96
Italy	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.95
Netherlands	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.94	0.97
Portugal	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.96
Spain	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.97
Turkey	0.93	0.94	0.94	0.94	0.93	0.93	0.94	0.92	0.94	0.93	0.94	1.00	0.97
Bulgaria	0.97	0.97	0.97	0.97	0.97	0.94	0.96	0.95	0.97	0.96	0.97	0.97	1.00

**TABLE 3: Mahalanobis Squared Distance-  $D^2$  by Countries**

Country	AU	BE	BU	FI	FR	GE	GR	HO	IR	IT	PO	SP	TU
AU	0	21.7102	103.487	9.2474	7.3811	13.3610	36.8199	11.3329	14.9827	5.4568	14.8528	29.8315	100.827
BE	21.7102	0	56.7474	9.8043	5.6376	1.7652	20.2536	49.5519	36.5181	12.7225	30.8474	16.7459	78.4563
BU	103.487	56.7474	0	85.3258	66.0564	74.9720	18.3217	167.162	68.4014	85.5784	84.8484	26.0703	34.3426
FI	9.2474	9.8043	85.3258	0	8.3935	5.7100	32.7481	20.0536	21.1333	14.5779	35.8557	29.6107	91.7809
FR	7.3811	5.6376	66.0564	8.3935	0	3.7387	17.2863	33.4338	20.8280	2.4117	11.9103	11.8285	76.7619
GE	13.3610	1.7652	74.9720	5.7100	3.7387	0	27.6431	34.1753	33.4202	7.8805	26.7072	22.3799	91.2935
GR	36.8199	20.2536	18.3217	32.7481	17.2863	27.6431	0	82.4817	22.5316	27.4595	27.5347	1.0588	36.2526
HO	11.3329	49.5519	167.162	20.0536	33.4338	34.1753	82.4817	0	33.2406	29.0380	48.3843	74.4735	154.770
IR	14.9827	36.5181	68.4014	21.1333	20.8280	33.4202	22.5316	33.2406	0	25.5023	28.1113	22.3874	64.5393
IT	5.4568	12.7225	85.5784	14.5779	2.4117	7.8805	27.4595	29.0380	25.5023	0	6.5171	19.2577	92.8314
PO	14.8528	30.8474	84.8484	35.8557	11.9103	26.7072	27.5347	48.3843	28.1113	6.5171	0	18.5674	88.7940
SP	29.8315	16.7459	26.0703	29.6107	11.8285	22.3799	1.0588	74.4735	22.3874	19.2577	18.5674	0	43.1547
TU	100.827	78.4563	34.3426	91.7809	76.7619	91.2935	36.2526	154.770	64.5393	92.8314	88.7940	43.1547	0

AU=Austria, BE=Belgium, BU=Bulgaria, FI=Finland, FR=France, GE=Germany, GR=Greece  
 HO=Netherlands, IR=Ireland, IT=Italy, PO=Portugal, SP=Spain, TU=Turkey

**TABLE 4: Univariate and Multivariate Tests on Equality of Means**

Univariate Test Statistics							
Variable	Total Standard Deviation	Pooled Standard Deviation	Between Standard Deviation	R-Square	R-Square / (1-RSq)	F Value	Pr > F
GDP Growth Rate	2.0959	0.9454	1.9776	0.8347	5.0485	21.88	<.0001
Current Balance % of GDP	5.9136	2.7901	5.5278	0.8191	4.5292	19.63	<.0001
Inflation	3.5559	2.0628	3.1305	0.7266	2.6572	11.51	<.0001
Unemployment Rate	2.8827	1.3615	2.6939	0.8188	4.5175	19.58	<.0001
Interest Rate	8.5630	5.0963	7.4636	0.7122	2.4748	10.72	<.0001

Multivariate Test Statistics and F Approximations					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.00146708	11.53	60	228.54	<.0001
Pillai's Trace	3.12577191	7.23	60	260	<.0001
Hotelling-Lawley Trace	22.39551893	17.41	60	148.06	<.0001
Roy's Greatest Root	14.82589702	64.25	12	52	<.0001

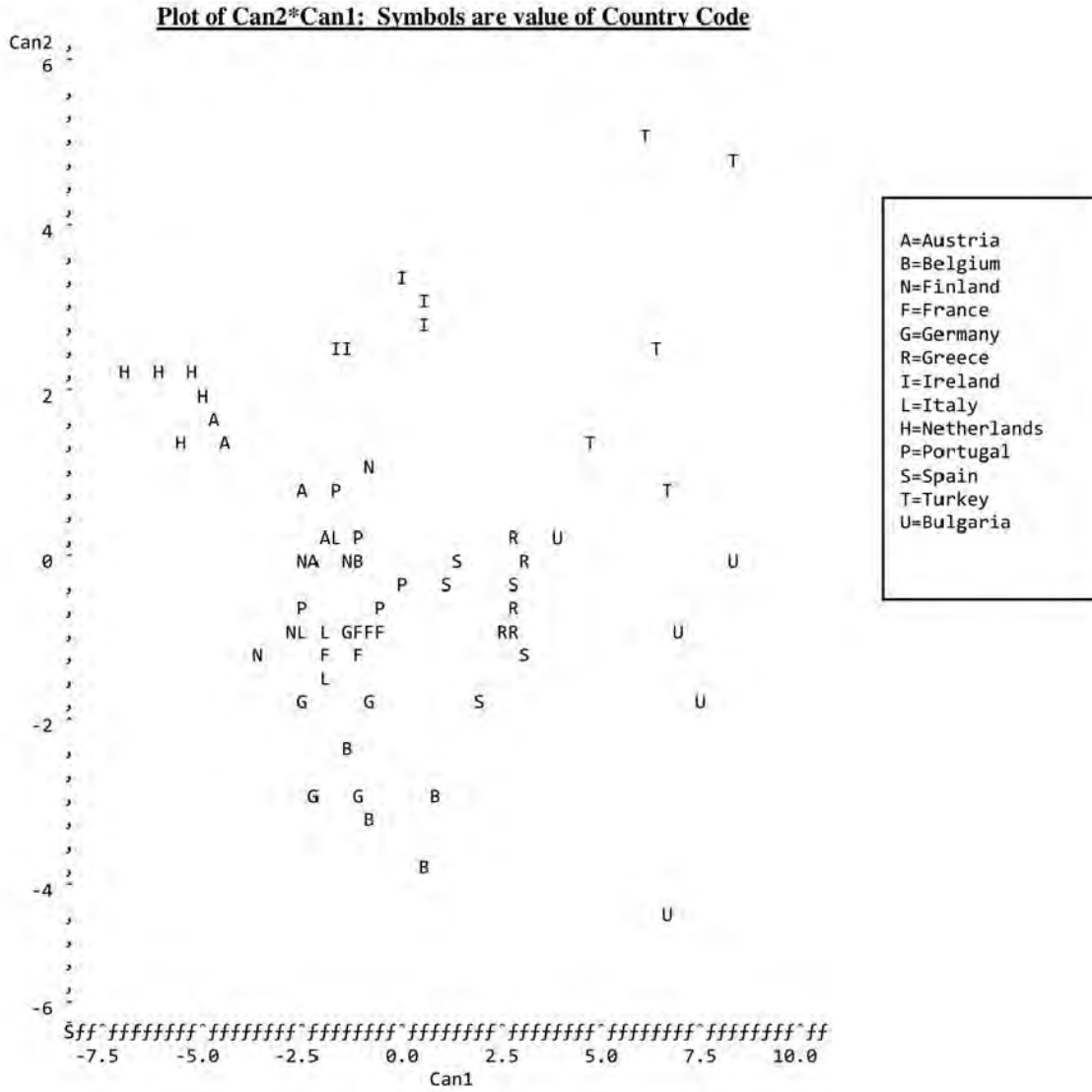
**TABLE 5: Canonical Discriminant Analysis**

	Canonical Correlation	Adjusted Canonical Correlation	Approximate Standard Error	Squared Canonical Correlation	Eigenvalues of $\text{Inv}(E) \cdot H = \text{CanRs}q/(1-\text{CanRs}q)$			
					Eigenvalue	Difference	Proportion	Cumulative
1	0.967891	0.960077	0.007898	0.936812	14.8259	11.3632	0.6620	0.6620
2	0.880862	0.843189	0.028010	0.775918	3.4627	0.8749	0.1546	0.8166
3	0.849279	0.832907	0.034841	0.721275	2.5878	1.1908	0.1155	0.9322
4	0.763411	0.743334	0.052150	0.582797	1.3969	1.2746	0.0624	0.9945
5	0.330106	0.192824	0.111379	0.108970	0.1223		0.0055	1.0000

Test of H0: The canonical correlations in the current row and all that follow are zero					
	Likelihood Ratio	Approximate F Value	Num DF	Den DF	Pr > F
1	0.00146708	11.53	60	228.54	<.0001
2	0.02321793	7.21	44	189.42	<.0001
3	0.10361355	5.72	30	147.44	<.0001
4	0.37174058	3.63	18	102	<.0001
5	0.89102977	0.79	8	52	0.6095

Raw Canonical Coefficients		
Variable	Can1	Can2
GDP Growth Rate	0.6513798162	0.4410642159
Current Balance % of GDP	-.1946843246	-.0238839067
Inflation	0.4562219832	-.1213042142
Unemployment Rate	0.5431012554	-.5711502141
Interest Rate	-.0931798933	0.1373904084

**GRAPH 1: Plot of Canonical Discriminant Functions.**



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## **The Fed Funds Rate and Interest Rate Elasticities**

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### **Abstract**

The federal funds rate is an important, short-term interest rate which is targeted by the Federal Reserve to influence economic growth and inflation. The financial markets closely monitor the Federal Reserve's monetary policy and changes in the federal funds rate to gauge future economic performance. This research analyzes how changes in the federal funds rate affected the 1) yield curve, 2) 30-year fixed mortgage rate, and 3) spread between Aaa and Baa corporate bond yields. The purpose is to determine the rippling effect between changes in the federal funds rate and changes in interest rates that affect the cost of borrowing by firms, individuals, and the government. The empirical results indicate that when a basis point change of 25 points or more occurs to the fed funds rate, which is of a magnitude consistent with a change in Federal Reserve policy, a statistically significant, positively related change occurs in the one-month interest rate elasticities for the 3-Month Treasury rate, 1-year Treasury rate, 5-Year Treasury rate, 10-Year Treasury rate, and the 30-Year Mortgage rate.

### **I. Introduction**

The Federal Reserve conducts monetary policy with the ultimate objectives of promoting economic growth with an acceptable amount of inflation. The Federal Reserve's primary tool for implementing monetary policy is through open market operations - purchases and sales of U.S. Treasury and federal agency securities. Although the goal of open market operations has historically varied, in the 1980s the focus gradually shifted toward attaining a specified level of the federal (fed) funds rate. The fed funds rate is the interest rate at which depository institutions lend balances at the Federal Reserve to other depository institutions overnight. In other words, it is a very short-term (overnight), market sensitive interest rate.

Thus, open market operations are used to target the fed funds rate, which in turn influences economic growth and inflation. To accomplish its economic objectives of economic growth and an acceptable level of inflation, the short-term objective for open market operations is specified by the Federal Open Market Committee (FOMC). Beginning in 1995, the FOMC began publicly announcing its target level for the fed funds rate. After its meetings, since February 2000, the FOMC has released the committee's assessment of the risks to the attainment of its long-run goals of price stability and economic growth. When the Federal Reserve determines a change in the targeted fed funds rate is necessary to accomplish its objectives, a change of 25 basis points or more will occur to the target rate. The focus of this research will be analyzing how other interest rates in the financial markets respond to a change in the fed funds rate caused by a change in Federal Reserve policy.

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The fed funds rate has become a key economic variable used by the Federal Reserve to balance economic growth and inflation. Investors in the stock market closely monitor the Federal Reserve's policy of targeting the fed funds rate. Changes in the target rate can cause significant stock market reaction, such as the 2.9% increase in the S&P 500 which occurred following the Fed's decision to reduce its target on the fed funds rate by one-half percentage point on September 18, 2007. Although stock market reaction to changes in the fed funds rate is usually widely reported in the media, generally less attention is given to how changes in the fed funds rate affect other interest rates.

Given the economic importance of the fed funds rate, this paper will analyze how other interest rates in the financial markets typically react to changes in the fed funds rate. The objective is to determine how changes in the fed funds rate typically affect the cost of borrowing. Changes in the cost of borrowing are determined by analyzing changes in the yield curve, changes in the residential mortgage rate, and changes in the spread between corporate bonds.

## **II. The Literature**

Existing research focuses on the effect changes in the fed funds rate has on asset prices, the mortgage markets, and variable rate debt instruments tied for instance to the prime rate, such as adjustable rate mortgages and credit cards. Bernanke and Kuttner (2005) found that an unanticipated rise in the fed funds rate by  $\frac{1}{4}$  percent (25 basis points) results in one percent drop in stock prices. They used a six variable VAR using unanticipated fed funds rate changes as a variable to generate responses for excess returns. Taylor (2007) found that housing construction and mortgage financing volatility relative to trend has decreased since 1980 largely due to an improved monetary policy.

Flattening of the yield curve has been analyzed the past few years, as long-term interest rates did not increase in a historically consistent manner when the FOMC began monetary tightening in June 2004. WU (2006) researched how the conventional relationship between short-term and long-term interest rates appears to have broken down during the recent fed funds rate increases. He believes the yield flattening is likely related to the decreased volatility in real economic activity caused by increased globalization; while at the same time, the available pool of world savings is increasing, bringing additional loanable funds to increasingly open markets, helping to hold down real interest rates worldwide. Backus and Wright (2007) think the evidence points to a declining term premium as the primary source of the recent fall in long-term forward rates.

## **III. Data**

To determine the relationship between changes in the fed funds rate and changes in other interest rates in the financial markets, interest rate elasticity is calculated. In each case, the one-month percentage change in a given interest rate is divided by the one-month percentage change in the effective fed funds rate. (The effective fed funds rate is a volume-weighted average of rates on trades arranged by major brokers. It is the market, rather than targeted, fed funds rate.) In effect, the interest rate elasticity is an arc elasticity that measures the one-month percentage change of a given interest rate relative to the one-month percentage change in the effective fed funds rate. Interest rate elasticities are calculated for the following variables: 1) 3-Month Treasury rate, 2) 1-year Treasury rate, 3) 5-Year Treasury rate, 4) 10-Year Treasury rate, 5) 30-

Year Mortgage rate, and 6) the basis point spread between Moody's Aaa and Baa Corporate Bond Yields. Elasticities are computed for the six variables under two scenarios: 1) the monthly interest rate elasticity for all periods in the analysis, and 2) the monthly interest rate elasticity for periods in which a significant change in the fed funds rate occurs. A significant change is defined as a 25 basis point change or greater. This corresponds to analyzing the impact of changes in Federal Reserve policy, as the Federal Reserve will change the targeted fed funds rate by 25 basis points or more.

To determine interest rate elasticities, monthly data from July, 1954 through December 2006 is used for the effective fed funds rate, the 3-Month Treasury Bill rate, the 5-Year Treasury rate, the 10-Year Treasury rate, and the basis point spread between Moody's Aaa and Baa Corporate Bond Yields. Monthly data from April, 1971 through December, 2006 is used for the 30-Year Conventional Mortgage Rate. In each case, the source of data is the Board of Governors of the Federal Reserve System.

### **Hypotheses**

Given that the Federal Reserve changes the targeted fed funds rate by 25 basis points or more when a change in policy is needed to accomplish its objectives, the primary focus of this research is to determine how other interest rates in the financial markets typically react to significant changes in the fed funds rate. A significant change is defined in this research as a change of 25 basis points or more, which reflects a change in Federal Reserve policy. Hypotheses are developed and tested to determine if significant changes in the fed funds rate are associated with changes in the 1) yield curve, 2) 30-year fixed mortgage rate, and 3) spread between Aaa and Baa corporate bond yields. The purpose is to determine the rippling effect between changes in Federal Reserve policy and changes in interest rates in which affect the cost of borrowing by firms, individuals, and the government.

Six statistical tests are performed to determine the significance of a given interest rate elasticity.

#### **Test 1**

$H_0$  : 3 month treasury one-month interest rate elasticity = 0

$H_a$  : 3 month treasury one-month interest rate elasticity > 0

#### **Test 2**

$H_0$  : 1-year treasury one-month interest rate elasticity = 0

$H_a$  : 1-year treasury one-month interest rate elasticity > 0

#### **Test 3**

$H_0$  : 5-year treasury one-month interest rate elasticity = 0

$H_a$  : 5-year treasury one-month interest rate elasticity > 0

#### **Test 4**

$H_0$  : 10-year treasury one-month interest rate elasticity = 0

$H_a$  : 10-year treasury one-month interest rate elasticity > 0

**Test 5**

$H_0$  : Aaa/Baa spread one-month interest rate elasticity = 0

$H_a$  : Aaa/Baa spread one-month interest rate elasticity > 0

**Test 6**

$H_0$  : 30-year mortgage one-month interest rate elasticity = 0

$H_a$  : 30-year mortgage one-month interest rate elasticity > 0

In each case, the null hypothesis states that a significant change in the fed funds rate (defined as 25 basis points or more) will not have an effect on the given interest rate variable. The null hypothesis states that the one-month percentage change in the given interest rate variable relative to the one-month percentage change in the fed funds rate is equal to zero. In each case, given a significant change in the fed funds rate, the alternative hypothesis states that the one-month percentage change in the given interest rate variable relative to the one-month percentage change in the fed funds rate is greater than zero.

**IV. Results**

Table I shows one-month statistics for the variables being analyzed. The monthly mean, median, and standard deviation were calculated over the period July, 1954 through December 2006 for the fed funds rate, the 3-Month Treasury rate, the 5-Year Treasury rate, the 10-Year Treasury rate, and the basis point spread between Moody's Aaa and Baa Corporate Bond Yields. The monthly mean, median, and standard deviation were calculated over the period April, 1971 through December, 2006 for the 30-Year Mortgage Rate.

The mean and median for the fed funds rate were 5.70 and 5.25, respectively, with a standard deviation of 3.35. The 3 month treasury rate had a mean of 5.21 and median of 4.95, with a standard deviation of 2.79. The 1-year treasury rate had a mean of 5.79 and median of 5.45, with a standard deviation of 2.95. The mean and median for the 5-year treasury rate were 6.39 and 6.01, respectively, with a standard deviation of 2.73. The 10-year treasury rate had a mean of 6.59 and median of 6.20, with a standard deviation of 2.66. The spread between Aaa and Baa corporate bond yields had a mean of 0.95 and median of 0.83, with a standard deviation of 0.41. The mean and median for the 30-year mortgage rate was 9.28 and 8.76 respectively, with a standard deviation of 2.76. The table reflects that generally the yield curve slopes upward, with interest rates increasing as maturity increases. However, the table also indicates that short-term interest rates have greater volatility than long-term interest rates, as the standard deviations of 3-month and 1-year treasury interest rates are greater than the standard deviations of 5-year and 10-year treasury interest rates and the 30-year mortgage rate.

Table II shows the one-month interest rate elasticities for the six different interest rate variables relative to the fed funds rate over all periods. All monthly changes to the market fed funds rate are included in the analysis, including changes between 0 and 25 basis points. Thus, changes to the fed funds rate which occur irrespective of Federal Reserve policy are included in the analysis. The interest rate elasticity measures the one-month percentage change of a given interest rate variable relative to the one-month percentage change in the fed funds rate. The

analysis indicates that large standard deviations for the interest rate elasticity of each variable result when all periods are included in the analysis.

The mean interest rate elasticities are 0.92, 0.65, 0.48 and 0.37 for the 3-Month Treasury rate, 1-year Treasury rate, 5-Year Treasury rate, and 10-Year Treasury rate, respectively. Thus, a 10 percent change in the fed funds rate is associated with, on average, a 9.2 percent change in the 3-month Treasury rate, a 6.5 percent change in the 1-year Treasury rate, a 4.8 percent change in the 5-year Treasury rate, and a 3.7 percent change in the 10-year Treasury rate. However, using all time periods in the analysis returns relatively large standard deviations for the interest rate elasticities. The standard deviations are 4.67, 5.01, 5.35, and 4.60 for the 3-Month Treasury rate, 1-year Treasury rate, 5-Year Treasury rate, and 10-Year Treasury rate, respectively. The mean interest rate elasticities for the 30-Year Mortgage rate and the basis point spread between Moody's Aaa and Baa Corporate Bond Yields are 0.08 and 0.41, respectively, and the standard deviations of the interest rate elasticities are 9.17 and 3.15, respectively. The relatively large standard deviations for the interest rate elasticities reflect large movements which can occur in the interest rate variables, despite only small movements in the fed funds rate.

Table III shows the one-month interest rate elasticities for the six different interest rate variables when there is a significant change to the fed funds rate. A significant change is defined as a 25 basis point change or greater and is consistent with a change in Federal Reserve policy. Thus, the focus of Table 3 is to show the association between movements in the fed funds rate that are a magnitude consistent with a change in Federal Reserve policy and other interest rates variables. The results in Table 3 indicate that when a significant change occurs in the fed funds rate, a statistically significant change in the interest rate elasticity occurs for the 3-Month Treasury rate, 1-year Treasury rate, 5-Year Treasury rate, 10-Year Treasury rate, and 30-Year Mortgage rate. The statistical significance is indicated by the Z-test. In each case, the percentage change in the fed funds rate is positively related to the percentage change in each of the interest rates. The change in the interest rate elasticity for the basis point spread between Moody's Aaa and Baa Corporate Bond Yields is not statistically significant. The greatest changes occur for the short-term rates. A dramatic reduction in the standard deviation of each of the interest rate elasticities occurs relative to Table 2 when all periods were considered in the analysis.

The mean interest rate elasticity for the 3-month Treasury rate is 0.58; the mean interest rate elasticity of the 1-year Treasury rate is 0.59. Thus, a 10 percent change in the fed funds rate is associated with, on average, a 5.8 percent change in the 3-month Treasury rate and a 5.9 percent change in the 1-year Treasury rate. The standard deviation of the interest rate elasticity is 0.97 and 1.06 for the 3-month Treasury rate and the 1-year Treasury rate, respectively. The interest rate elasticities for the longer-term interest rates are lower relative to the short-term interest rates. The mean interest rate elasticities for the 5-Year Treasury rate and 10-Year Treasury rate are 0.34 and 0.23, respectively. Thus, a 10 percent change in the fed funds rate is associated with, on average, a 3.4 percent change in the 5-year Treasury rate and a 2.3 percent change in the 10-year Treasury rate. A 10 percent change in the fed funds rate is associated with, on average, a 2.4 percent change in the 30-year Mortgage rate, as indicated by the 0.24 mean interest rate elasticity for the 30-year Mortgage rate. The standard deviation of the interest rate elasticity is 0.91 for the 3-year Treasury rate, 0.79 for the 10-year Treasury rate, and 0.50 for the

30-Year Mortgage rate. When the time periods analyzed include only those periods in which a significant change in the fed funds occurs, the standard deviations of all the interest rate elasticities are greatly reduced.

## **V. Summary**

The federal funds rate is an important, short-term interest rate which is targeted by the Federal Reserve to influence economic growth and inflation. The focus of this research was to analyze how significant changes in the fed funds rate affected the 1) yield curve, 2) 30-year fixed mortgage rate, and 3) spread between Aaa and Baa corporate bond yields. The purpose was to determine how changes in the federal funds rate were associated with changes in interest rates that affect the cost of borrowing by firms, individuals, and the government.

The research indicates that when a basis point change of 25 points or more occurs to the fed funds rate, which is of a magnitude consistent with a change in Federal Reserve policy, a statistically significant, positively related change occurs in the one-month interest rate elasticities for the 3-Month Treasury rate, 1-year Treasury rate, 5-Year Treasury rate, 10-Year Treasury rate, and the 30-Year Mortgage rate. The basis point spread between Moody's Aaa and Baa Corporate Bond Yields is not significantly affected. The mean interest rate elasticities are 0.58, 0.59, 0.34, and 0.23 for the 3-month Treasury rate, 1-year Treasury rate, 5-year Treasury rate, and 10-year Treasury rate, respectively. Thus, a 10 percent change in the fed funds rate is associated with, on average, changes of 5.8 percent, 5.9 percent, 3.4 percent, and 2.3 percent for the for the 3-month Treasury rate, 1-year Treasury rate, 5-year Treasury rate, and 10-year Treasury rate, respectively. The mean interest rate elasticity for the 30-year Mortgage rate is 0.24, which indicates that a 10 percent change in the fed funds rate is associated with, on average, a 2.4 percent change in the 30-year Mortgage rate.

**TABLE I**  
**Interest Rate Monthly Statistics**

	<i>Effective Federal Funds Rate</i>	<i>3 Month Treasury Rate</i>	<i>1-year Treasury Rate</i>	<i>5-year Treasury Rate</i>	<i>10-year Treasury Rate</i>	<i>Aaa/Baa Spread</i>	<i>30-year Mortgage Rate</i>
Mean	<b>5.70</b>	<b>5.21</b>	<b>5.79</b>	<b>6.39</b>	<b>6.59</b>	<b>0.95</b>	<b>9.28</b>
Median	<b>5.25</b>	<b>4.95</b>	<b>5.45</b>	<b>6.01</b>	<b>6.20</b>	<b>0.83</b>	<b>8.76</b>
Standard Deviation	<b>3.35</b>	<b>2.79</b>	<b>2.95</b>	<b>2.73</b>	<b>2.66</b>	<b>0.41</b>	<b>2.76</b>
Number of Periods	<b>630</b>	<b>630</b>	<b>630</b>	<b>630</b>	<b>630</b>	<b>630</b>	<b>429</b>

**TABLE II**  
**One – Month Interest Rate Elasticities Relative to Federal Funds Rate: All Periods**

		<i>3 Month Treasury Rate</i>	<i>1-year Treasury Rate</i>	<i>5-year Treasury Rate</i>	<i>10-year Treasury Rate</i>	<i>Aaa/Baa Spread</i>	<i>30-year Mortgage Rate</i>
Mean		<b>0.92</b>	<b>0.65</b>	<b>0.48</b>	<b>0.37</b>	<b>0.08</b>	<b>0.41</b>
Median		<b>0.69</b>	<b>0.58</b>	<b>0.32</b>	<b>0.19</b>	<b>0.00</b>	<b>0.20</b>
Standard Deviation		<b>4.67</b>	<b>5.01</b>	<b>5.35</b>	<b>4.50</b>	<b>9.17</b>	<b>3.15</b>

**TABLE III**  
**One – Month Interest Rate Elasticities Relative to Federal Funds Rate:  
 Periods in Which Significant Change Occurred in Federal Funds Rate**

		<i>3 Month Treasury Rate</i>	<i>1-year Treasury Rate</i>	<i>5-year Treasury Rate</i>	<i>10-year Treasury Rate</i>	<i>Aaa/Baa Spread</i>	<i>30-year Mortgage Rate</i>
Mean		<b>0.58</b>	<b>0.59</b>	<b>0.34</b>	<b>0.23</b>	<b>0.02</b>	<b>0.24</b>
Median		<b>0.65</b>	<b>0.63</b>	<b>0.33</b>	<b>0.16</b>	<b>-0.04</b>	<b>0.18</b>
Standard Deviation		<b>0.97</b>	<b>1.06</b>	<b>0.91</b>	<b>0.79</b>	<b>2.03</b>	<b>0.50</b>
Number of Periods		<b>217</b>	<b>217</b>	<b>217</b>	<b>217</b>	<b>216</b>	<b>153</b>
Z-test		<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.443</b>	<b>0.000</b>

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## **Personal Financial Planning: When Should You Start?**

Jason Lin and Devin Dorosh

### **Abstract**

This study was conducted to determine if age plays a factor in the level of a person's personal financial awareness and practices. An online survey of Truman State University students and Faculty was conducted, and the data was analyzed using crosstabs in SPSS software. In general, the results showed that older people are more aware of their personal finances and have begun saving for retirement. However, contrary to other studies, older people have more credit cards and credit card debt than younger people based on the data. Finally, the data showed that people who feel that they are aware of their personal finances, generally are aware and demonstrate their awareness through their actions.

### **I. Introduction**

Recent news articles have described a crisis in the personal finance habits of young adults. More and more students are graduating from college deep in debt. Credit card companies start sending multiple credit card offers to students at earlier and earlier ages. As tuition rates increase, many students are borrowing money to attend school and then start accumulating more and more debt by using the credit so easily extended by these credit card companies. Financial planners agree that people need to have money set aside in an "emergency fund" so they do not have to use high interest rate credit cards if problems arise. Many students do not have money set aside and have to turn to credit cards (Fetterman).

Student borrowing seems to be rising overall, whether via credit cards or private student loans. Based on an article in USA Today, nearly two-thirds of "twentysomethings" have debt and the total average debt is \$16,120 (Fetterman and Hansen). Students think that they can easily pay off these debts once they have a full-time job and find later that getting out of debt is much harder than they anticipated. With all of this debt accumulated, many young people have stopped paying their debt, forcing lenders to charge it off (Fetterman and Hansen). As a result of all of this, some young people are forced to put things off, like buying a home, getting married, or having children, in order to pay off their debt (Fetterman and Hansen). In a poll of 910 "twentysomethings" nineteen percent had to move back in with their parents to cut costs (Fetterman and Hansen).

We assume that older adults should be more aware of and more adept at handling their personal finance. However, another critical issue regarding personal finances is the lack of saving and investment by older adults. Reports indicate that Social Security and company pensions will not provide sufficient funds for adults in their retirement years. Individuals must take responsibility for their financial futures and investing money for their retirement. Many have spent beyond their means in their early adult years, and have accumulated debt through heavy spending, credit cards, and mortgages, thinking there will be time to save money for retirement as they get older.

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It is important for young people to begin forming good personal finance habits while they are still young. One study showed that fifty-five percent of young people are not saving for retirement in a 401(k) or individual retirement account, and forty percent do not even have a savings account (Waggoner). Results like these caused the State of Missouri to add a half-unit course in personal finance as a new requirement for high school graduation. The new policy began applying to the 2006-2007 freshmen class graduating in 2010 (Morris 1).

This research was designed to determine how personal finance attitudes, habits, and awareness differ between young adults who are just beginning to develop their personal finance practices and older adults who have established patterns of personal finance behaviors. Throughout the process of conducting this research, the hope was to encourage people to think about their personal finance situation and become more aware of good practices and how to do a better job of planning for their financial future. This research demonstrates the importance of educating young people in the importance of personal financial planning.

## **II. Data and Methodology**

### **II.1. Data**

As a sampling technique for this research, an online survey consisting of 30 questions was developed. Question types included choose the best response, choose all that apply, yes/no questions, and Likert scale questions. The first two questions were demographic questions, that assessed the respondents age and sex. The third question listed several aspects of personal finance and asked respondents to check the ones they felt were aspects of personal finance. The purpose of this question was to see if people realized how broad personal finance is and what it encompasses. The fourth question asked respondents to assess how aware they felt they were about their personal finances. This question was used as a measure to determine if people are as aware of their personal finances as they think they are. The remainder of the questions were designed to measure if respondents are aware of various aspects of personal finance and if they demonstrate that awareness through their actions, for example, developing and following a budget, keeping a check register, and saving money each month. The survey was posted on Truview, Truman State University's local portal. The survey link was also emailed to all of the deans to distribute to their respective divisions' faculty. An incentive of a chance to win a \$50 gift card was used as motivation to complete the survey.

There were 745 responses to the survey. Of those responses, 690 of them were from ages 17 to 25, and 55 were from ages 26 and greater.

### **II.2. Hypotheses and Methodology**

Three main hypotheses were developed before conducting this research.

Hypothesis 1: Personal financial awareness is dependent upon age. Older adults are more aware of their personal finances and have established firm patterns regarding their finances. Younger people are less informed about what are good personal finance practices.

Hypothesis 2: Good personal finance habits are dependent upon age. Older adults save money in order to prepare for retirement and have little to no credit card debt. Younger people do not save much money, are not preparing for retirement, and have credit card debt.

**Hypothesis 3:** Many who believe they are informed about their personal finances do not demonstrate it through their actions and habits.

The underlying reasoning behind these hypotheses is that personal financial awareness is dependent upon age. As people get older, they become more educated about and more aware of their personal finances through classes, seminars, and experiences. The first hypothesis was formed on the basis that older adults have had more experiences to date in their lives and have had time to develop financial behaviors that work for them, where as most younger adults have not yet had these experiences. Based on other studies regarding young people and debt, younger adults are not as inclined to save their money and accumulate more debt than older adults. This is based on the assumption that younger people have less income, rely on credit to meet their needs, and plan to be able to pay their debt when they get a job.

After all of the data were collected, a crosstabs comparison in SPSS was used to find significance within the data. The data were also analyzed using Pearson's Chi Squared Test with a p-value of 0.05. The actual values of the results were then compared to the expected values based on the crosstabs to find any significant differences. Each set of crosstabs is described in the tables in the empirical results section.

### **III. Empirical Results and Discussion**

The sample size for this study was 55 for older adults (ages greater than 26) and 690 for younger adults (ages 17 through 25). Since age was the major variable of the study, the four responses that did not include their age were not considered in the results.

The following tables show the crosstabs between age and various questions. Table 1 shows all of the variables that are independent from age based on the data of this research. For example, based on the data, age is independent from awareness, age is independent from having and following a budget, and age is independent from having a savings account.

Table 2 summarizes the variables that demonstrate dependence upon age. For example, based on the data, recognizing a 401(k) as an aspect of personal finance is dependent upon age, the amount of monthly savings is dependent upon age, and having an IRA is dependent upon age.

Tables 3 through 7 provide a break down of the results that are dependent into the hypothesis that they support or cause to reject.

Table 8 summarizes variables that are dependent upon perceived awareness. For example, recognizing impulse buying as an aspect of personal finance is dependent upon perceived awareness, having a checking account is dependent upon perceived awareness, and keeping a check register is dependent upon perceived awareness.

Table 9 summarizes the variables that are independent from perceived awareness. For example, based on the data, recognizing that having and keeping a budget is an aspect of personal finance is independent from perceived awareness, having a savings account is independent from perceived awareness, and carrying a credit card balance is independent from perceived awareness.

In comparing other factors within the survey, some other interesting relationships were discovered. The majority of the sample said that they save for reasons other than travel, car, retirement, gifts, house, and goods. People that save more are more likely to save for retirement than expected and save for a house more than expected. This would lead one to believe that people that do save are educated about the importance of saving for retirement. The majority of every age category responded that 5 to 7 % is an acceptable return on savings. The majority of every age category responded that 7 to 10% is the highest rate they could attain on their savings (except for ages 26 to 30). Finally, more older people than expected responded that they could not achieve financial independence in their lifetime.

#### **IV. Conclusion**

Based on the data, hypothesis 1 cannot be rejected. As people get older they become more educated about certain aspects of personal finance including real estate, 401(k), retirement planning, and insurance. Hypothesis 2 needs to be refined based on the data. Older people are planning for their retirement more than younger people; however, the data showed that younger people actually had fewer credit cards resulting in less credit card debt. Finally, hypothesis 3 should be rejected based on the data. Individuals that rated themselves highly on financial awareness, demonstrated it through their actions (as shown in Tables 10 through 12)

##### **IV.1. Limitations of Study**

This particular study was limited by several different factors. First, the sample was somewhat biased. The respondents were enticed by the chance of a reward. The sample also was not random since people had to read the link on TruView and respond. Second, the study had geographic and cultural limitations. It was limited only to the Truman State University community, which eliminates some cultural perspectives. Finally, the sample size limited the results. Distribution to older adults on campus (faculty and staff) was limited by University policy, hence the distribution of ages present, N=55 for ages greater than 26 and N=690 for ages less than 25.

##### **IV.2. Possible Areas of Future Study**

Areas of possible future study are numerous. However, to improve upon this particular study, multiple discriminant analysis could be used to determine if the different age groups could be profiled on the basis of multiple different independent variables. A more expansive sample including more than Truman State University students and staff would be necessary, and would also provide a more unbiased sample.

Other areas to expand upon this research include finding a reason that Truman students do not follow the trend of having more credit cards with a balance, determining the reasons students do not save for retirement, and finding out how we can educate students about the importance of saving for retirement. Finally, with the implementation of the new policy in Missouri, requiring high school students to take a course in personal finance in order to graduate, will future studies still show that younger people are uneducated about what constitutes good personal finance?

Table 1: Variables that are independent from age.

<b>Variables</b>	<b>Chi-Squared Value</b>	<b>df</b>	<b>P-Value</b>	<b>Dependence</b>
Age vs Impulse Buying Aspect	8.632	6	0.195	Independent
Age vs Investing Aspect	11.384	6	0.077	Independent
Age vs Budget Aspect	8.630	6	0.196	Independent
Age vs Savings Account Aspect	12.277	6	0.056	Independent
Age vs Check Register Aspect	3.090	6	0.797	Independent
Age vs Awareness	29.905	24	0.188	Independent
Age vs Checking Account	6.080	6	0.414	Independent
Age vs Reconcile	10.208	6	0.116	Independent
Age vs Savings	8.369	6	0.212	Independent
Age vs Why Save_Goods	3.586	6	0.733	Independent
Age vs Acceptable Rate of Return	28.668	30	0.535	Independent
Age vs Highest Rate of Return	34.768	30	0.251	Independent
Age vs Having Budget	10.086	6	0.121	Independent
Age vs Wise Choice	9.023	6	0.172	Independent
Age vs When IRA	48.170	36	0.085	Independent
Age vs Medical Insurance	11.132	6	0.084	Independent
Age vs Auto Insurance	3.538	6	0.739	Independent
Age vs Better Mortgage	10.155	6	0.118	Independent
Age vs Why Buy House_Equity	9.737	6	0.136	Independent
Age vs Why Buy House_Investment	1.851	6	0.933	Independent
Age vs Why Buy House_Collateral	4.103	6	0.663	Independent
Age vs Why Buy Home_Make Money	8.421	6	0.209	Independent
Age vs Why Buy Home_Save Money	9.061	6	0.170	Independent
Age vs Why Buy Home_Not Rent	8.968	6	0.175	Independent

Table 2: Variables that are dependent upon age.

<b>Variables</b>	<b>Chi-Squared Value</b>	<b>df</b>	<b>P-Value</b>	<b>Dependence</b>
Age vs Real Estate Aspect	22.535	6	0.001	Dependent
Age vs Checking Account Aspect	22.844	6	0.001	Dependent
Age vs 401(k) Aspect	17.777	6	0.007	Dependent
Age vs Retirement Plan Aspect	19.732	6	0.003	Dependent
Age vs IRA Aspect	23.205	6	0.001	Dependent
Age vs Insurance Aspect	24.394	6	0.000	Dependent
Age vs Check Register	14.038	6	0.029	Dependent
Age vs Means for Highest Rate of Return	62.694	42	0.021	Dependent
Age vs Number of Credit Cards	268.046	24	0.000	Dependent
Age vs Credit Card Balance	23.759	6	0.001	Dependent
Age vs IRA	169.003	6	0.000	Dependent
Age vs Financial Independence	13.488	6	0.036	Dependent
Age vs How Become Financially Independent	81.096	18	0.000	Dependent
Age vs Life Insurance	57.171	6	0.000	Dependent
Age vs Auto Premium	151.698	48	0.000	Dependent
Age vs Medical Premium	480.807	48	0.000	Dependent
Age vs Life Premium	394.094	42	0.000	Dependent

Table 3: Results related to Hypothesis 1.

<b>Hypothesis</b>	<b>Result</b>	<b>Supports Hypothesis</b>
Hypothesis 1	As people get older, they are more informed that certain characteristics are considered to be aspects of personal finance: real estate, 401(k), planning for retirement, and insurance.	Supports
Hypothesis 1	As people get older, they are more aware of the importance of keeping a check register (starting at ages 26+).	Supports
Hypothesis 1	Age and the amount of monthly savings are dependent on one another, but how they are dependent cannot be determined.	Neither Supports or Rejects

Table 4: Percentages supporting table 3 results.

<b>Result</b>	<b>% of Ages 17 to 26</b>	<b>% of Ages &gt; than 26</b>
As people get older, they are more informed that real estate is considered to be an aspect of personal finance.	39.86%	61.82%
As people get older, they are more informed that a 401(k) is considered to be an aspect of personal finance.	53.04%	81.82%
As people get older, they are more informed that planning for retirement is considered to be an aspect of personal finance.	58.84%	85.45%
As people get older, they are more informed that insurance is considered to be an aspect of personal finance.	56.09%	83.64%
As people get older, they are more aware of the importance of keeping a check register (starting at ages 26+).	59.42%	80.00%
Age and the amount of monthly savings are dependent on one another, but how they are dependent cannot be determined.	N/A	N/A

Table 5: Results related to Hypothesis 2.

<b>Hypothesis</b>	<b>Result</b>	<b>Supports Hypothesis</b>
Hypothesis 2	More older people said that they save for retirement, while few younger people said they do.	Supports
Hypothesis 2	Few people said that they are saving to buy a house.	Supports
Hypothesis 2	Older people tend to have more than one credit card whereas few younger people have more than one credit card	Reject
Hypothesis 2	More older people than expected carry a balance on their credit cards.	Reject
Hypothesis 2	Those who had more credit cards are more likely to carry a balance.	Reject
Hypothesis 2	More older people than expected have an IRA, whereas fewer than expected young people do not.	Supports

Table 6: Percentages supporting Table 5 results.

<b>Result</b>	<b>% of Ages 17 to 26</b>	<b>% of Ages &gt; than 26</b>
More older people said that they save for retirement, while few younger people said they do.	8.55%	45.45%
Few people said that they are saving to buy a house.	13.62%	5.45%
Older people tend to have more than one credit card whereas few younger people have more than one credit card	21.01%	83.64%
More older people than expected carry a balance on their credit cards.	23.77%	50.91%
More older people than expected have and IRA, whereas fewer than expected young people do not.	7.83%	67.27%

Table 7: Percentages supporting Table 5 result.

<b>Result</b>	<b>% with 1-2 Cards</b>	<b>% with More than 2 Card</b>
Those who had more credit cards are more likely to carry a balance.	26.03%	53.25%

Table 8: Variables dependent on awareness.

<b>Variables</b>	<b>Chi-Squared Value</b>	<b>df</b>	<b>P-Value</b>	<b>Dependence</b>
Awareness vs Impulse Buying Aspect	16.287	4	0.003	Dependent
Awareness vs Checking Account Aspect	32.938	4	0.000	Dependent
Awareness vs Check Register Aspect	17.942	4	0.001	Dependent
Awareness vs Checking Account	11.004	4	0.027	Dependent
Awareness vs Check Register	60.808	4	0.000	Dependent
Awareness vs Reconcile	57.708	4	0.000	Dependent
Awareness vs Amount Monthly Savings	40.052	24	0.021	Dependent
Awareness vs Why Save_Car	14.296	4	0.006	Dependent
Awareness vs Having Budget	23.823	4	0.000	Dependent
Awareness vs Following Budget	21.307	4	0.000	Dependent
Awareness vs IRA	16.531	4	0.002	Dependent
Awareness vs Auto Premium	53.517	32	0.010	Dependent
Awareness vs Auto Type	26.394	12	0.009	Dependent
Awareness vs Why Buy Home_Investment	10.447	4	0.034	Dependent

Table 9: Variables independent of awareness.

<b>Variables</b>	<b>Chi-Squared Value</b>	<b>df</b>	<b>P-Value</b>	<b>Dependence</b>
Awareness vs Investing Aspect	3.811	4	0.432	Independent
Awareness vs 401(k) Aspect	6.487	4	0.166	Independent
Awareness vs Retirement Plan Aspect	4.728	4	0.316	Independent
Awareness vs IRA Aspect	5.658	4	0.226	Independent
Awareness vs Insurance Aspect	2.577	4	0.631	Independent
Awareness vs Budget Aspect	2.332	4	0.675	Independent
Awareness vs Savings Account Aspect	7.289	4	0.121	Independent
Awareness vs Savings	6.305	4	0.178	Independent
Awareness vs Why Save_Other	4.007	4	0.405	Independent
Awareness vs Why Save_Retirement	2.624	4	0.623	Independent
Awareness vs Why Save_Gift	0.785	4	0.940	Independent
Awareness vs Why Save_House	1.674	4	0.796	Independent
Awareness vs Why Save_Goods	2.203	4	0.699	Independent
Awareness vs Acceptable Rate of Return	23.592	20	0.261	Independent
Awareness vs Highest Rate of Return	23.572	20	0.262	Independent
Awareness vs Means for Highest Rate of Return	29.077	28	0.409	Independent
Awareness vs Number of Credit Cards	24.067	16	0.088	Independent
Awareness vs Credit Card Balance	0.948	4	0.918	Independent
Awareness vs Wise Choice	5.453	4	0.244	Independent
Awareness vs When IRA	34.096	24	0.083	Independent
Awareness vs Financial Independence	6.037	4	0.196	Independent
Awareness vs How Become Financially Independent	11.905	12	0.453	Independent
Awareness vs Medical Insurance	3.138	4	0.535	Independent
Awareness vs Auto Insurance	2.317	4	0.678	Independent
Awareness vs Life Insurance	4.719	4	0.317	Independent
Awareness vs Medical Premium	36.051	32	0.285	Independent
Awareness vs Life Premium	40.015	28	0.066	Independent
Awareness vs Life Insurance Amount	46.663	40	0.217	Independent
Awareness vs Better Mortgage	0.904	4	0.924	Independent
Awareness vs Why Buy Home_Equity	8.476	4	0.076	Independent
Awareness vs Why Buy Home_Collateral	2.403	4	0.662	Independent
Awareness vs Why Buy Home_Make Money	1.515	4	0.824	Independent
Awareness vs Why Buy Home_Save Money	4.308	4	0.366	Independent
Awareness vs Why Buy Home_Not Rent	0.424	4	0.980	Independent

Table 10: Results related to Hypothesis 3.

Hypothesis	Result	Supports Hypothesis
Hypothesis 3	Within the sample the majority of each age rated themselves a 4 or 5 on personal finance awareness.	Neither Supports or Rejects
Hypothesis 3	Generally people who rated themselves highly on awareness demonstrated truth in their claim: aspects of personal finance including avoiding impulse buying, having a checking account, and keeping a check register; the importance of keeping a check register; the importance of reconciling their account with their bank statement; having and following a budget; investing in an IRA; and the idea of buying a home as making an investment.	Rejects

Table 11: Percentages supporting Table 10 results.

Result	% Rated 1 & 2	% Rated 3-5
Generally people who rated themselves highly on awareness demonstrated truth in their claim - avoiding impulse buying as an aspect of personal finance	63.54%	79.57%
Generally people who rated themselves highly on awareness demonstrated truth in their claim - having a checking account as an aspect of personal finance	81.25%	95.85%
Generally people who rated themselves highly on awareness demonstrated truth in their claim - keeping a check register	32.29%	65.33%
Generally people who rated themselves highly on awareness demonstrated truth in their claim - reconciling their account with their bank statement	28.13%	54.62%
Generally people who rated themselves highly on awareness demonstrated truth in their claim - following a budget	32.22%	50.49%
Generally people who rated themselves highly on awareness demonstrated truth in their claim - the idea of buying a home as making an investment.	71.88%	84.95%
Generally people who rated themselves highly on awareness demonstrated truth in their claim - investing in an IRA	6.25%	13.24%

Table 12: Percentages supporting Table 10 results.

Result	% of Ages 17 to 26	% of Ages > than 26
Within the sample the majority of each age rated themselves a 4 or 5 on personal finance awareness.	57.04%	80.00%

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***Super Size Me* and Stock Prices**  
John Byrd and Kent Hickman

**Abstract**

We examine the impact of the release of “Super Size Me,” a movie critical of the nutritional aspects of McDonald’s restaurants, on the stock prices of McDonald’s and Wendy’s corporations. Consistent with investors impounding information from non-traditional sources, we find a large and significant valuation effect for both firms. A similar effect was documented for the movie “Fast Food Nation,” but none was observed around the release of either “Roger and Me” or for “Walmart: The High Cost of Low Price.” These results may indicate that investors believe that health-related issues have greater business impact than other aspects business practice.

**I. Introduction**

The Efficient Markets Hypothesis underlies much of our understanding of finance. One of the most tested theories in finance is the degree to which investors impound information into share price. Thousands of studies show that investors readily use financial information such as earnings, dividends, stock issuances, and merger announcements to make buy and sell decisions, and thereby determine the market prices of securities. The various types of information that investors use to inform their decisions remains an area of continuing interest. In this paper we show that investors use information far beyond the traditional sources. We examine the impact of the release of the movie *Super Size Me* on the stock prices of fast food franchises. The movie examines obesity, nutritional health, and the marketing of fast food to children by having the protagonist eat every meal for one-month at a McDonald’s restaurant. Using standard event study methodology, we find significant negative abnormal returns in response film festival releases of the film as well as its general release for both McDonald’s and Wendy’s restaurants. Our results demonstrate that the public information upon which semi-strong market efficiency is based extends beyond the financial page of newspapers into movie theatres. The study also documents the importance that investors believe consumers place on the health ramifications of their food choices. Interestingly, we do not find that other muckraking films impact the valuations of their targets when the films’ focus on issues other than health.

**II. Super Size Me**

*Super Size Me* (2004) is the visual chronicle of director Morgan Spurlock’s month-long experiment regarding the effects of an exclusively fast-food diet. During February, 2003, Spurlock followed a nothing-but-McDonald’s diet, filming his experience to produce what became an Academy Award nominated documentary (the movie was nominated for Best Documentary in 2005). While his effort won him the Best Director Award at the well-known

Sundance Film Festival in 2005, it also almost ruined his health. Aside from gaining over twenty pounds during the month, his cholesterol rose, and he developed liver and digestive problems.

The movie not only captured the attention of film critiques, but apparently McDonald's Corporation took notice as well. As noted in the *Wall Street Journal* "Around the film's debut, McDonald's removed the super-size option from its menu although it said the decision wasn't prompted by the film" (Adamy and Gibson, 2006).

Our interest centers on whether investors believed that consumers would alter their eating habits as a result of the film and the attention it focused on the relationship between fast-food and America's growing obesity problem. Did the movie's topic, appeal, and notoriety contribute information that the market impounded into price?

### III. Methodology

To answer this question, we examined the reaction of both McDonald's and Wendy's shares to several important dates surrounding the motion picture. Dates of interest included the premier at the Sundance Film Festival (January 14, 2004), the opening at the South by Southwest Festival (March 14, 2004), the Philadelphia International Film Festival (April 10, 2004), and the nationwide US opening of the movie on May 7<sup>th</sup>.

Daily stock price data was collected for McDonald's and Wendy's. Stock betas were computed using daily data and the S&P 500 Index for 262 immediately preceding the first release date (January 17, 2004). Similar calculations were done utilizing the NYSE Composite Index with no material difference in the results as reported. Abnormal returns were computed by subtracting the expected return (Beta times Index return) from the 5-day raw return for the company. Statistical tests were based on a standard error using non-overlapping 5-day abnormal returns for the beta estimation period.

### IV. Initial Results

As reflected in Table I, the negative reaction of McDonald's investors is evident beginning with the introduction of the movie at the Sundance Film Festival, while Wendy's investor response seemed to gain negative momentum from the initial screening until the general release of the picture about five months later. The abnormal return of McDonald's on April 10<sup>th</sup> (-6%) translates into a loss of investor wealth during that five day period approximately equal to \$2 billion, given the firm's capitalization of nearly \$35 billion on April 7<sup>th</sup>, the last trading day prior to the Philadelphia International Film Festival. Cumulatively, the effect of the four *Super Size Me* events cost the fast food company's shareholders about 12% of their investment or about \$4.5 billion. This staggering amount implies an anticipated loss of sales of at least \$45 billion in the future using the firm's 10% net profit margin as a rough estimate of its cash flows generated per dollar of revenue and ignoring the time value of money. Following the lead of *The Economist*, using a Big Mac hamburger metric, that's about 20 billion burgers in anticipated lost sales. Clearly, the market recognizes the film's ability to raise customer awareness of the negative health consequences of eating fast food and the detrimental effect this awareness will have on the cash flow generating capacity of restaurant chain.

**Table I: McDonald's Stock Reaction to Premiers of *Super Size Me***

	McDonald's	5-day Raw Return	5-Day Expected Return	5-Day Abnormal Return	t-statistic
17-Jan-04	(Sundance Film Festival)	0.0041	0.0068	-0.0027	-1.9617
13-Mar-04	(South by Southwest Film Festival)	-0.0234	0.0115	-0.0349	-9.2895
10-Apr-04	(Philadelphia International Film Festival)	-0.0691	-0.0082	-0.0609	-15.1909
7-May-04	(USA limited)	-0.0439	-0.0127	-0.0312	-8.4437

**Table II: Wendy's Stock Reaction to Premiers of *Super Size Me***

	Wendy's	5-day Raw Return	5-Day Expected Return	5-Day Abnormal Return	t-statistic
17-Jan-04	(Sundance Film Festival)	0.0115	0.0066	0.0050	0.1734
13-Mar-04	(South by Southwest Film Festival)	0.0049	0.0111	-0.0062	-2.3318
10-Apr-04	(Philadelphia International Film Festival)	-0.0378	-0.0080	-0.0298	-7.6196
7-May-04	(USA limited)	-0.0693	-0.0123	-0.0570	-13.7254

## V. Some Additional Tests

These results support the notion that consumers' health concerns raised by *Super Size Me* will affect their behavior, which, in turn, will affect financial performance. To confirm this hypothesis, we tested the market's response to the Cannes Film Festival premier of a second muckraking movie, *Fast Food Nation*. The May 18, 2006 event was well publicized with an article appearing on page B-1 of the *Wall Street Journal* (Adamy and Gibson, 2006) and was apparently considered a threat and taken seriously by the industry. Based on the novel of the same name, aspects of the picture's plot bear a striking similarity to McDonald's: the restaurant in the movie is called "Mickey's" and its most popular sandwich is called "The Big One." Like *Super Size Me*, this motion picture casts fast food restaurants in an unfavorable light. The 5-day cumulative abnormal return following the appearance of the *Wall Street Journal* article on May 17<sup>th</sup> was -2.48%, whose t-statistic was -6.99. Thus, the market's utilization of information from the entertainment industry in valuation is confirmed.

Our final tests asked whether movies exploring topics other than health, particularly socially responsible business practices, might impact share prices. We conducted similar event studies surrounding the opening of two other well-known muckraking documentaries, *Roger and Me* (1989) and *Walmart: The High Cost of Low Price* (2005). The evidence in both cases was inconclusive, implying that perhaps health issues are of greater concern to customers than are business policies, particularly when the policies don't affect them directly like diet clearly does.

## **VI. Conclusion**

The study extends to the movie theater the documented sources of information that can affect share valuation. Investors apparently perceive consumer concern with the healthiness of fast food, a concern that can translate into loss of business and an impact on the wealth of restaurant ownership. Additionally, no effect is found for movies that raise concerns regarding socially irresponsible behavior, perhaps signaling that consumers have less regard for business practices than for their own health. The study points the direction toward future research to determine the robustness of these findings across more similar events as well as the longevity of the impact of such information.

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## **Biases and Fundamental Investing Knowledge: An Assessment of College Students**

Brian Porter

### **Abstract**

Individuals are being forced to take a greater role in personal retirement planning. Until the mid 1970s, the predominant retirement plan was defined benefit, rather than defined contribution. Since the 1970s, there has been a move towards defined contribution retirement plans and, in the mid 1990s, defined contribution retirement plans outnumbered defined benefit retirement plans. From 1975 to 1998, there was an increase of 42 million Americans enrolled in non-Social Security retirement programs, from 44 million to 86 million. In 1975, the predominant plan was defined benefit with 32 million Americans participating in 103,000 different defined benefit plans. In contrast, 10 million Americans were participating in 208,000 different defined contribution plans. By 1998, the dominant plan had switched. Forty-six million Americans were in defined contribution plans and 40 million were in defined benefit plans (Migration News). Among Fortune 100 companies the shift is just as dramatic. In 2007, only 28% of Fortune 100 companies offered a defined benefit retirement plan to new employees, compared with 89% in 1985 (Geisel, 2008).

The trend away from defined benefit to defined contribution plans is also evident in respect to the total dollars invested in each of the plans. In 1990, institutional ownership of private defined benefit retirement plans had total assets of \$900 billion compared with defined contribution plans with total assets of only \$727 billion. By 2004, defined contribution plans had significantly more assets with a total of \$2.636 trillion compared with defined benefit plans with total assets of only \$1.811 trillion (Federal Reserve Flow of Funds).

Four observations are evident. First, assets in both retirement plans have substantially increased. Second, the trend is clearly away from defined benefit plans and to defined contribution plans. Third, because of this trend, individuals have a greater responsibility in investing and planning decisions. Four, it is vital that individuals have a basic understanding of fundamental investing and financial concepts (e.g., efficient market theory) and psychological biases pertaining to investing.

This paper will look at previous research on investor psychology and the biases that exist. There are certain tendencies that may be detrimental to investment decisions. It has also been found that there are sometimes differences between males and females in regards to investor behavior. Previous research has found that young people lack adequate broad based financial skills, but it has not focused on specific psychological biases or fundamental investing concepts. Research that has addressed biases, has not specifically studied different subgroups of college students.

Extensions of prior research are performed in this research. A survey was conducted that studies the perceptions, knowledge, and biases of college students. The survey respondents are both male and female and have various college majors. Approximately forty percent of the sample has taken a college course in finance.

This study fills the gap that currently exists in this area and advances this body of knowledge in four important ways. One, it extends prior research pertaining to investor psychology and studies its applicability for individual investors. Two, it examines college students, a significant demographic group that is impacted by the necessity to make investment decisions, and compares their tendencies with previous research. Three, it reexamines and assesses college students' comprehension of fundamental financial investing concepts. Four, it compares possible biases on three factors: (1) gender, (2) college major, and (3) exposure to a college course in finance.

### **I. Introduction and Prior Research**

As defined contribution retirement plans, rather than defined benefit retirement plans, become the norm, the number of people investing for retirement, continues to grow. As such, it is essential that individuals have a solid foundation in finance and investing. In addition, it is also vital that individuals have an understanding of their own psychological investing biases and tendencies. Most academics advocate the efficiency of markets and acknowledge that there are certain overriding principles of financial markets. John Bogle, founder and former CEO of the Vanguard mutual fund group writes that it is often ignored that "the value of a corporation is neither more nor less than the discounted value of its future cash flow, not only a point endorsed by wise oracles but a mathematical certainty" (Bogle, p. 69). For individuals that must make investment decisions, what is their level of understanding of fundamental financial principles such as this? Further, how well do investors understand their own emotional biases in regards to investing? Are the answers to these two questions different among subgroups of investors?

There is little research pertaining to college students and their understanding of financial investing fundamentals, such as the efficiency of markets and the necessity to invest for the long run. There is also little research that specifically assesses subgroups of college students and their psychological biases in regards to investing. Prior research has examined college students' knowledge of finance in general. Research has also looked at psychological biases of established investors. Prior research indicates that the majority of college students are financially illiterate. Chen and Volpe (1998) conducted a financial literacy questionnaire to college students and found that students incorrectly answered 47% of the questions. Although different subgroups were examined (e.g., class rank, work experience, age), no subgroup correctly answered more than 65% of the questions. Volpe, Chen, and Pavlicko (1996) also find that college students do not have adequate knowledge of certain personal investment concepts. A study by Chen and Volpe (2002) finds that, on average, women know less about personal finance than men. Chen and Volpe encourage future research to "focus on how to improve both women and men's knowledge of personal finance and their ability to handle personal finances."

A few research studies examine college students' skills in specific financial areas. Understanding of credit cards and credit card involvement has been studied (Palmer et al, 2001; Warwick and Mansfield, 2000). Retirement planning research has typically studied workers already in their careers. Bajtelsmit et al. (1999) find that working women, compared with working men, exhibit greater relative risk aversion in their allocation of wealth into defined contribution pension assets. Though it is useful to study the retirement planning knowledge and behavior of workers, such as post-college graduates, it is equally vital to research younger people, such as college students. Delaying retirement planning, or uninformed retirement

decisions in early years, has detrimental implications on retirement savings. Therefore, it is critical to evaluate and improve retirement and investing knowledge at an early age.

Psychological biases and tendencies have been explored by several researchers. Kahneman and Riepe summarize three decades of research on judgment, decision-making, and regret. They then apply this research to investor behavior and offer suggestions for professional financial advisors. One such behavior that they describe is overconfidence, and argue that this overconfidence is particularly strong with investors. This concurs with early research, such as by Peters and Waterman, in their book *In Search of Excellence*, where they found that men tend to be overconfident. Peters and Waterman asked a random sample of males to rank themselves on certain attributes. Every man in the sample ranked himself as being above average in getting along with others. Ninety-four percent of the male respondents thought their athleticism was above average (Peters and Waterman, 1988).

Barber and Odean (2001) did an extensive empirical analysis of common stock investing behavior, examining account data for over 35,000 households from a large discount brokerage. They find that men trade 45 percent more than women, and that this frequent trading reduces men's net returns by 2.65 percent per year as compared with 1.72 percent for women. Subsequent research by Barber and Odean (2002) show that when investors switch to online trading they trade more frequently, more speculatively, and less profitably than before the switch. Contrary to previous research, Dittrich et al. (2005) found that in some investing situations, males are less prone to overconfidence than females.

## II. Research Description

Prior research has examined psychological tendencies and investor biases. It has also studied basic investing knowledge of college students. Absent, in the literature, is an examination of college students' investing behavior and biases along subgroups. Also missing is an assessment of college students' knowledge of fundamental financial and investing concepts, such as the efficiency of markets. This research fills this gap and examines these important issues. A survey was conducted of college students across various subgroups of major, gender, and exposure to finance. College students are an ideal population to study for at least two reasons. First, they are a large demographic group that will be forced to make investment and financial decisions as they enter the job market. Second, it is imperative that college students begin investing immediately. On a whole, this population, more than the generation that preceded it, will work in jobs that have defined contribution, rather than defined benefit retirement plans, and will be forced to make investing decisions that directly impact their financial future. Two important predictors of future wealth for these students are when they begin investing and how much they invest. According to Burton Malkiel, author of *A Random Walk Down Wall Street*,

*The single most important thing you can do to achieve financial security is to begin a regular savings program and to start it as early as possible. The only reliable route to a comfortable retirement is to build up a nest egg slowly and steadily. Yet few people follow this basic rule, and the savings of the typical American family are woefully inadequate. It is critically important to start saving now.* (Malkiel, p. 278)

Thus, it is critical that college students understand financial concepts, begin investing early in their career, and are aware of their psychological biases and tendencies.

A copy of the survey is provided in Table I. The objective of the survey is to evaluate college students' psychological biases, specifically in investing. The survey also assesses college students' understanding of basic financial investing concepts. Three factors are examined: (1) gender, (2) major, and (3) having taken a course in finance. The results of the survey will be analyzed. Areas will be identified that need to be addressed so that this large demographic of individuals can be more informed, and hopefully more successful, as they make investment decisions, such as for their defined contribution retirement accounts.

### III. Discussion of Results

Two aspects of the results will be discussed. First, observations of the total means for each question will be examined. Overall means, with standard deviations, for each question by subgroup and total, is given in Table II. The second discussion of the results will be of significant differences between subgroups. Table III provides a summary of the one-way analysis of variance (ANOVA) for each of the three factors. Table III identifies significant differences ( $p < 0.05$  level) within subgroups in bold and underline.

#### Means

Questions one through four examine the confidence of students. Question one is a non-financial general confidence question confirming prior research that 80% of drivers believe they are above average, a mathematical impossibility (Kahneman and Riepe, 1998). Interestingly, college students, a high risk driving group without many years of driving experience, clearly feel that they are above average drivers, relative to other drivers (4.01 on 5 point scale). Again, it is mathematically unlikely for the majority of college drivers to be above average compared with all drivers.

Questions two, three, and four examine whether or not self-confidence carries over to investing. Although none of the responses indicate a self confidence as high as driving, all three responses indicate that students, on a whole, think of themselves as above average investors. This is strongest for two attributes—students consider themselves above average at managing money (3.87) and they anticipate future investment returns that are above average (3.71). Students consider themselves to have a knowledge of stocks that is only slightly above average (3.10).

Questions five through eight examine students' perception at picking "winning" and "losing" stocks. It is useful to compare question five, that asks about a "winning" stock (New Oriental Education—EDU) with question seven, that asks about a "losing" stock (Countrywide Financial Corporation—CFC). On a whole, students report that they are no more, or less, likely to have bought EDU, a "winning" stock (3.02) prior to its increase in price. However, students believe that they would have been less likely to have bought CFC, a "losing" stock (2.43) prior to its decrease in price. Questions six and eight indicate that students are now much less inclined to buy EDU (1.93) a "winning" stock that has increased significantly in price. But students are

no more, or less, likely to now purchase CFC (3.06), a “losing” stock that recently decreased significantly in price.

Questions nine, ten, and eleven examine students’ confidence in the stock market in general. Students are told the current value of the S&P 500 is 1500 and they are asked to estimate a high, low, and most likely value of the S&P 500 one year from today. In question nine, students estimate that the S&P 500 will mostly likely increase by 16% to 1739. In questions ten and eleven, students estimate the highest possible value for the S&P is 5098 (an increase of 240%) and the lowest possible value for the S&P 500 is 1011 (a decrease of decrease of 33%). Two observations can be made of students as a whole. First, their estimates are often unrealistic, particularly to the upside. Second, students are overly confident and optimistic about the stock market.

Questions 12 and 13 examine a students’ propensity for risk and adversity to loss. Question 12 presents students with a 50% chance of losing \$100 and a 50% chance of winning an unknown amount. Students, on a whole, required a 50% chance to win \$338 to offset the 50% to chance to lose \$100. Students have a strong adversity to losing, demanding over three times the \$100 amount simply to breakeven. However, in question 13, students are given a 50% chance of winning \$1000 with a 50% chance of winning nothing. Though the expected outcome of this game is \$500, students required \$889 to forego the 50% probability of winning \$1000. Students are more willing to take on risk when it entails the possibility of a gain, and less willing to take on risk when it might result in a loss.

### Subgroup Differences

Table III provides a summary of the one-way analysis of variance (ANOVA) for each of the three factors, with significant differences ( $p < 0.05$  level) within subgroups identified with bold and underline. An overall observation is that there are only three significant differences for *course in finance*, five significant differences for *major*, and seven differences for *gender*. Earlier research (e.g., Barber and Odean, 2001) also indicates that *gender* is significant for adult investors. Earlier research has not extensively studied college students. This research indicates that *gender* differences also exist at the college level.

For *course in finance*, the ANOVA indicates that there is a significant difference for questions three, four, and eleven. Question three and four indicate that students that have taken a course in finance are more likely to think they have a better understanding of stocks than their peers ( $p = 0.000$ ) and that their future investment returns will be above average ( $p = 0.011$ ). Question 11 indicates that students that have taken a course in finance are more confident that the overall stock market will not experience a significant drop in value ( $p = 0.009$ ). Students that have taken a course in finance, compared with those that have not, anticipate that in the upcoming year the S&P 500 will decrease, at most, by 13% and 44%, respectively.

For *gender*, questions one, two, three, four, six, eight, and thirteen all indicate significant differences. Questions one through four, which examine confidence, all indicate that males are more confident than females. Males, compared with females, think that they are better drivers ( $p = 0.001$ ), are better at managing money ( $p = 0.046$ ), have a better knowledge of stocks ( $p = 0.002$ ), and will have higher future investment returns ( $p = 0.000$ ). Question six indicates that

males are less likely ( $p = 0.011$ ) to purchase a “winning” stock that has experienced a significant run-up in price. However, question eight indicates that males are more likely ( $p = 0.032$ ) to buy a “losing” stock that has experienced a significant decrease in price. On the other hand, question 13 shows that males are more likely to accept a lower guaranteed amount rather than take a chance on winning a higher amount ( $p = 0.000$ ).

For *major*, questions two, three, four, eight, and thirteen indicate significant differences. Questions two, three, and four, show that business majors are more confident about investing. Business majors, compared with non-business majors, think that they are better at managing money ( $p = 0.001$ ), have a better knowledge of stocks ( $p = 0.000$ ), and will have higher future investment returns ( $p = 0.015$ ). Based on question eight, business majors are more likely ( $p = 0.049$ ) to purchase a “losing” stock that has experienced a significant decrease in price. Question 13 indicates that business majors are more likely to accept a lower guaranteed amount rather than take a chance on winning a higher amount ( $p = 0.024$ ).

#### **IV. Conclusion**

Until recently, pensions that did exist were predominately defined benefit. However, the pendulum has swung in the other direction and now defined contribution plans outnumber defined benefit plans. This shifts responsibility to individuals and with this responsibility is a need to understand retirement planning and investing. A survey was created to assess the investing behavior and biases of college students. This demographic is critical for at least two reasons. One, it is highly impacted by the shift to defined contribution plans. Two, retirement planning must begin early in one's career.

It was found that students, similar to adults, are highly confident. On a whole, they think of themselves as better than average drivers and investors. Naturally, this is infeasible. A group, as a whole, relative to the individuals within that same group, must be average. Some individuals are above average, some individuals are below average, but the group, as a whole, is average. Overall, it was also found that students are irrationally overconfident about the stock market. As a group, students think that the upside potential of the stock market is very high, but students' downside assessment of the stock market is more realistic.

The research also found significant differences between subgroups. Three factors were examined: 1. Taken a course in finance; 2. Gender; and 3. Major. Gender proved to be the factor with the most significant differences. Males, compared with females, are more confident of their driving and investing ability. This is also true for students that have taken a course in finance and major in business; both groups are more confident.

This is seminal research in assessing the investing behavior and biases of college students. A continuation of this study would be to research further these behaviors and biases of students. An increased understanding of these biases would help students improve their future investing decisions, particularly for retirement planning. One possible application of this research would be for all finance courses to include a module on behavioral finance. A better understanding of one's investing behavior and biases would help one to make better choices. For example, if a male has a tendency to be unrealistically overconfident, he can force himself to be less aggressive in his investing. The reverse might be true for a female. A female, knowing her

tendency to be less confident, might want to be a bit more aggressive with her investing. A second possible application of this research would be to offer a basic finance and personal investing course, which includes behavioral finance, for non-business majors. Because of its importance, a course such as this could be required of all students. Although a student may not major in business, there are fundamental financial concepts, including one's behavior and biases, which all students need to understand.

**Table I**  
**Questionnaire Given To Students**

**Answer the following personal information questions:**

- (a) Have you taken a Finance Course?      No      Yes  
(b) Gender:    Male                      Female  
(c) Major:     Business            Non-Business

**Respond to questions 1 to 4 based on the following scale:**

Below Average      1      2      3      4      5      Above Average

1. Compared with the average person that you encounter on the road while driving, your driving ability is:
2. Compared with the average person in your peer group, your ability to manage money is:
3. Compared with the average person in your peer group, your knowledge of stocks and investing is:
4. In the future, when you make investment decisions, do you anticipate that your investments will yield a return that is:

**Respond to questions 5 to 8 based on the following scale:**

Not Purchase      1      2      3      4      5      Purchase

5. On September 25, 2006, the stock of New Oriental Education and Technology Group was selling for \$24.20. Today it has increased in value to \$90.26. If you were investing in the stock market (and you had known about New Oriental Education) what do you think is the likelihood that you would have purchased New Oriental Education stock when it was selling for \$24.20?
6. Now that you are aware of New Oriental Education, if you were investing in the stock market today, what is the likelihood you would purchase New Oriental Education stock at \$90.26?
7. On May 8, 2006, the stock of Countrywide Financial Corporation was selling for \$42.40. Today it has decreased in value to \$16.63. If you were investing in the stock market (and you had known about Countrywide Financial Corporation) what do you think is the likelihood that you would have purchased Countrywide Financial Corporation stock when it was selling for \$42.20?
8. Now that you are aware of Countrywide Financial Corporation, if you were investing in the stock market today, what is the likelihood you would purchase Countrywide Financial Corporation at \$16.63?

**Table I (Continued)**

**Answer Questions 9 through 13 by placing your answer in the blank**

9. The S&P 500 index is a valuation of the overall stock market. **Currently, the S&P 500 index is at 1500.** What is your best estimate of the S&P 500 index one year from today?  
Best estimate for S&P 500 = \_\_\_\_\_
10. Now, pick a high value for the S&P 500 index one year from today. That is, pick a high value that you are 99% sure (but not absolutely sure) that the S&P 500 will be lower than this value one year from today.  
High value for S&P 500 = \_\_\_\_\_
11. Now, pick a low value for the S&P 500 index one year from today. That is, pick a low value that you are 99% sure (but not absolutely sure) that the S&P 500 will be higher than this value one year from today.  
Low value for S&P 500 = \_\_\_\_\_
12. You have the possibility to play the following game: A coin is flipped. If the coin comes up heads, you lose \$100. If it comes up tails, you win a certain amount. What is the minimal amount that you must win when it comes up tails so that you would play this game?  
\$ \_\_\_\_\_
13. You have the possibility to choose one of two alternatives (you must choose one of the alternatives):  
  
Alternative 1: A coin is flipped. If it comes up heads, you win \$1,000. If it comes up tails, you win nothing.  
Alternative 2: You receive a guaranteed certain amount  
  
What is the minimal amount that you must be guaranteed so that you would choose Alternative 2 rather than Alternative 1?  
\$ \_\_\_\_\_

**Table II**  
**Means for Questions 1-8**

		Q1 DRIV	Q2 MMN	Q3 KNW	Q4 YLD	Q5 BEDU	Q6 NEDU	Q7 BCWF	Q8 NCWF
<b>COURSE FINANCE</b>									
Yes	Mean, N=57	4.07	4.04	3.79	3.91	3.19	1.77	2.42	3.25
	Std. Dev	.704	.755	.921	.830	1.043	.907	.999	1.229
No	Mean, N=93	3.98	3.78	2.67	3.59	2.92	2.02	2.42	2.92
	Std. Dev	.78	.867	1.070	.694	1.020	.989	.929	1.102
<b>GENDER</b>									
Male	Mean, N=90	4.13	3.99	3.37	3.91	2.97	1.76	2.38	3.19
	Std. Dev	.753	.759	1.075	.729	1.022	.825	.924	1.096
Female	Mean, N=61	3.82	3.70	2.70	3.40	3.11	2.18	2.49	2.85
	Std. Dev	.719	.910	1.138	.712	1.045	1.088	.994	1.223
<b>MAJOR</b>									
Bus	Mean, N=113	4.04	4.00	3.36	3.79	3.08	1.95	2.51	3.16
	Std. Dev	.767	.776	1.017	.746	1.045	1.007	.959	1.158
Other	Mean, N=38	3.92	3.50	2.32	3.45	2.86	1.87	2.18	2.74
	Std. Dev	.712	.893	1.165	.760	.979	.811	.896	1.107
Total	Mean, N=151	4.01	3.87	3.10	3.71	3.02	1.93	2.43	3.06
	Std. Dev	.753	.833	1.146	.762	1.030	.960	.951	1.157

**Means for Questions 9-13**

		Q9 S&P	Q10 HS&P	Q11 LS&P	Q12 L100	Q13 GAL2
<b>COURSE FINANCE</b>						
Yes	Mean, N=57	1928	3292	1303	473	848
	Std. Dev	1960	4356	1535	1347	927
No	Mean, N=93	1619	6228	842	253	914
	Std. Dev	409	23423	475	215	1063
<b>GENDER</b>						
Male	Mean, N=90	1809	6449	1112	242	618
	Std. Dev	1551	23565	1278	290	426
Female	Mean, N=61	1627	2975	851	480	1275
	Std. Dev	548	2425	412	1312	1409
<b>MAJOR</b>						
Bus	Mean, N=113	1786	5728	1086	374	783
	Std. Dev	1430	21237	1159	988	750
Other	Mean, N=38	1591	3134	783	226	1218
	Std. Dev	394	2176	472	199	1536
Total	Mean, N=151	1739	5098	1011	338	889
	Std. Dev	1262	18520	1039	865	1011

**Table III**  
**ANOVA SUMMARY**

Question	Course In Finance				Gender			
	Sum of Squares	D F	F	Sig.	Sum of Squares	D F	F	Sig.
Q1-DRIV	.297	1	.525	.470	8.179	1	<b>7.88</b>	<b>.001</b>
Q2-MMN	2.211	1	3.236	.074	4.245	1	<b>2.123</b>	<b>.046</b>
Q3-KNW	44.127	1	<b>42.763</b>	<b>.000</b>	16.454	1	<b>6.749</b>	<b>.002</b>
Q4-YLD	3.762	1	<b>6.718</b>	<b>.011</b>	9.445	1	<b>8.996</b>	<b>.000</b>
Q5-BEDU	2.646	1	2.502	.116	4.623	1	2.213	.113
Q6-NEDU	2.201	1	2.396	.124	8.126	1	<b>4.623</b>	<b>.011</b>
Q7-BCWF	000	1	.001	.982	.576	1	.316	.730
Q8-NCWF	3.518	1	2.652	.106	9.122	1	<b>3.522</b>	<b>.032</b>
Q9-S&P	3252380	1	2.044	.155	1158483	1	.361	.698
Q10-HS&P	2.92E+08	1	.844	.360	4.29E+08	1	.622	.539
Q11-LS&P	7222561	1	<b>6.970</b>	<b>.009</b>	2841480	1	1.322	.270
Q12-L100	1637143	1	2.196	.141	1959365	1	1.317	.271
Q13-GAL2	152293	1	.148	.701	15494137	1	<b>8.343</b>	<b>.000</b>

Question	Major			
	Sum of Squares	D F	F	Sig.
Q1-DRIV	.372	1	.655	.420
Q2-MMN	<b>7.109</b>	<b>1</b>	<b>10.920</b>	<b>.001</b>
Q3-KNW	<b>30.913</b>	<b>1</b>	<b>27.756</b>	<b>.000</b>
Q4-YLD	<b>3.378</b>	<b>1</b>	<b>6.010</b>	<b>.015</b>
Q5-BEDU	1.432	1	1.352	.247
Q6-NEDU	.175	1	.189	.664
Q7-BCWF	2.997	1	3.365	.069
Q8-NCWF	<b>5.182</b>	<b>1</b>	<b>3.948</b>	<b>.049</b>
Q9-S&P	1000224	1	.627	.430
Q10-HS&P	1.78E+08	1	.518	.473
Q11-LS&P	2483425.7	1	2.322	.130
Q12-L100	582837	1	.779	.379
Q13-GAL2	<b>5156018</b>	<b>1</b>	<b>5.192</b>	<b>.024</b>

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# **The New Generation of Public Entity Risk Pools: Understanding Its Innovations and Roles in Public Finance**

Yuhua Qiao

## **Abstract**

As governments continue to face fiscal pressures and increasing insurance costs, public entity risk pools will play an important role in public finance and public management. Since their emergence in the 1970s, public entity risk pools have evolved from their start-up stage into mature organizations with broad missions and responsibilities. As little academic research has been done in this area, this paper is to study the current generation of public entity risk pools in terms of the environment they are in, recent innovations, and problems they face, and future research questions. The main data source comes from an electronic survey sent to the Association of Government Risk Pools' 300 members in 2006 with 28% of response rate.

## **I. Introduction**

Public entity risk pools<sup>1</sup> play an important role in public finance and public management. The Association of Governmental Risk Pools (AGRiP 2004, p.VII) defines a pool as "a separate and distinct legal entity composed of public entity members that have joined together to finance an exposure, liability or risk" through group purchase, group self-funding, or other cooperative means for primary and/or excess coverage.

Public entity risk pools are public entities' response to the cyclical nature of the private insurance market. Since its emergence in the 1970s, public entity risk pools have evolved into mature organizations with broad missions and responsibilities. Though important to public finance and public management, very little academic research has been conducted about public entity risk pools. The purpose of this paper is to study the current generation of public entity risk pools in terms of the environment they are in, recent innovations, problems they face. The author will highlight future research questions and hope more attention will be paid to this important public risk and management instrument.

## **II. Public Entity Risk Pools: Development and Relevant Literature**

Public entities face more risk exposures (e.g., general liabilities, property liabilities, and legal liabilities, etc.) than their private counterparts (Head and Wong, 1999). To address these risks exposures, public risk management emerged as a new but important element of public management. An effective risk management program can control and reduce the cost of risks, make good use of taxpayers' money, and protect the well-being of the community. In the area of public risk management, the most significant development is the use of public entity risk pools that stems from the mid-1970s and again in the mid-1980s. The erosion of governmental immunity to third party liability made public entities the target of lawsuits and exposed them to liability in new areas. Insurance companies refused to provide coverage or they charged skyrocketing premiums for policies that were available. Public entities had to find alternative

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<sup>1</sup> Several names are found in the literature. The most commonly used name is self-insurance pools. Young and Reed (1995) feel the term, self-insurance pools, is oxymoronic and prefer "government risk-financing pools." AGRiP uses public entity risk pools. Since AGRiP represents pools, the author adopts its term.

financing mechanisms. While large governments turned to self-insurance program, small governments came together to pool their resources to finance various risks. Young and Reed (1995) emphasized that “pooling was a small government phenomenon” (p. 103). In his 1988 survey, about 15,000-17,000 small cities, towns, counties, special districts, and school districts participated in such pools. About 80 percent of his participants had populations below 9,999, while 94 percent had populations below 25,000 (Young, 1995).

The first public entity risk pool was established in 1974 by the Texas Municipal League (Wander, 1980). In 1976, the state of California amended its laws to allow its local governments to pool their self-insured losses, and cities in Contra Costa County soon establish their liability and property pools. By 1985, pools for workers’ compensation, property insurance and public liabilities had been set up in twenty-two states, including Alabama, Illinois, Texas, Florida, Connecticut, and Maine (Pouzar, 1985).

Pools have many advantages. They offer long-term stability and protect the participants from the uncertainties caused by the cycles of insurance markets. They offer more favorable coverage, terms, conditions and limits than private insurance companies and are tailored to the needs of their members (Head and Wong, 1999). For long-term members, benefits of belonging to a pool extend far beyond simple insurance coverage. Pools provide their members with full-service risk management that helps to control risks and stabilize the financing of government. Members have created successful, long-term strategies that can have a significant impact on the fiscal health of their governments. In addition, in many cases, coverage programs through a pool may save members up to 60 percent of what they would have spent to purchase commercial insurance (Washington Governmental Entity Pool, 2005).

The establishment of the Association of Governmental Risk Pools (AGRiP) as an independent agency from the Public Risk and Insurance Management Association (PRIMA) in December 1998 indicated the growing need for and interest in risk pools (Ceniceros, 1999). Pool numbers and membership grew rapidly. The number of pools doubled between 1988 and 1993. Young and Reed (1995) estimate that in 1993 there were about 400 public risk pools covering 35,000 members or 45 percent of all governmental entities in the U.S. According to the Missouri Intergovernmental Risk Management Association (MIRMA), there are about 500 public risk pools in the nation today that generate an estimated \$6 billion in annual premiums. There are nearly 140 pools in California alone. Intergovernmental pooling arrangements exist in almost every state. It is estimated that 80 percent of local governments in the U.S. use risk pools for at least one type of insurance coverage (Greifer and Schwarz, 2001).

Since their inception in the 1970s, public entity risk pools have experienced many changes. Pools have evolved from a predominantly risk-sharing tool into a long-term risk management strategy. Public entity risk pools have diversified their coverage (Young and Reed, 1995) over the years from general liability coverage and workers’ compensation to many other risks such as crime, employee dishonesty, and employee benefits. According to the AGRiP *Sourcebook* (2004), the major lines of coverage pools offer includes the following:

- ◆ General liability
  - Automobile liability
  - Public officials/school boards

- Law enforcement professional
- Medical malpractice
- Employment practices
- ◆ Property liability
  - Boiler & machinery
  - Electronic data processing
  - Auto physical damage
- ◆ Worker compensation and unemployment compensation
- ◆ Bonds (e.g. crime, employee dishonesty, and public officials)
- ◆ Health insurance, dental insurance, vision insurance
- ◆ Other ancillary coverage such as special events and pollution

Moreover, public entity risk pools have expanded their services. They provide members educational training, workshops, loss control audits, risk assessments, legal counsel, and on-site safety inspections (Greiger and Schwarz, 2001). Pools have also become more sophisticated in their administrative capabilities by building up their own in-house experts to perform various functions. For instance, a 1988 survey found that “pools were heavily reliant on the use of third party administrators (TPAs)” (Young and Reed, 1995, p. 104) for a variety of services such as underwriting, claims management, lost control advising, actuarial services, financial management services, audit and accounting services, and healthcare network management. The AGRiP survey (2006b) found that a clear majority to a supermajority of the respondents were using in-house employees for all its administrative functions except legal services.

According to AGRiP’s 2006 (a) *Annual Compensation Survey*, 80 percent of the 87 respondents have state-wide members and 15 percent of the membership is regional within the state. Nation-wide public risk pools are emerging. These include national captives and risk retention groups (RRG) that serve constituencies in more than one state. Examples are the Housing Authority Insurance Group (HAIG) - a federally chartered pool for Indian Housing Authorities (AMERIND, Inc.); Transit Re - a pool of transit pools; the National League of Cities Mutual Insurance Company (NLC – MIC) - a captive reinsurance pool for state municipal league sponsored or endorsed pools; County Reinsurance Limited (CRL) - a captive reinsurance pool for county association-sponsored or-endorsed pools; and Government Entities Mutual (GEM) - a captive reinsurance pool for pools not eligible for NLC-MIC or CRL.

There are a great variety of public entity risk pools. Pools can be classified in the different ways. They can be capitalized or non-capitalized. Capitalized pools require their members to make capital contributions, and non-capitalized pools do not. A majority of the pools are non-capitalized pools. Pools can be assessable or non-assessable. In an assessable pool there is an express authority and obligation to issue and honor future assessments to fund losses. Pool members usually pay a minimum premium and are assessed at the end of some period to cover the losses of that period. Fone and Young (2000) recommend that a member assessment provision be in place when forming a pool. This provision would make clear the members’ obligations and is important for a pool to succeed. Young and Reed (1995) found that over 83 percent of their respondents stated that they could assess all members if the pools’ loss was worse than expected.

Pools can be primary pools or excess pools. In primary pools, there is either no deductible or a low deductible “first dollar” coverage. Excess pools are above a self-insured retention - usually above \$100,000. Pools can be independent or association-sponsored. When pools started, many of them were sponsored by various local government associations. Independent pools were established later, which are not directly affiliated or controlled by associations. According to the AGRiP’s data (2004), approximately 25 percent of US pools are association-sponsored. This ratio is lower than the 57 percent reported by Young and Reed (1995).

Pools can be monoline, multiline or fleet depending on how many lines of coverage they offer (AGRiP 2004). Monoline pools offer only one line of coverage. Multiline pools offer two or more lines of coverage. Members in fleet pools can choose to participate in any line(s) of coverage. According to the AGRiP (2004), among the 339 responses that reported their type of pools, 96 are monoline pools, 159 are multiline pools, 76 are fleet, and 8 are other types.

Membership eligibility differs among pools (AGRiP 2004). Pools usually serve one type of jurisdiction that faces similar risks and needs, thus pools are homogenous. Some pools include more than one type of jurisdiction. According to the AGRiP (2004), 61 percent of pools have only single type of government entities, and 39 percent serve multiple types of entities.

Pools have established themselves as a necessary risk management instrument for local governments, but they also face challenges. Back in 1993, pools indicated that competition, state regulation, and the challenge of maintaining membership interest and participation were major issues (Young and Reed, 1995). According to Fone and Young (2000), in the years to come, competition either from the insurance market or from other pools is likely to continue to be a big challenge. Pools will need to take a strategic position to meet the challenges.

While risk pools have become an important phenomenon, research on this topic is limited. Young and Reed (1995) state that “perhaps one of the most remarkable aspects of pooling is the relative paucity of attention it has received in academic circles” (p. 97). Their work is a major contribution to this area. Based on the results of the two nation-wide surveys conducted in 1988 and 1993, Young and Reed provide a comprehensive examination of pooling practices in terms of general administrative issues, membership characteristics, pool administration, coverage, and financial management practices. They conclude that “pooling is not a transitory phenomenon, and that pools – in one form or another – will be part of the public sector landscape for quite some time” (p. 111). To them, this very nature of permanency raises the important conceptual question - What precisely is pooling? Though pools are described as intergovernmental entities and trusts, these general terms cannot cover everything about pools. Young and Reed (1995) suggest more studies need to be done about the nature of pools and their financial performance.

Practitioner-oriented magazines and AGRiP are active in disseminating information about pools. AGRiP conducted two types of online surveys with its members in 2006 and in 2007. One focused on executive salaries and benefits (AGRiP, 2006a; 2007a), and the other on pool demographic characteristics (AGRiP, 2006b; AGRiP, 2007b). Qiao (2007) explored

intergovernmental risk pools but only from the perspective of how pools are used as a funding technique of general public risk management.

Since Young's research, more than a decade has passed, and pools have experienced monumental changes (Worthington, 2007) and transformed from being start-ups in a crisis to mature organizations that are the dominant public risk management force in their state. Further research is needed for this rich and blooming area.

### III. Methodology

Data for this research comes from several sources. The major source is an electronic survey sent to the AGRiP's 300 members in September, 2006. The author designed the questionnaire, and AGRiP created an online survey link and invited all its members to participate. The survey was closed in December 2006, and the results were sent back to the author. Since AGRiP is the official representative of government risk pools, its membership list is the best source for this survey. The number of respondents per question ranges from 81 to 84. The response rate is 28 percent. The second source is newsletters issued by various public risk pools. The author obtained the newsletters during her trip to the AGRiP's headquarters in Prague Oklahoma in September 2006. The third source is a two-hour long interview that the author conducted with the AGRiP chief executive officer, Harold Pumford, regarding the changes in public risk pools over the years. The fourth source is the websites of AGRiP members.

### IV. Findings

#### A. Membership composition

Table 1 presents pools' membership composition from the current survey and from the AGRiP *Sourcebook* (2004). The two sources reveal a very similar distribution of multiple v. single type(s) of jurisdictions. In the current survey, 30 out of the 81 respondents (37%) indicate they serve multiple types of entities and 51 (63%) serve single types of members. The AGRiP *Sourcebook* (2004) reports 140 pools (or 39%) have multiple types of entities and 223 pools (61%) have single members only. Based on the current survey, among the single-member pools, more pools serve school districts.

#### B. Characteristics of Pool Executives

The first generation of pool directors came from the intergovernmental associations or public agencies. As pools mature and as many of the original directors have retired, pools have a new generation of directors. What are their backgrounds? Are they from inside the pools or outside of the pools? The findings are reported in Table 2. There are two characteristics of the current pool directors. First, they grew up with the pools. This is seen from the facts that they come from the internal promotion (21%), from another pool (17%), and from member organizations (9%). All these together add up to 47 percent of the respondents. Second, business experience is coming into pool administration as seen by the fact that 21 percent of the pool directors are from the insurance industry.

Gagne (2007b) reports a growing demand for demonstrated competency and credentialing in the field of pool management. For a pool manager to lead its organization into the future competitive environment, insurance background is important. At the same time a firm understanding about the pooling profession and practices – loss control, claims, finance, auditing, reinsurance and actuarial- is also essential. It looks like the current generation of pool directors possesses at least one side of the knowledge. When the other side of the knowledge is wanting, training programs like the professional designation available from the Insurance Education Association (IEA) and the California Joint Powers Authority can help (Gagne, 2007a). As discussed later in this article, how to cultivate future risk managers is a big concern in the public risk pool industry.

[Insert Table 2 here]

### **C. Changes and Innovation Practices**

One of the major goals of the research is to gauge how pools have changed over the years. In terms of the environmental changes, competition from other pools exists to a certain extent. As Table 3 shows, 46 percent of the respondents confirmed competition from the other pools. But more pool directors (52%) see competition coming from private insurance companies. Either as a response to the competition, or as an effort to provide goods and needed services to their members, pools have a strong desire to change and make innovations. There is an overwhelming agreement (82% of the responders) that without change and innovations, the pools would decline. Pools themselves are an innovation, and they will continue to stay innovative. They (84% of the responders) also believe that they have succeeded in most of their changes and innovations in recent years.

Then what are these changes and innovations? As shown in Table 3, some diversifying of the product/service mix (e.g., into financial services, life insurance, investment management) is happening, but on a small scale (16% of the respondents). Are pools looking to diversify by underwriting different types of local entities? Only 20 percent of the respondents (e.g., 9% and 11%) confirmed this change, while 57 percent of the respondents denied it. This means that pools still remain relatively homogenous in terms of their memberships. This may be a reason why pools do not perceive other pools as much competitors as private insurers.

[Insert Table 3 here]

In terms of whether pools are participating in or considering joining a regional/ national excess or reinsurance pools, more than 40 percent of the respondents confirm this trend. Although there is no previous data to compare with, this is an important phenomenon, and will be discussed later.

Many reported innovative methods used in the areas of delivering service, providing training/education, expanding risk coverage, enhancing loss control efforts, providing loss prevention incentive programs, and using information technology in providing training and communications. A few reported new practices in financial management. The specific activities and changes are reported in Appendix 1. The reported innovations and changes are consistent with Gagne's (2007b) finding. A pool must "constantly refine, repackage, and resell its programs to increase the potential for member retention" (p. 8).

Reviewing the websites, newsletters, and the personal interview also reveal two more important changes. The first one is that pools have moved to a holistic perspective in delivering risk management. Almost all of them have mission statements and strategic plans. They have a clear focus on safety and risk control programs. Training and education are a highly integrated part of the programs. The survey shows that many are considering leadership development. Many pools are continuing their commitment to the concept of wellness in the workplace. The concept of a holistic risk management approach (also known as enterprise risk management or strategic risk management) has been used extensively in the private sector (Liebenberg and Hoyt 2003); Qiao (2007) documented its emerging use in the public sector. This study seems to suggest that it is common among public entity risk pools.

The second major change is the creation of pools of pools. Pools are created with pools as members. Examples are the Government Entities Mutual or Transit Reinsurance, the National League of Cities Mutual (NLC Mutual), and the County Reinsurance Limited (CRL) as discussed earlier. These are pools that have taken the pooling concept to share risk with other self-insured pools across the lines. Gagne (2007b) indicates that these pools of pools are created as a response to the emerging challenge of reinsurance consolidation. They are helpful at the excess layer that sits above the pools' self-insured retention level. There are some regional excess pools of pools. The California Excess Insurance Authority serves a number of other joint power authorities in California. Other regional reinsurance pools exist in four other states: Ohio, Iowa, Michigan, and Nebraska. The survey also found that 42 percent of respondents indicate they are participating or are considering joining or forming a regional or national excess or reinsurance pool as shown in Table 3.

#### **D. How Changes Have Taken Place**

The findings are reported in Table 4. The most common source of ideas is from members' input. Other sources come from other pools and conferences. Competition and trade journals provide additional sources. Seven more respondents stated that all of the sources help them to come up with new ideas.

[Insert Table 4 here]

What drives the interest in innovation? As shown in Table 5, the most important driver is the desire to meet the needs/demands of the pool members. This is logical since pools are established to provide services for their members. The second important factor is to maintain and expand the pools' membership, followed by a desire to secure more favorable excess/reinsurance terms. More than one third (36%) of the respondents indicate meeting or beating the competition motivates innovation. This competition can come from private insurance industry and from other pools, as discussed earlier. In sum, most of the innovations deal with how to serve pool members.

[Insert Table 5 here]

#### **E. Issues, Challenges, and Problems**

What are the major issues, problems, and challenges pools will be facing in the next five years? The author developed a list of twelve issues from the literature. The respondents are asked to identify from the list up to four issues. The results are reported in Table 6. Looking at

the total times reported, maintaining the membership support and participation is the leading issue. Fifty-four times it is identified as an important issue. This is consistent with Jorgensen's (2008) comment that "self-insured groups (SIGs) work relentlessly to retain and grow membership" (p. 58). One way to do this is to communicate with members about the value-added services it can provide. Gagne (2007b) also has the same finding. Membership retention and controlled growth are of great importance to his six interview panelists. The next one is uncertainty arising from the new risks, followed by competition from private insurance companies. By contrast, much fewer see competition from others pools as a challenge. Looking at specific ratings, more respondents indicate competition from the private insurance companies as the number one challenge (see Column 2 of Table 6). The second most common issue of concern is maintaining the membership support and participation. These two issues could be combined as a survival issue for the pools.

[Insert Table 6 here]

The next generation of pool administrators also emerges as an important issue for thirty-one respondents. Gagne's interview panelists also reveal the same concern and they suggest that pools develop succession plans and integrate the plan into the culture. This is a big concern due to the following factors: 1) the essential characteristics for effective leadership is important to pool performance (Public Entity Risk Institute 2006); 2) pools' management would see significant turnover in the next three to eight years; and 3) the emerging challenge of reinsurance consolidation, the ever changing insurance market, and the competition from the private sector and other pools make it essential that a pool manager should have a high degree of not only technical expertise, but also proficiency in pooling principles and practices and a clear understanding of the unique needs of the pools membership (Gagne 2007b). It is important for pool managers and governing boards to select successors capable of handling this multi-dimensional position.

When asked what actions pools are taking being taken to address the issues pools are facing, there are a wide range of answers. However, several types of measures stand out. One type clearly focuses on the members and services to members. Another stream of action is communication among members, board members, and with other pools and working with other pools. This is consistent with the finding that maintaining membership support and participation is one of the major problems and challenges.

Organizational capability-building is also emphasized in over ten responses. This includes developing and drafting a succession plan and grooming new leaders. Several also mention adding staff and increasing staff professional development and networking as well as orientation and training of new board members. Many mentioned long-term planning and strategic planning as a way to address the issues they are facing. Another type of action is to build fiscal capacity and improve the cost efficiency, including initiating dividend programs, extending discounts for good members, actuarially determined adequate funding, and maintaining financial strength to combat competition.

## **V. Conclusion**

This research studied the current generation of public entity risk pools. It revealed many innovative practices and programs that public entity risk pools have engaged over the past few years in the areas of delivering services, providing training/education, expanding risk coverage,

enhancing loss control efforts, providing loss-prevention incentive programs, and using information technology. Particularly interesting is the emergence of regional or national excess or reinsurance pools. There is also evidence that public entity risk pools are taking a holistic perspective in delivering risk management and in funding risks.

The survey also found that the greatest motivation for the innovation is to meet the needs/demands of the members, followed by securing more favorable excess/reinsurance terms, and meeting and beating competition. The major issues respondents identified include maintaining membership support and participation, competition from private insurance companies, and uncertainty arising from new risks, and leadership succession.

To conclude, the author offers two observations regarding pools and their innovations. First, public entity risk pools are member-oriented organizations. Serving the needs of their members is why they were created and why many innovated practices and programs took place as stated earlier. Member retention and improving and expanding the services will be very important for pool managers and will be a driving force for pools' development in the years to come. The second point is how changes in public entity risk pools are related to private insurance market condition changes. To a large extent, the innovated practices and programs are irrelevant to what happens in the traditional insurance market. According to David Hayasaka, the former AGRiP board member and Executive Director of Washington Schools Risk Management Pool, though the private insurance market helped to form pools in the first place, pools develop regardless of market conditions. Many innovative practices took place not because the current insurance market was hard or soft, but because the members needed them, or they wanted an edge against competitors. Many pools' innovations are not available in the private insurance market such as special education coverage, pre-claim coverage, and pre-loss legal consultation service. Indeed, how well pools can meet the needs of their members and how well pools can communicate with their members and other stakeholders will determine the stability and fiscal health of the pools.

However, competition from the private insurance industry and the changes in the overall financial market do push the pools to be more innovative in providing services. For instance, to respond to the rapidly consolidating reinsurance market, public entity risk pools "are designing innovative programs that call for innovative excess and reinsurance solutions" (Shull, 2005, p. 1). The pressures of emerging and intense competition, the global reinsurance market, and the emergence of new risks make it necessary for pools to find ways to work with other pools and with the private sector as well to tap the talents and skills that they need to open up new services for their members.

This is an exploratory study about the current generation of pools. More studies about pools, their performance and their roles in public financial management is warranted. From a public budgeting and financial management perspective, research topics should include pools' fiscal conditions, their investment strategies, the impact of pool service on their members' budgeting, and what fiscal constraints they will have when they move ahead. Pools also provide a rich ground to test such management theories as agency theory. Just as in a corporate setting, there are two sets of interests: pool's members' and the director's. Given the fact that pools focus on members, will the director's interest align with the members'? And how? Or will agency

theory work the same for the pool setting as in the corporate setting? This would also be an interesting research question.

**Acknowledgment**

The author wants to express her sincere thanks to Harold Pumford, Chief Executive Office of AGRiP, and Dave Hayasaka, the former AGRiP board member and Executive Director of Washington Schools Risk Management Pool, for their valuable comments and feedback in the survey design and for sponsoring the survey. Her thanks also go to Dr. Peter Young and Dr. Stanley Adamson for their feedback about the paper and to the survey participants whose participation is essential in completing this survey.

Table 1. Types of public entities eligible for membership

	2006 Survey (N = 81)	2004 AGRiP Source Book (N=363)
Multiple Types of Entities	30 (37%)	140 (39%)
Two types	13 (16%)	55 (15%)
Three types	6 (7%)	26 (7%)
Four types	5 (8%)	30 (8%)
Five types	2 (4%)	16 (4%)
Six types	2 (2%)	8 (2%)
Seven types	1 (1%)	5 (1%)
Eight types	1 (1%)	N/A
Single Type of Entities	51 (63%)	223 (61%)
Municipalities	12 (15%)	N/A
Counties	7 (9%)	N/A
School districts	16 (20%)	N/A
Special districts	3 (4%)	N/A
Housing authorities	6 (7%)	N/A
Transit authorities	3 (4%)	N/A
Townships	3 (4%)	N/A

Table 2. The background of the pool's current executive directors (N=84)

	Number of Respondents	% of the total respondents
Another pool	14	17%
The insurance industry	17	21%
A pool service provider	5	6%
The membership	7	9%
Internal promotion within the pool	17	21%
Other	24	30%

Table 3. Competition, Innovations and Success (N=83)

	To what extent do you agree with the following statement?				
	Not at all	Strongly disagree	Indifferent	Agree	Strongly agree
Top number is the count of respondents. Bottom % is percent of total respondents					
We are experiencing competition from other pools.	26 32%	9 11%	9 11%	26 32%	11 14%
We are experiencing competition from private insurance companies.	10 12%	18 22%	11 14%	29 36%	13 16%
We have to make constant changes & innovations, otherwise we might fall backward.	1 1%	4 5%	9 11%	36 44%	30 38%
We have succeeded in most of our recent changes/innovations	1 1%	1 1%	10 13%	42 54%	24 30%
We are diversifying our product/service mix (e.g. into financial services life insurance, etc.)	39 48%	11 14%	18 22%	11 14%	2 2%
We are looking to diversify by underwriting different types of local entities.	33 41%	13 16%	19 23%	7 9%	9 11%
We are a participant in or are considering joining a regional/ national reinsurance pool.	25 31%	8 10%	15 19%	11 14%	22 27%

Table 4. Sources for ideas to change (Multiple responses are permitted) (n=81)

	# of respondents	% of total
I acquire my ideas directly from members' input	65	81%
I acquire my ideas from other pools	61	76%
I acquire my ideas directly from conferences	57	71%
I acquire my ideas from the competition	39	49%
I acquire my ideas from trade journals	30	38%
Others	22	28%

Table 5. What Drives the Interest in Innovation? (Multiple responses are permitted) (n=81)

	# of respondents	% of total
To meet the needs/demands of our members	73	91%
To maintain and expand the pool's membership	41	51%
To secure more favorable excess/reinsurance terms	32	40%
To meet or beat the competition	29	36%
Executive motivations	22	28%
Other motivations	12	15%
Access to capital	5	6%

Table 6. The Most Important Four Issues Pools Will Be Facing in the Coming Five Years

N= 81	Frequency of Ratings #1, #2, #3, #4,				
	#1 issue	#2 issue	#3 issue	#4 issue	Total times of being identified as an issue
Maintaining the membership support and participation	15	17	16	6	54
Uncertainty arising from the new risks.	8	6	11	16	41
Competition from private insurance companies	18	8	1	13	40
Next generation of pool administrators	6	6	10	9	31
Generating/maintaining adequate financial capital	3	9	6	6	27
State and/or Federal regulations.	10	4	7	6	27
Competition from other pools	7	13	5	1	26
Tort reform or loss of tort cap or immunity.	3	9	10	4	26
Difficult to provide cost-effective service.	3	1	9	4	17
Lack of qualified personnel	2	3	2	6	13
Lack of a long-term mission and plan.	3	2	0	6	11
Possible merge with other pools.	0	1	2	2	5

### Appendix 1: Selective Changes and Innovations during 2003-2006 Reported in the Survey

New coverage

- Litigation

- No-fault mold coverage for remediation and repair
- No-fault accident insurance and WC-Free Acc/Health coverage for all volunteers
- Modifying and broadening existing coverage, concentrating on poor performing members

#### Education and training

- Multi media and online training
- FATS-fire arms training system
- Training consortium with other agencies and training partnership with member associations
- Right-to-know training, law enforcement/jailer training
- Leadership/supervisor training
- Firearms training simulator, driver training simulator
- Loss control training
- Trainers go to the locals and to the high-risk locations
- Increasing frequency in training and providing systematic training program

#### Loss control

- Results-oriented risk control, loss control grants to members
- Strong preventive benefits and personal service
- Law enforcement loss control resources, safety audits
- Cost allocation based on miles and hours
- Implementing multiple risk control programs
- Vehicle accident prevention program
- Annual loss control evaluation rating and loss control excellence program
- loss incentive program (loss control premium credit program, premium incentives for compliance, safety credit program)
- Linking root causation data to prevention programs
- Comprehensive loss control, risk awareness program
- Safety videos and more services with new techniques (more strategic data-driven approach)
- Expanding safety audits, extensive outreach efforts
- More proactive measures (e.g., testing employees' strength, pro-employment physical)
- Setting up loss prevention committees
- Using online inspection and increasing field presence

#### Financing management

- Using reinsurance instead of insurance
- Balancing capital growth and dividends, sending dividends to members
- Providing capital contribution to captive insurer (GEM)
- Developing a specific pool surplus formula
- Implementing dividend and rate stabilization funding
- Basing property premium on three year rolling loss

#### New services

- EDI transmission for medical/imaging system in house
- Offering contract review services

- Establishing award/grant program
- Providing general administration technique support to membership
- Using in-house claim database

#### Claim administration

- Using new technology such as online claim reporting and web-based claim system
- Using new software to streamline operation, using own data system
- Bringing claim in house and increasing in-house staff
- Starting investigation prior to claim being filed
- Using comprehensive claims audit or annual claim audit
- Hiring the best and lowering case loads
- Using toll free telephone reporting, establishing best practices
- Improving response time and closure, more training to the claim staff.

#### Legal defense

- More in-house counsels, more active review
- Early intervention in administration and hearing
- Using specialists in the field of school law
- Adding litigation management software
- Cultivating new defense teams for specialized areas
- Providing immediate access to legal counsel as needed, pre-defense reviews
- Major incident investigations
- Better tracking cases referred to outside counsel

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## **Congressional Calendar and Control Risks: Evidence from United States Mega-cap, Broad-based and Innovation-based Stock Market Performance**

Charles R. Rayhorn and Kenneth R. Janson

### **Abstract**

United States stock market returns are examined in the context of the Congressional calendar and the incidence of party control. A legislative calendar effect in returns is deemed possible when the Congress is in-session. Previously published studies report a strong negative calendar effect in historical returns for the mega-cap Dow Jones Industrial Average. In this study, similar though less pronounced results are observed for more recent periods. More pronounced negative calendar effects are observed in both the broader S&P 500 Index and the more innovation oriented NASDAQ. Finally, evidence is presented that performance of both the S&P and NASDAQ indices have been related to the incidence of party control in the U.S. Congress.

### **I. Introduction**

Pundits have quipped that our citizenry is fortunate to consume less than one-half of the governmental services for which they are compelled to pay. It may be argued that such commentators have a free-market perspective and that they view with disdain, much of what passes as governmental regulation. The obvious corollary to this world view is that legislative activity raises the prospect for increasing governmental intrusion into society and that this perception retards business initiative. Innovators, the argument goes, will sit on their hands when rule-makers are active and will proceed more rapidly when the threat of legislative activism is perceived to be low. Since business initiatives are inherently bound in inertia, it is difficult discern innovators' reactions to periods of legislative trepidation and out-of-session confidence. The investment community is much less constrained. Market participants may very quickly express through their investment choices their collective assessments of the legislative climate for business innovation. Market returns are therefore an appropriate vehicle for detecting perceptions of legislative risk.

In this study, we revisit the effort of Lamb et.al. (1997) to investigate correlations between stock returns of the large capitalization firms that comprise the Dow Jones Industrial Average (DJIA) and the in-session incidence of the United States Congress. We find that recent experience through early 2008 mirrors the results that Lamb et.al. (1997) reported but that the phenomenon is now less pronounced than it had been historically. The DJIA component firms are 30 of the largest and most widely held U.S. public companies. As such they represent only a subset of the equity universe and notably underweight the innovative entrepreneurial sector. We also examine correlations between the Standard and Poor's 500 Index (S&P500) and the Congressional calendar. The S&P500 also gauges large-capitalization firms, but includes a much broader spectrum of the economy. The NASDAQ Composite index tracks the performance of over 3,000 public companies and has traditionally been viewed as a surrogate for

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the innovative technology sector. We find that the Congressional calendar effect has been more pronounced in the S&P500 and NASDAQ returns than in the DJIA arena and that in these venues, the phenomenon has persisted.

For all three market indices, we also tested for the presence of a January effect. Rozeff and Kinney (1976) identified January as a period of higher than normal stock returns, but Banz (1981), Keim (1983) and Reinganum (1983) found that significant January effects are not prominent in the returns data of larger firms. Like the Lamb et.al. (1997) analysis of the DJIA, we found that the calendar effect was sustained for all three markets while a hypothesized January effect did not attain statistical significance for any of the indices.

In both the S&P500 study and the NASDAQ study, we also find modest evidence that the incidence of Democratic Party control of the U.S. Senate has a negative correlation with market returns. No similar attribution was indicated for control of either the U.S. House of Representatives or the White House.

## II. Data and Methodology

Daily closing levels for the DJIA were collected for the period from October 1, 1928, through January 16, 2008, or for nearly 80 years. There are 19,908 daily return levels determined as  $\ln(p_t/p_{t-1})$  where  $p_t$  is the DJIA closing level for date  $t$ . Dates that the Congress was formally convened and control of the Senate and the House of Representatives were determined from the Congressional Record.

Daily closing levels for the NASDAQ were collected for the period from February 5, 1971, through January 16, 2008, or for nearly 37 years, from yahoo.finance.com. Daily closing levels for the S&P500 were also collected for the period from December 31, 1969 through January 16, 2008, or more than 38 years, from yahoo.finance.com.

For each market index, the daily returns series is regressed on an indicator variable, *InSession*, coded as 1 when Congress is convened and as 0 when Congress is recessed. The estimate of a model's *constant* represents the average daily return for the market when Congress is adjourned, while the *constant* plus the estimated value for *InSession* represents the average daily return when Congress is convened.

To assess potential January effects, for each model we defined an indicator variable, *Month-Jan*, coded as 1 for trading dates in January. Positive estimates for the *Month-Jan* parameter would indicate incremental daily returns to the stock index in January.

To assess the potential impact of party control of the legislative and executive branches, we defined the following indicators: *Senate-Dem* coded as 1 when the Senate has a majority of its members from the Democrat Party; *House-Dem* coded as 1 when the House of Representatives has a Democrat Party majority; and *Pres-Dem* coded as 1 when a Democrat occupies the White House as President. In each case, a positive parameter estimate would suggest an incremental return to the index when a Democrat majority or Democrat president was seated.

### III. Discussion and Findings

#### Calendar Effects

The first regression examines DJIA returns from 1928 to 1993 and confirms the Lamb et al (1997) findings. The results are presented as Table I.

With approximately 250 trading days in a year, the coefficient estimates imply an average annualized rate of return of 11.76% when Congress is adjourned and a 2.53% annualized rate of return when Congress is in session. The *In-Session* effect is significant at a 0.05 level.

We repeated the regression on the DJIA data since January 1, 1994 to ascertain whether the Congressional calendar effect demonstrated by Lamb et.al. (1997) has persisted. The results presented as Table II suggest that for this mega-capitalization market index, the previously demonstrated Congressional Calendar effect, although still negative, no longer attains statistical significance.

The broader S&P data were examined for the period January 2, 1970 through January 16, 2008, with the result presented as Table III. The average annualized return when Congress is adjourned is 15.13% and the annualized return when the Congress is convened is 3.30%. For the 38 year period the calendar effect is significant at a 0.05 level.

We also evaluated the S & P data for the period subsequent to 1993 and again found that the Congressional calendar effect, although negative, had lost statistical significance. Table IV reports those results.

Returns data for the more innovation oriented NASDAQ were evaluated for calendar effects over the period from February 8, 1971 through January 16, 2008, and the negative correlation with Congressional activity was pronounced. The regression results are presented in Table V and suggest that annualized returns when Congress is adjourned have been 20.99% while the returns when Congress is in session are only 2.46%. The effect is significant at the 0.005 level.

Again, we repeated the analysis on the recent NASDAQ returns data since 1994 with results as reported in Table VI. The Congressional Calendar effect is significant at the 0.10 level. For this recent interval, annualized returns when Congress is adjourned average 23.96% and when Congress is in session, annualized returns average just 0.52%

#### January and Party Effects

None of our regressions revealed a significant January effect although collinearity with the Congressional calendar may very likely confound this factor. The evaluation of the NASDAQ data for the period 1971 to 2008 is illustrative and is presented as Table VII.

Our investigation of the relationship between market returns and the political control of the Congress yielded interesting results. When evaluated with a multiple variable model including parameters for calendar and January effects, the 1971-2008 NASDAQ data revealed a significant negative impact on market returns when the Democrat party had control of the United States Senate. Interestingly, the coincident estimates for Democrat control of the House of Representatives and the White House were positive, but not statistically significant. The results are presented in Table VIII.

To isolate the relationship between returns to the relatively innovative NASDAQ and a Senate that seats a majority from the Democrat Party, we examined a simple regression of returns on the Senate control variable and report the results in Table IX. The regression is significant at the .10 level and suggests that average annualized returns to the NASDAQ index have been 16.07% when Republicans control the United States Senate and 5.62% when Democrats are in control.

For the broader S&P 500 index, the effect is even more pronounced. Our regression is presented as Table X and is nearly significant at the .05 level. When Republicans control the Senate, the S&P 500 has returned an annualized 13.90%, while annualized returns were just 3.96% when Democrats were in control.

#### **IV. Conclusion**

Securities returns have been significantly correlated with the Congressional calendar for many decades. Market returns have been lower when Congress is in session. This phenomenon has been expressed in the mega-cap firms that constitute the Dow Jones Industrial Average, in the broad market of major U.S. firms constituting the Standard & Poor's 500 Index, and in the more innovative stocks that are prominently represented in the NASDAQ Index. A plausible explanation is that investors view the possibility of new legislative initiatives as an undesirable source of uncertainty. Even though they might reasonably expect businesses to continue their long-term innovative initiatives, investors may reserve for themselves the luxury of timing their investment decisions to periods of lower perceived legislative risk. Acting as a group, their collective aversion to legislative risk will plausibly explain a growing backlog of demand for equities while Congress is in session. Once the legislature is adjourned, the legislative risk is reduced, at least for a short period, and investors move to relax that backlog of demand for common stocks. Price response to this unleashed demand explains superior returns in periods of legislative recess. Our models did not confirm the existence of a January effect in the markets we examined, but did suggest that a significant negative impact on returns is experienced when Democrats control the U.S. Senate. An interesting extension of this analysis will be to consider legislative calendar effects on market returns in developing economies. Our previous research on emerging market efficiencies in New Zealand, Rayhorn et.al. (2007), provides a natural entry point for extending this study.

Table I - DJIA Calendar Effect 1928-1993

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00047	0.00015	3.13375	0.00173
InSession=1	(0.00037)	0.00019	(1.96384)	0.04957

Table II - DJIA Calendar Effect 1994-2008

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00054	0.00025	2.13129	0.03313
InSession=1	(0.00028)	0.00035	(0.80332)	0.42184

Table III - S&amp;P 500 Calendar Effect - 1970-2008

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00061	0.00016	3.89690	0.00010
InSession=1	(0.00047)	0.00020	(2.32177)	0.02027

Table IV - S&amp;P 500 Calendar Effect - 1994-2008

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00056	0.00026	2.13707	0.03266
InSession=1	(0.00036)	0.00035	(1.02607)	0.30493

Table V - NASDAQ Calendar Effect - 1971-2008

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00084	0.00019	4.44535	0.00001
InSession=1	(0.00074)	0.00025	(2.98473)	0.00285

Table VI - NASDAQ Calendar Effect - 1994-2008

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00096	0.00040	2.38069	0.01733
InSession=1	(0.00094)	0.00055	(1.71634)	0.08619

Table VII - Calendar &amp; January Effects - NASDAQ - 1971-2008

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00090	0.00019	4.65748	0.00000
InSession=1	(0.00073)	0.00025	(2.93205)	0.00338
Month-Jan=1	(0.00061)	0.00040	(1.52996)	0.12606

**Table VIII - Calendar, January & Party Effects - NASDAQ - 1971-2008**

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00107	0.00026	4.16510	0.00003
InSession=1	(0.00072)	0.00025	(2.89848)	0.00376
Month-Jan=1	(0.00059)	0.00040	(1.48062)	0.13874
Senate-Dem=1	(0.00055)	0.00032	(1.73842)	0.08217
House-Dem=1	0.00008	0.00033	0.25788	0.79650
Pres-Dem=1	0.00064	0.00042	1.54241	0.12301

**Table IX - Senate Party Effects - NASDAQ - 1971-2008**

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00064	0.00018	3.49699	0.00047
Senate-Dem=1	(0.00042)	0.00025	(1.69378)	0.09034

**Table X- Senate Control Effect - S&P500 - 1970-2008**

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.00056	0.00015	3.63802	0.00028
Senate-Dem=1	(0.00040)	0.00020	(1.95997)	0.05003

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**Do Turtles Have Fat Tails?**  
**Donchian Channels and Turtle Trading: The Case of Soybeans**

David L. Rayome and Abhijit Jain

**Abstract**

The movie “Trading Places” starring Dan Aykroyd and Eddie Murphy premiered in 1983 and concerned a friendly wager between two long time traders as to whether traders were born or could be “made”. Unbeknownst to the cast of the movie, a real experiment was taking place in Chicago at the same time. Richard Dennis had advertised in the Wall Street Journal, selected ten candidates (and added three others), and taught them to trade like “turtles”. Twenty years later their story is the stuff of legend. This paper attempts to simulate “Turtle Trading” to ascertain whether the legend holds kernels of truth. More importantly, the research provides information on whether the turtle system has merit, and what the more important ingredients might be.

The system, a channel breakout system, is tested with data from soybean futures contracts over a 27 year period; from 1980 into 2007. An initial amount of capital of \$5,000.00 grows to \$187,762.50 under the best case scenario. One of the most important ingredients in the turtle system is the use of stops to preserve capital. Indeed, the capital preservation rules may be the most important ingredient.

Random behavior in the financial markets, as predicted by efficient market proponents, would lead to normal distributions of returns with “skinny” tails. Trend traders, like the turtles, believe that prices move in trends that defy the description of random movement. These trends lead to distributions of returns with “fat tails”. The analysis of more than 100 futures contracts and several hundred trades over more than 27 years in this paper lend credence to the idea that the “Turtles” do have “fat tails”.

**I. Introduction**

Richard Dennis and his partner William Eckhardt conducted an experiment in Chicago in the 1980s. They taught a group of new traders their “turtle” system and supplied them with capital to begin trading. Some reports indicate that the turtles earned annual average rates of return approaching 80 percent for most of that decade. The “Turtle” system became the stuff of legend into the 1990s until some of the former turtles began conducting seminars to teach others how to invest like a turtle. Since that time various web sites and books have appeared related to “turtle trading”.

This study analyzes the “turtle trading system” that has been published in recent years. The system is based on a form of channel breakouts first expounded by Richard Donchian. Richard Dennis, a legendary commodities trader further developed the breakout system. This was the system named “Turtle Trading”, so named for the two groups of traders Dennis hired and trained in the 1980’s. This paper utilizes the system Dennis taught his traders to determine its success in trading soybean futures contracts from 1980 until early 2007. Soybeans are a good

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starting point for the examination of the “Turtle Trading” system since Richard Dennis reportedly made his early fortune trading soybeans.

## II. Literature Review

Charles Dow, the founder of the Wall Street Journal created the first market index and the first widely followed public information on business activity. Dow could also be considered the father of technical analysis, since his Dow Theory was the first technical method to predict future movements of security prices. Dow was one of the first to suggest that prices moved in trends and the recognition of such trends was a key in profitable investing (Pring 2002). Technical analysis’ main purpose is to identify trends in security prices (Kirkpatrick and Dalquist 2007). The existence of these trends that last longer than random behavior would predict is the key to profitable trends. These are the “fat tails” that are explained well in A Short Course in Technical Trading (2003) by Perry Kaufman.

Channel breakouts have been studied in the financial literature since the early 1960’s. Edwards and McGee (2007) describe support and resistance levels in their classic work. Alexander’s filter rules (1961) were one of the first academic studies of this phenomenon. Lukac and Brosen (1990) conducted a comprehensive study of technical trading systems analyzing twelve different trading signals, including breakouts, on several markets over a ten year period. Taylor (1994) conducts a simulation of currency futures trading based on channel breakouts.

Lo, Mamaysky, and Wang (2000) in a significant article in the Journal of Finance analyze several technical analysis formations, including double tops and bottoms, head and shoulders formations, among others. These formations can be demonstrated to be related to channel breakouts. More recently, Sehgal and Garhyan (2006) utilized technical analysis and channel breakouts to test their effectiveness on the Indian stock market, as did Mitra (2002). Tian, Hua, and Guo (2002) analyzed returns from the U.S. equity market and the Chinese equity market utilizing trading systems with technical analysis, including channel breakouts.

Academic research on “turtle trading” is rather sparse. Anderson (2003, and in an undated working paper) examined a breakout system modeled after the Turtles’ system to trade U.S. Bond and Corn futures contracts. Miyazaki and Riles (2004) reported on a group of traders working in a Japanese investment house, who based their trading strategy on the channel breakout system as posited by the Turtles.

The popularity of Michael Covel’s books on trend trading and the turtles’ system (2006, 2007) has illuminated the timeliness and relevance of this subject. Curtis Faith (2007) one of the original, and by some reports, the most successful “Turtle”, has also published a book explaining the details of the “Turtle Trading” system.

Rayome and Jain examined the usage of Donchian channels for 20 day breakouts (2008a) and again for 55 day breakouts (2008b). The combination and synthesis of these two breakout systems with Richard Dennis’ money management rules result in the “Turtle System”.

The “free for all” of information that has descended on all investors through the rise of the Internet has created a new environment for technical analysis and investing. Information that was previously available to a privileged few, if at all, can now be downloaded for free and on a regular basis from many websites.

### III. The Model

The success of the "Turtle Trading" system depends on a security's price continuing in motion once it moves out of its channel (up or down). The channel is formed over time as the price moves up and down between resistance and support levels. Donchian described a channel as a minimum of twenty trading days (Donchian, 1995), (Dixon, 1978). The channel is formed by the daily high and low prices. Richard Dennis and the Turtles used the 20 day channel but also used a 55 day channel for a more conservative approach. If the closing price for the day exceeded the previous twenty days' high prices then a long position was initiated and the contract was purchased. The same strategy holds true for the 55 day channel. Alternatively, if the day's closing price was lower than the previous twenty days' low prices then a short position was initiated and the futures contract was sold.

One of the advancements incorporated in Richard Dennis' system is the analysis and inclusion of risk into the trading system. All trades were analyzed from a risk perspective utilizing a concept of "N". "N" is a measure of daily price volatility that is then used for several purposes. "N" is the 20 day exponential moving average of the True Range. The True Range in turn is defined as the following:

$$\text{Daily True Range (TR)} = \text{Maximum (H-L, abs(H-PDC), abs(PDC-L))}$$

Where:        H = the day's high price  
                   L = the day's low price  
                   PDC = the previous day's closing price  
                   abs = absolute

$$\text{N is then computed as: } \quad \frac{\text{N} = (19 \times \text{PDN}) + \text{TR}}{20}$$

Where:        PDN = Previous day's N

The initial PDN is calculated as a simple average of the first 20 days of True Ranges in the beginning of the price series.

"N" then is used by the Turtles as a measure of volatility to place protective stops and exits. It is also used in an algorithm for position sizing that the Turtles used to determine order size and for diversification purposes. This paper is interested in the predictive power of the trading system and uses "N" for stops and exits. Position sizing and diversification effects are of secondary interest and are therefore relegated to future inquiries.

The 20 day breakout system was referred to as System 1. If the price of a commodity they traded exceeded the price for the previous 20 days, it was purchased. A buy order (limit order) was placed if the price exceeded the previous 20 days by 1 tick. The turtles did not wait until the close or until the next day's open. The converse was also true. If the price of the commodity was lower than the previous 20 days by just 1 tick, a sell order (again a limit order) was placed.

The exception to this rule was that if the previous 20 day signal was a profitable signal (whether or not it was taken) then the current signal was to be ignored. So, buy/sell signals were only taken if the previous signal had been an unprofitable one.

The System 2 was based on a 55 day breakout. System 2 was called the failsafe signal. If the previous signal was skipped because the signal prior to that was profitable, and the 55 day signal was triggered, the order would be placed regardless of the previous signals.

All orders filled were protected by stops (mental stops as opposed to market stop orders). The stops were placed 2 N above sell orders and 2 N below buy orders. These 2 N protective stops are referred to as "N-Stops" throughout the paper. The Turtles used the mental stops because at the time their positions were obvious to other traders in the market because of the size of the orders.

Once a signal was generated and a position established, additional orders in the same direction would be issued as the price moved  $\frac{1}{2}$  N in the appropriate direction. Each time an additional order was filled the stop for the overall position was also adjusted in the same amount; 2 N above (or below) the new position, as appropriate.

System 1 trades were exited if one of the following three occurred: 1 - a stop order was triggered, 2 - the daily price made a 10 day low for a long position or a 10 high for a short position, 3 - the contract was within 10 days of the Last Trading Day.

System 2 trades were similarly exited if: 1 - a stop order was triggered, 2 - the daily price made a 20 low for a long position or a 20 day high for a short position, 3 - the contract was within 10 days of the Last Trading Day.

The 10 and 20 day high and low exits explained above are incorporated into the model and referred to as "T-stops" or trailing stops (exits).

The primary purpose of this paper is to examine the performance of the "Turtle Trading" system and to attempt to isolate the successful and unsuccessful components of the system. Therefore, several different scenarios are possible for the utilization of the system. The breakout system can be employed with both N-Stops and T-Stops, with one or the other, or without stops altogether. The four different scenarios are all analyzed throughout the entire time period. Each scenario is contrasted to comparative investments in both the S&P 500 Index and U.S. Treasury Bills (T-Bills).

The models were programmed in Visual Basic for Applications which in turn utilizes Excel spreadsheet data. The programming creates a very powerful tool for research. Chandan Sengupta (2004) has written an excellent book on the subject.

#### IV. Data

The turtles, as trained by Richard Dennis, were allotted amounts of money ranging from several hundred thousand dollars to several million to trade. They were trained over a period of two weeks and were instructed in how to trade multiple markets to diversify their risk. But, they were not allowed to trade Soybean markets, because Dennis, himself, traded that market and the exposure for he and the group would be too large (Covel 2007) (Faith 2007). Dennis had purportedly made his legendary fortune in the Soybean markets. This, then, becomes an interesting starting point on which to examine the Donchian Breakout and Turtle Breakout system. The purpose of this study is to find whether the breakout system has merit and is warranted further study. If this is so, further research can be conducted to analyze the significance of trading other markets and combinations of those markets.

The model found the same percentage returns whether \$5,000 or some amount larger was used as a starting point. If \$2,000,000 is used, as some of the Turtles began with, the percentage results are the same, only the dollar amounts are larger. Since most investors do not start with

\$2,000,000, we asked the system to compute the minimum amount necessary for the system to be successful. Surprisingly, \$5,000 was an adequate amount to fund the system. Less than \$5,000 and the system went broke.

The Grain Products traded on the Chicago Board of Trade are some of the oldest traded commodities in the United States. Soybean contracts are one of the most important and well followed of the grain contracts. This commodity is highly dependent upon weather as well as supply and demand forces. If a financial product is subject to long trends in market price, it may be a product such as soybeans. The primary months of activity are January, March, July and November. The models are tested on daily data for those months from January 1980 through January 2007. 109 contracts are examined over 27 years. The most liquid (*front*) months are used for the tests and there is no overlap of daily prices for the contract months traded. The front month during each quarter is used for the data source. The closing daily price is used for the entry price. The exit prices are recorded as signaled. Because all trades occur in the front, most liquid contracts, slippage is assumed to be a minor effect.

Futures trading by nature, involves the use of leverage, so at no time could 100% of the capital be employed. One adverse day could result in the failure of the account. The Turtles were instructed to allot no more than 2% of their account to any one position. This is an indirect method of controlling risk. For the purpose of this study, the system was allowed to determine the amount of leverage that could be employed without jeopardizing the system's success. The system analyzed the performance of leverage from 0% to 100% with and without stops. The results indicate that the use of 20% leverage was adequate. The system employed up to 15% of the available capital in the account for the sale and purchase of the Soybean contracts. The margin on Soybean contracts fluctuates as the price in the market moves. Generally speaking, the margin ranges between 2 and 3 percent of the value of the contract. In 1980, for example, a starting balance of \$5,000 with 20% leverage would allow \$1,000 for the sale/purchase of one contract. This relationship is maintained throughout the study.

Transaction costs were ignored in this study. Once the profitability of these strategies is established, transactions costs can be included. Each contract, if open, is closed ten days before expiration of the contract.

## V. Analysis

Table I shows the results for the Trading System for the four scenarios.

### (Table I – Summary for Four Trade Systems.)

A trader or speculator is recognized to be a risk taker. These investors need to be rewarded for the risk they bear. One comparison that may be made is between the speculative investment and a relatively risk free investment. Lukac and Brorsen (1990) demonstrated that there is no correlation between futures or derivatives trading and the stock market (with the exception of stock market index futures contracts and perhaps single stock futures contracts). However, a correlation and relationship between the risk free rate, represented by 90 Day U.S. Treasury Bills, and the risky investment, in this case Soybean futures contracts can be examined. When a buy or sell signal occurs the trader can use his or her capital to make the trade, or alternatively, the speculator could buy a U.S. T-bill and hold it for the same period of time. Another option in lieu of taking a trade would be simply to invest (buy) in the S&P 500 Index for

the same period as the trade occurrence. Table I also provides the results from these alternative investments.

The system, utilizing 20 and 55 day breakouts combined with N-stops and T-stops is productive over the period in question. However, without the trailing stops, the system fails. The use of the trailing stop is critical to the success of the system.

**(Table II – Long Trade Results)**

Table II provides a closer inspection of the trade system from the long (buy) position. The system initiates 375 long positions of which 160 are profitable and 215 are not. The concept of risk management is again the critical focal point. The losing trades from the long side vary from -\$844.12 for the System with stops to -\$3,496.25 to the System with no stops. Minimizing the losses while allowing the profitable trends to run is one the key factors in play. The average profit of \$2,276.72 compared to the average loss of -\$844.24 offset the win ratio of less than 50%. Investors and traders should take note of this important point.

**(Table III – Short Trade Results.)**

Table III also corroborates the information provided in Table 2, except these trades are from the short (sell) side. The system generates 400 short positions of which 165 are profitable and 235 are not (for System with Stops). Again, controlling the risk and minimizing the losses are the critical factor for the success of the system. An average profit of \$1,042.35 offsets the average loss of -\$756.97.

**(Table IV – System Results.)**

Table IV provides some interesting and important information. The most profitable system, System with Stops, has a winning percentage of 41.94% of trades taken. The average profit on a trade is \$228.08. The resulting conclusion is that the success of the system is minimizing losses (controlling the risk) and accumulating profits over time.

The following charts provide a graphical representation of the results.

**(Figure I- System with Stops.)**

Figure I illustrates how the system performs over the 26.25 years that the data is tracked. On three occasions, 1983, 1988, and 2003 the system catches significant trend breaks. The rest of the time it appears to slightly trend downwards. The graph also illustrates how the system outperforms the S&P 500 and also T-Bills over the same investment periods.

**(Figure II - System No N-Stop.)**

Figure II illustrates the performance of the system without N-stops but still utilizing the T-stops. The performance is similar to that of the system in Figure I. The System without N-stops actually has a slightly higher rate of return, but also has increased volatility.

**(Figure III - System w/o Stops.)**

Figure III shows the System without any stops. The results are extremely volatile and the system underperforms the S&P 500 and T-bills beginning in 1986 and finally fails in 1988. The lack of stops usage fails to control the inherent volatility of the soybean prices and leads to the system's failure.

**(Figure IV - System No T-Stop.)**

Figure IV again demonstrates clearly the importance of stops in the success of the system. Without the trailing stops, the system fails in the first year. The N stops provided too much latitude for the volatility of the underlying commodity. The first major spike in the prices (positively or negatively) bankrupted the trading system.

**(Figure V - System Comparison.)**

Figure V provides graphical representation of the trading system with its different variations. The systems that utilize trailing stops for risk management control are the successful methods.

**Statistical Analysis**

The data were back-tested using our model via a back-testing simulation software application built using Visual Basic for Applications. The software was designed to read the three sets of data – Soybean Futures, S&P and T-Bill prices – one by one. First, the software used the Turtle System rules to determine appropriate entry and exit points for the Soybean Futures data, and calculated the returns generated thereof. Then, the software determined what alternate returns would have accrued if the same entry and exit points were applied to long positions in the S&P or the T-Bill data. In this back-testing process, investment opportunities in the first contract period are explored with a certain amount of capital in hand. Then, when this contract period ends, the then available capital is used to explore investment opportunities in the next contract period, and so on, till the end of the last contract period.

When back-testing, the simulation software makes it possible to include or not include the different kinds of Stops that may be employed. Thus, four different sets of back-tests were performed using varying combinations of inclusion for T-Stops and N-Stops, and the four are described in the table below. By employing the different permutations of Stops in different back-tests, we can determine the utility of the various kinds of Stops.

**(Table V – Backtests)**

The back-tests indicated that only under back-test # 1 and back-test #4 could on-hand capital be sustained till the end of the back-testing period. That is, when no Stops are used, or when no T-Stop is used, sustained losses lead to capital depleting and the trade system going bankrupt.

Back-test # 1 is the principal back-test we are concerned with because we wish to analyze the System with all Stops included. From the table below, Back-test # 1, the system return on

soybean futures yielded a much higher mean return than investing in T-Bills. All statistical analyses were performed using SPSS v12.

**(Table VI - Back-test # 1 Descriptives (Turtle System vs. T-Bills).)**

Next, a one-tailed independent samples t-test was conducted to determine whether the difference between the returns from the system return on soybean futures and comparative investment in T-Bills is statistically significant. The table below describes the t-test. The t-test results indicate that the returns from the trade system on soybeans are indeed significantly higher than returns from the T-Bills ( $p < 0.004$ ). The previous table also indicates that the standard deviation is quite different between the trade system on soybeans and the T-Bills results. Thus, this likely violates the equal variances assumption for t-tests. However there are two reasons why the results have high validity. Firstly, t-tests are robust to violations of the equal variances assumption when sample sizes are large (~ 100) as is the case here. And secondly, in the bottom row of Table VI below, are the results in the case that equal variances were not assumed, and these results are negligibly different from the actual t-test results.

**(Table VII - One-tailed Independent Samples t-test (Turtle System vs. T-Bills).)**

In Tables VIII and IX, similar analyses are produced (that were displayed in the Tables VI and VII), except in these cases returns from investing in S&P are compared to returns from T-Bills. Note that T-Bills yielded higher returns than S&P during the investment periods recorded.

**(Table VIII - Back-test # 1 Descriptives (S&P vs. T-Bills).)**

Next, Table IX indicates that this difference (in the returns between T-Bills and S&P) is not statistically significant ( $p < 0.44$ ).

**(Table IX - One-tailed Independent Samples t-test (S&P vs. T-Bills).)**

Table X contains a comparison of the returns from the two back-tests that produced positive capital for the entire length of contracts (i.e., Back-test # 1 and Back-test # 2). Tables X and XI display the descriptives that enable this comparison.

**(Table X - Back-test # 1 Descriptives.)**

**(Table XI - Back-test # 1 Descriptives.)**

The results of Back-test # 1 indicate that the returns from investing in the trade system in soybeans with Stops are significantly higher than the returns from the T-Bills and further, that there is no significant difference between the returns from investing in S&P and T-Bills.

The statistical software SPSSv12 is utilized to not only compile the basic statistics of return, variance and standard deviation, but the returns of the risky trading strategy are also compared to the risk free returns of the U.S. 90 Day T-Bill to ascertain whether the returns are justified in a traditional return-risk relationship.

The T-Bill is recognized as a proxy for the risk free rate of interest. This interest rate is also a basic building block in all interest rates of return. The risk free rate includes the real rate of return plus any anticipated inflation. All subsequent rates of interest in an economy must include the risk free rate and then include appropriate risk premiums. Many return risk analyses examining equity securities are framed in the Capital Asset Pricing Model (CAPM) structure. Lukac and Brorsen (1990) demonstrated that there is no correlation between equity markets and currency or futures markets, therefore the CAPM framework is not appropriate for the analysis of futures returns. The appropriate comparison is then between the risky returns of the futures trading system and the opportunity costs forgone in the riskless T-Bill.

The Sharpe Ratio is one appropriate measure of the return risk relationship. According to William Sharpe (Fama and Sharpe, 1994) "The historic Sharpe Ratio is closely related to the t-statistic for measuring the statistical significance of the mean differential return. The t-statistic will equal the Sharpe Ratio times the square root of T (the number of returns used for the calculation). If historic Sharpe Ratios for a set of funds are computed using the same number of observations, the Sharpe Ratios will thus be proportional to the t-statistics of the means."

The Sharpe Ratio is useful in comparing returns of varying volatility. Sharpe suggests that the ratio is useful in comparing returns over short periods, i.e. monthly return, and then annualizing the results over longer periods for comparison (Fama and Sharpe, 1994). The risky component of the respective returns is isolated separate from the risk free component. Table XII compares the Sharpe Index of the Trading system to that of the S&P 500 over the same investment time periods.

#### **(Table XII- Sharpe Index Ratios.)**

The results of both systems with stops provide higher Sharpe Ratios than the alternative investment in the S&P 500. The statistics indicate that not only do the Trading Systems utilizing stops have higher returns that are significantly different from the returns available from either a risk free approach of U.S. T-bills or that obtainable from an investment in the S&P 500, but also that those returns are also significant from a risk adjusted perspective.

#### **VI. Conclusion**

This paper analyzes the breakout systems based on the work of Richard Donchian and trend traders like Richard Dennis and the Turtles. Data from over twenty seven years from 1980 until early 2007 is filtered through a program created on with VBA programming for Excel.

The key goals of this research were to understand how the Turtle Rules can yield a profitable trading strategy in a highly volatile and risky commodities futures market such as Soybean futures. This research project produced several statistically significant findings. First, when applied over the period in consideration, Turtle Rules indeed yield a positive annual rate of return (14.67% compounded) over the more than 27 year period. An initial capital amount of \$5,000 in 1980 grows to an ending capital amount of \$181,762.50 in 2007. The research also evaluates the efficacy of the two kinds of stops used in the Turtle Rules. T-stops are revealed to be critical to the success of the system with soybean futures. However, the N-stops are problematic. N-stops seem to work in conjunction with T-stops, but apparently are not successful in managing risk without the additional contribution provided by the T-stops. Future research could examine the conditions under which N-stops are effective.

This return is dampened somewhat when considered in the context of several factors. The returns are highly volatile (leading to greater risk), and as illustrated in Figure I, most of the gains occur in three short time-frames (1982-83, 1987-88, 2002-2003) within the entire examination period. Nevertheless, it is notable that at no time does the amount of available capital dip below the initial starting capital. Since historical prices have no discernable relationship to future prices, the replication of these returns in the future may be suspect.

The analysis uses a modified version of the original Turtle rules. It is a best fit based on the data available. One improvement to the analysis would use actual intra-day tick data for the entire period considered. Such data is difficult, if not impossible to obtain for such a long time period.

With Soybean futures, the Turtle Rules system patiently waits for high gain opportunities while minimizing losses during barren times.

The test results indicate the returns are significant from a statistical and a risk adjusted analysis. Trend trading with channel breakouts is experiencing renewed interest by the investing public. It is important that researchers investigate the validity of such a strategy.

The returns generated require a risk tolerance that may be beyond that of most investors. More importantly, even the study of 27 years of data and hundreds of ex post trades may provide little real guidance to the ex ante returns generated by today's volatile markets. However, producers of soybeans and end users of the product may be able to better hedge their exposure to uncertainty by employing the system explained in this paper. Users of the underlying commodity seek to manage the risk of the price uncertainty inherent in this, one of the most volatile products traded. The use of Trend Trading or Turtle Trading to offset the uncertainty of uncertain pricing may prove to be its most important product.

Future research combining this system with other important filters such as other technical signals or fundamental analyses could indeed make the results more robust and certainly worthy of future investigation.

The Turtle Rules trading system cannot predict when significant trends will occur. However, consistent application of the trading system can minimize the risk involved and be in position to capitalize on a significant trend when it does occur. So after all, it does appear that "Turtles" may have fat tails.

**Tables and Figures****Table I – Summary for Four Trade Systems.**

Summary Statistics			
Trade System	Stops	T-Bill	S&P Index
Beginning Amount	\$5,000.00	\$5,000.00	\$5,000.00
Profit	\$176,762.50	\$2,052.18	\$1,472.07
End Amount	\$181,762.50	\$7,052.18	\$6,472.07
APR	14.6698%	1.3187%	0.9879%

Trade System	No N Stop	T-Bill	S&P Index
Beginning Amount	\$5,000.00	\$5,000.00	\$5,000.00
Profit	\$198,412.50	\$2,383.11	\$3,034.57
End Amount	\$203,412.50	\$7,383.11	\$8,035.47
APR	15.1624%	1.4959%	1.8233%

Trade System	No T Stop	T-Bill	S&P Index
Beginning Amount	\$5,000.00	\$5,000.00	\$5,000.00
Profit	-\$7,362.50	\$2,052.18	\$1,472.07
End Amount	-\$2,362.50	\$7,052.18	\$6,472.07
APR	N/A	1.3187%	0.9879%

Trade System	No Stops	T-Bill	S&P Index
Beginning Amount	\$5,000.00	\$5,000.00	\$5,000.00
Profit	-\$7,750.00	\$1,630.85	\$1,472.07
End Amount	-\$2,750.00	\$6,630.85	\$6,472.07
APR	N/A	3.2788%	2.9932%

**Table II – Long Trade Results**

Trade System	Stops	No N Stop	No T Stop	No Stops
Max Contracts	17	17	8	16
Max Capital Used	\$12,750.00	\$12,750.00	\$6,000.00	\$12,000.00
# Long Wins	160	152	1	23
# Long Losses	215	218	6	30
# Longs	375	370	7	53
Long Gross Profit	\$364,275	\$412,050.00	\$5,125.00	\$107,875.00
Long Gross Losses	-\$181,512.50	-\$205,850.00	-\$10,650.00	-\$104,887.50
Net Profit (Longs)	\$182,763	\$206,200.00	-\$5,525.00	\$2,987.50
Max Long Win	\$12,387.50	\$14,275.00	\$5,125.00	\$10,362.50
Max Long Loss	-\$3,275.00	\$4,275.00	-\$3,275.00	-\$10,700.00
Ave Long Win	\$2,276.72	\$2,710.86	\$5,125.00	\$4,690.22
Ave Long Loss	-\$844.24	-\$944.27	-\$1,775.00	-\$3,496.25
Max Long Win (Days)	57	57	6	85
Max Long Loss (Days)	32	32	18	83
Min Long Win (Days)	1	1	1	1
Min Long Loss (Days)	1	1	1	1

**Table III – Short Trade Results.**

Trade System	Stops	No N Stop	No T Stop	No Stops
# Short Wins	165	159	5	21
# Short Losses	235	226	1	18
# Shorts	400	385	6	39
Short Gross Profit	\$171,987.50	\$164,525.00	\$2,862.50	\$23,800.00
Short Gross Losses	-\$177,887.50	-\$172,312.50	-\$87.50	-\$34,537.50
Net Profit (Shorts)	-\$5,900.00	-\$7,787.50	\$2,775.00	-\$10,737.50
Max Short Win	\$5,525.00	\$4,400.00	\$1,125.00	\$3,937.50
Max Short Loss	\$4,625.00	\$3,325.00	-\$87.50	-\$18,162.50
Ave Short Win	\$1,042.35	\$1,034.75	\$572.50	\$1,133.33
Ave Short Loss	-\$756.97	-\$762.44	-\$87.50	-\$1,918.75
Max Short Win (Days)	45	45	18	84
Max Short Loss (Days)	22	24	3	82
Min Short Win (Days)	1	1	1	1
Min Short Loss (Days)	1	1	1	1

**Table IV – System Results.**

Trade System	Stops	No N Stop	No T Stop	No Stops
Winning Percentage	41.94%	41.19%	46.15%	47.83%
Average Profit/Trade	\$228.08	\$262.80	-\$566.35	-\$84.24

**Table V - Backtests**

Backtest #	T-Stop	N-Stop
1	Included	Included
2	Not Included	Not Included
3	Not Included	Included
4	Included	Not Included

**Table VI - Back-test # 1 Descriptives (Turtle System vs. T-Bills).**

	N	Mean	Std. Deviation	Std. Error Mean
Return per contract (%) Turtle System	104	6.74	36.85	3.61
Return per contract (%) T-Bills	109	0.32	0.37	0.04

**Table VII - One-tailed Independent Samples t-test (Turtle System vs. T-Bills).**

	t	df	Sig. (1-tail)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Upper	Lower
Equal variances assumed (t-test)	1.8 2	211	<b>0.004</b>	6.43	3.53	-0.53	13.38
Equal variances not assumed	1.7 8	103	0.004	6.43	3.61	-0.74	13.59

**Table VIII - Back-test # 1 Descriptives (S&P vs. T-Bills).**

	Code	N	Mean	Std. Deviation	Std. Error Mean
Return per contract (%) S&P	2	108	0.28	2.75	0.27
Return per contract (%) T-Bills	3	109	0.32	0.37	0.04

**Table IX - One-tailed Independent Samples t-test (S&P vs. T-Bills).**

	t	df	Sig. (1-Tail)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Upper	Lower
Equal variances assumed	-0.15	215	<b>0.44</b>	-0.04	0.27	-0.57	0.48
Equal variances not assumed	-0.15	110	0.44	-0.04	0.27	-0.57	0.49

**Table X - Back-test # 1 Descriptives.**

<b>withStops</b>				
	N	Mean	Std. Deviation	Variance
Return on System minus Risk Free Rate	104	6.43	36.72	1348.50
Return on S&P minus Risk Free Rate	108	-0.04	2.81	7.89
Valid N (listwise)	103			

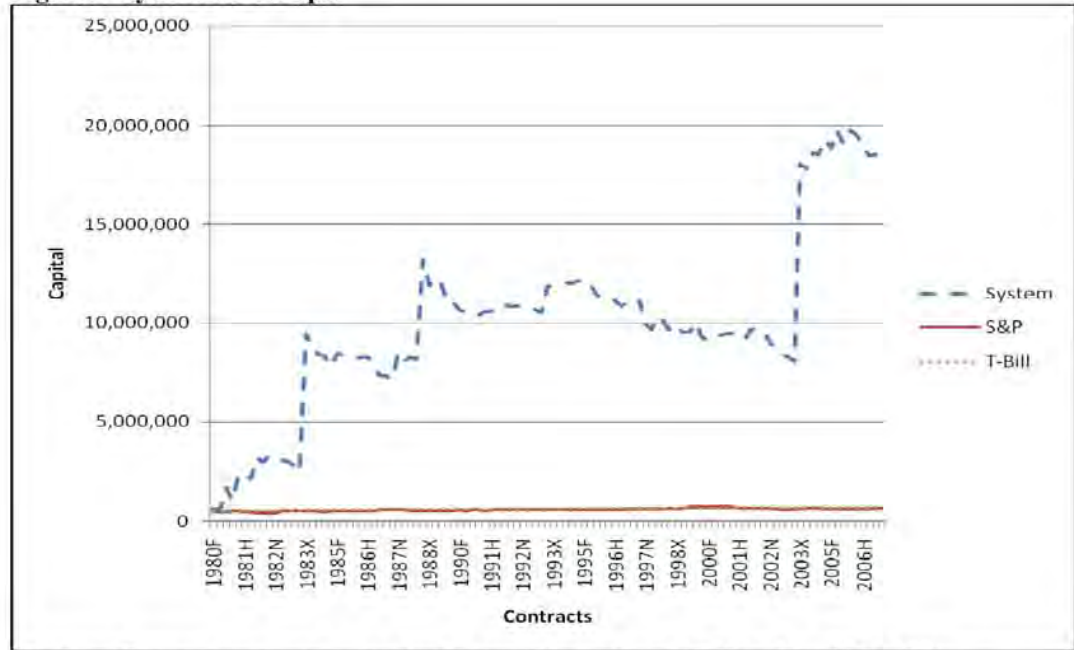
**Table XI - Back-test # 1 Descriptives.**

<b>no NStop</b>				
	N	Mean	Std. Deviation	Variance
Return on System minus Risk Free Rate	103	6.93	39.11	1529.83
Return on S&P minus Risk Free Rate	108	0.13	3.18	10.11
Valid N (listwise)	102			

**Table XII- Sharpe Index Ratios.**

	Sharpe Ratio
<b>System with Stops</b>	
Return on System without Risk Free Rate	0.1750
Return on S&P without Risk Free Rate	-0.015
<b>System no N-Stop</b>	
Return on System without Risk Free Rate	0.17708
Return on S&P without Risk Free Rate	0.03974

**Figure I- System with Stops.**



(Soybean futures contracts are priced in cents/pound, eg. 25,000,000 = \$250,000)

Figure II - System No N- Stop

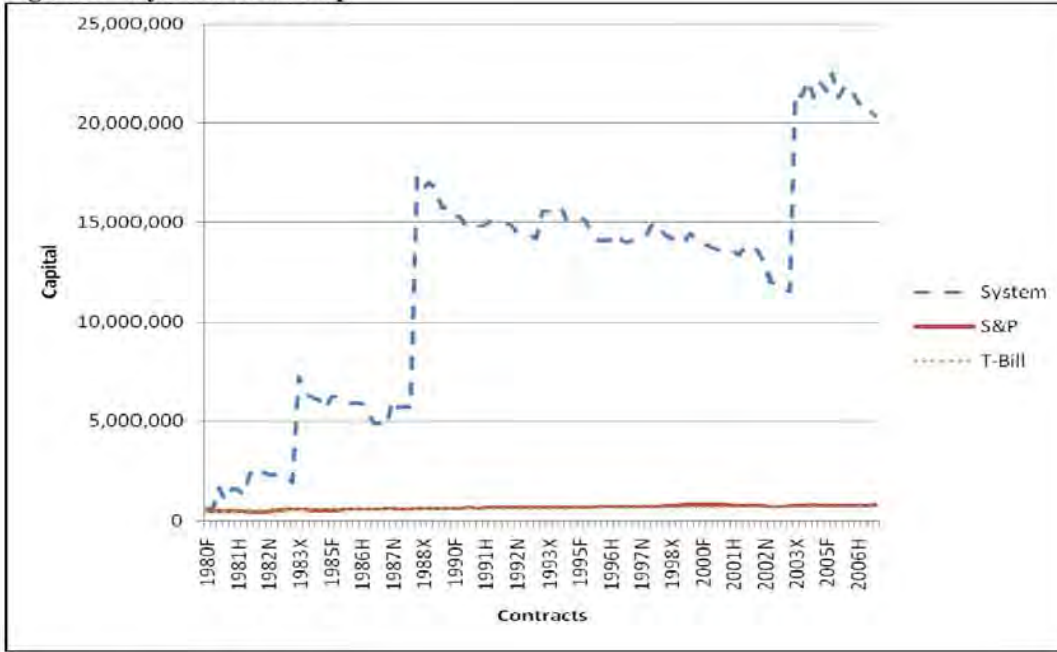
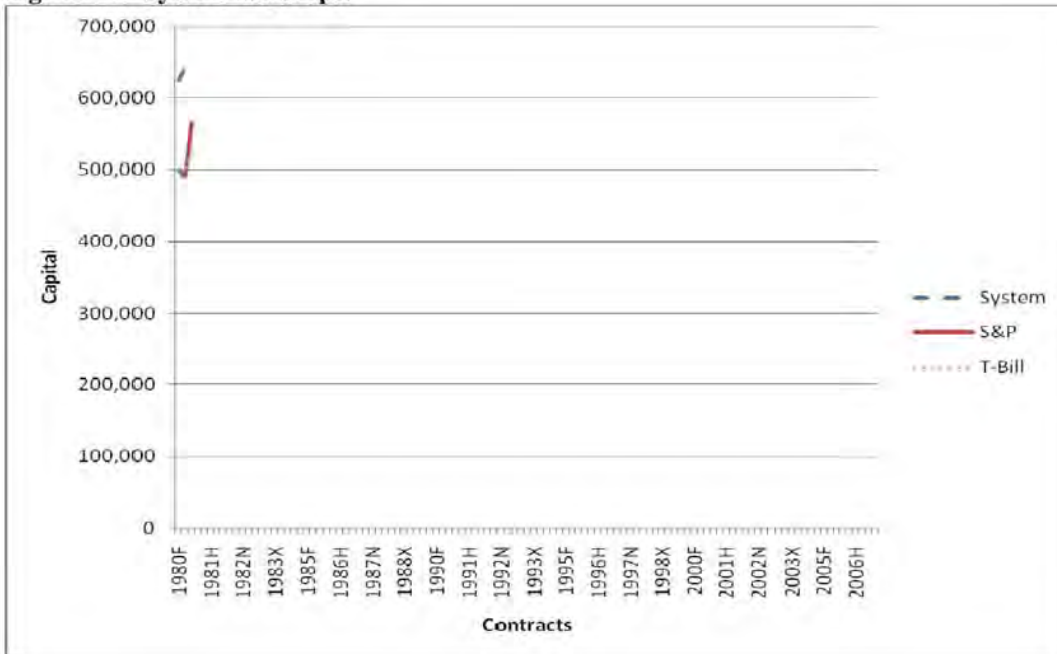
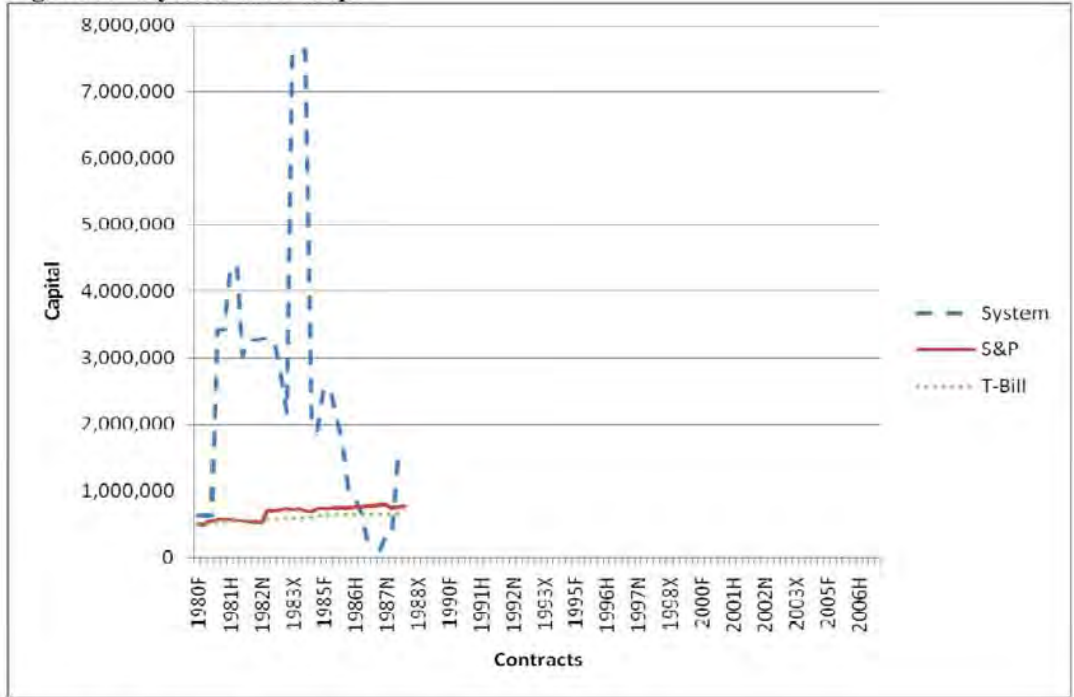


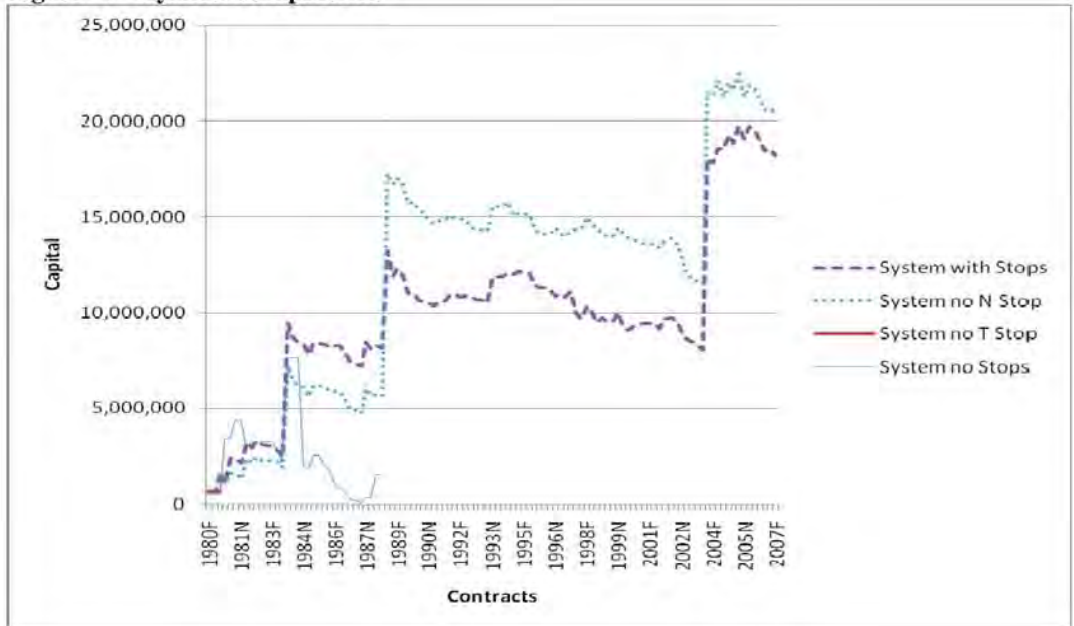
Figure III - System w/o Stops.



**Figure IV - System No T-Stop.**



**Figure V - System Comparison.**



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## **Can We Improve Student Performance in the Introductory Business Finance Course?**

Robert L. Howard and Alonzo Redmon

### **Abstract**

Successful completion of the introductory business finance course is a requirement in most undergraduate business programs. Prior research suggests that it is possible to develop a predictive model of academic performance in this course so that students likely to experience difficulty in business finance can be identified before the course begins. The purpose of this study is to evaluate several activities that might be beneficial to students identified as likely to have difficulty in the course. The results of this study suggest that extraordinary efforts by the instructor to improve the performance of poor performing students produce marginal results.

### **I. Introduction**

This paper is a continuation of research reported by Howard and Redmon (2006) on the determinants of academic performance in the introductory business finance course. There was interest at the university where the research was performed with improving the university's graduation rate. It was noted that 1) earning a grade of C or higher in the introductory business finance course was a graduation requirement for most of the students in the School of Business and Economics; 2) there was a high degree of nonsuccess in the course; and 3) some students did not graduate because they did not successfully complete the course. Thus, improving performance in the business finance course would lead to an increase in the university's graduation rate. The introductory business finance course had been identified as one of the courses at the university where the nonsuccess rate was 30% or higher, where nonsuccess was identified as earning a grade of F (failure), I (incomplete), or W (withdrawal).

In developing models of performance in business courses, researchers have found a variety of factors that are statistically related to student success in the courses examined: experience with personal computers, cumulative grade point average, grades in accounting, economics and mathematics courses, hours of employment, SAT and ACT scores, and transfer status. The Howard and Redmon (2006) study extended the literature in a very significant way: it developed a predictive model of academic performance in the business finance course, and then using that model a determination was made of which students were likely to experience difficulty in the course. We are aware of no other study where the models developed were then used to predict student performance (in another group of students that were not used to develop the model) so that students likely to experience difficulty in the course could be identified.

It is not sufficient to identify those students likely to perform poorly in the course and simply report those findings in a research report; there should be some remediation efforts extended by the instructor so that student performance might be improved. The purpose of this study is to extend the literature even further by evaluating extraordinary efforts by the instructor

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to assist those students identified as likely to experience difficulty in the business finance course. The model developed by Howard and Redmon (2006) was applied to a new group of business finance students, final grades were predicted for all students in the course, and special attention was extended by the instructor to assist those students who were predicted to receive a grade of D or F in the course.

## II. Literature Review

Several researchers have evaluated the factors that determine academic performance in the introductory business finance course. Ely and Hittle (1990) found that experience with personal computers, the student's major, and success in the finance prerequisite courses were significantly related to success in the finance course. The years of high school math, the level of high school math, the grade in college calculus, and the number of hours of work were also tested but found to be insignificant. On the other hand, Didia and Hasnet (1998) found that grades in mathematics were significantly related to performance in the introductory business finance course. Age, cumulative grade point average, and grades in beginning accounting and economics were also positively related to course performance. Chan, Shum, and Wright (1997) found that class attendance was marginally related to success in the finance course and that a mandatory attendance policy did not improve performance.

In an analysis of performance in an introductory marketing course, Borde (1998) found a positive correlation between GPA and course performance, and a negative relationship between hours of employment and course performance. Students who transferred from a community college did not perform as well in the marketing course as did nontransfer students.

Performance in cost accounting was evaluated by Kirk and Spector (2006). They found that grade point average and performance in managerial accounting and in the first statistics course were positively related to performance in cost accounting. They also looked at sequencing of courses and found that students performed better in cost accounting if they had completed Intermediate Accounting I, and that accounting students performed better in the introductory business finance course if they had completed cost accounting.

Performance in the introductory economics course was evaluated by Okpala, Okpala, and Ellis (2000) and by Ballard and Johnson (2004). Okpala, Okpala, and Ellis found that students who possessed a high degree of confidence in their school performance and who had well-defined study strategies performed better in the economics course; grade point average and SAT scores were also positively related to course performance. Ballard and Johnson found that ACT scores and whether or not the student took calculus were positively related to success in economics.

Another impact on the grades of college students was employment. One of the studies in this area was by Jeffrey DeSimone (2008). It was found that full time employment in fact reduced the grades of the student. The effects were stable across time, gender, class, and age. However, the effects did vary by health status, maternal schooling, religious background and especially race/ethnicity. A second study by Arano and Parker (2008) also looked at the effects of student work on academic performance. The results of the study were that student employment did hurt the grades of freshmen students. For upperclassmen, the negative effect on

grades only showed up after working longer hours. The negative effect on grades was weakest among juniors, followed by seniors and sophomores.

The study by Howard and Redmon (2006) forms the basis for this current study. The details of our study are shown below.

### **III. Data and Methodology**

We conducted this study at a mid-sized state-supported university located in North Carolina. One of the schools at the university is the School of Business and Economics, which offers majors in accounting, business education, finance, management, management information systems, marketing, business economics, general economics, and transportation. The school, which has an enrollment of approximately 1500 students, is made up of four departments: accounting, business administration, business education, and economics/transportation. The accounting and business programs of the school are accredited by the AACSB International – the Association to Advance Collegiate Schools of Business; this is the premier accrediting agency for academic programs in business and accounting.

The university attracts students ranging widely in age, academic ability, economic status, and motivation. The business finance course is required for all majors in the School of Business and Economics except students majoring in general economics. Students majoring in accounting, finance, and management are required to earn a grade of C or higher in the course. Virtually all of the students taking the course are business students; rarely will there be a student with another major taking the course as an elective.

Our initial data consist of students who took the introductory business finance course in their curriculum and graduated in December 2003, May 2004, or December 2004. There were 213 students who were graduated during that period. After correcting for missing data, the sample size was reduced to 143. Much of the missing data was due to transfer students who took some of the courses used as explanatory variables in this study at other institutions. As noted, some studies have found transfer status to be significantly related to course performance. There is also a perception that community college transfers are not adequately prepared for university level courses, and thus do not perform as well as non-transfer students (Didia and Hasnat, 1998). Thus, this dichotomous variable was tested separately using all 213 students.

Regression analysis is the methodology used in this study. This statistical procedure is consistent with the methodology used in the studies reviewed above. Simple and multiple linear regressions were used to determine the relationship between the dependent variable, grade earned in the introductory business finance course and the explanatory variables. Five separate regressions were used in this study, with different explanatory variables, to avoid the problem of multicollinearity. A list of explanatory variables is given in Table I.

The first set of regressions included gender, high school grade point average, the verbal SAT score, and the math SAT score as explanatory variables. Using the SAT score is consistent with the review of studies reported by Gehring (2001) in which SAT scores were used to predict overall college performance. It is also consistent with Okpala, Okpala, and Ellis (2000) and Ballard and Johnson (2004) who used SAT scores and ACT scores, respectively, in predicting

performance in introductory economics courses. The present study converted ACT scores into SAT equivalents using a standard transformation formula. The dichotomous variable gender was coded 1 for males and 0 for females. Gender was also included in two of the studies reviewed above. There is some evidence that females might outperform their male colleagues: (1) a report recently released by the U.S. Department of Education indicated that there has been a steady decline in the academic performance of boys in elementary and high school (Freeman, 2004); on several assessments males performed lower than females; (2) the female graduation rate was higher than the male graduation rate in fourteen of the sixteen universities in the UNC system (Education Trust 2005); and (3) the authors of this study have noted that over the past several years students inducted into Beta Gamma Sigma, the business honorary society, have been overwhelmingly female.

The second set of regressions included the student's grade point average prior to taking the business finance course and the number of semester hours attempted before taking the course. The hypothesis is that a student's grade point average before taking business finance would be a good predictor of their performance in the course. If a student has done well in other courses, it would be relevant to determine if their earlier performance is an indication of future performance. Further, it is hypothesized that students who attempted a large number of hours before taking the course may be at risk of performing poorly in that class. Students in the School of Business and Economics who follow their designated curriculums will take business finance during their junior year. Most students who take the course in the first semester of the junior year will have completed between 66 and 72 hours; those who take the course in the second semester will have completed between 81 and 88 hours. A substantially larger number of attempted hours is an indication of courses repeated because of withdrawals or low grades in those repeated courses.

The third set of regressions included the average grade in the two required English courses and the average grade in college algebra and calculus. These courses are taken in the student's freshman year. Using math courses to predict future performance in quantitatively oriented courses (such as business finance) is consistent with the work of Ely and Hittle (1990) and Ballard and Johnson (2004). It does seem logical that performance in math courses would be an indicator of performance in business finance. Using the English variable as an explanatory variable is consistent with the fact that writing skills are important for performing well on essay exams and preparing reports in the business finance course. Although business finance is a heavily quantitative course, there are qualitative concepts that are related to skills learned in English courses.

The fourth set of regressions included the grade earned in business communications (basically a writing course), the average grade in the two required statistics courses, the average grade in micro and macro economics, and the average grade in the two required accounting courses. These courses are taken in the sophomore year. The rationale for using the business communications course as a predictor of performance in business finance is similar to that indicated above for English courses. Although none of the studies mentioned earlier used statistics as a predictor, the two statistics courses are quantitative courses and considering the earlier hypotheses, should be analyzed as a predictor of performance in the business finance course. The justification for the economics variable as an explanatory variable for performance

in business finance is that finance is a subset of economics and therefore performance in economics courses may be a good predictor of a student's performance in business finance. Perhaps the most logical explanatory variable for business finance is accounting since understanding some of the material in the business finance course requires specific knowledge taught in accounting.

The fifth set of regressions tests whether transfer students perform as well as nontransfer students in business finance. This variable was also used in the Didia and Hasnat (1998) and Borde (1998) studies. Transfer status is important to study since there is some perception that transfer students underperform nontransfer students. This dichotomous variable was coded 1 for transfer students and 0 for nontransfer students.

Other studies have included explanatory variables such as number of hours working, participation in extracurricular activities, class attendance, number of hours spent studying, and experience with personal computers. We decided to use variables that are already available to advisors and instructors prior to the beginning of class, rather than these other variables that are not readily available without discussion with the students. If an advisor knows which advisees who are planning to take business finance are at risk of performing poorly, based on the known explanatory variables, the student can be offered pointed advice that may result in better performance in the courses. Similarly, if an instructor knows the background of his students and the probability of their success in his course, based on known explanatory variables, he may be in a better position to help meet their needs.

#### **IV. Results**

The variables used in the study are listed in Table I and the regression results are shown in Table II through Table VI. With the exception of Regression 5, the F-statistics indicate that the null hypothesis that the regression coefficients are jointly equal to zero can be rejected at the .01 level of significance. The overall fits, as measured by  $R^2$ , are good for the first four sets of regressions.

In Regression 1 (see Table II), the grade earned in business finance was regressed against the gender of the student, the student's verbal and math SAT scores, and the student's high school grade point average. The student's high school grade point average was significant at the .01 level and the math SAT score was significant at the .10 level. Neither gender nor the verbal SAT score was significant in predicting performance in the business finance course. These results suggest that skills, study habits, and motivation demonstrated in high school may carry over into the college classroom.

In Regression 2 (see Table III), the grade earned in business finance was regressed against the student's grade point average before taking the business finance course and the number of hours the student attempted before taking the business finance course. Grade point average was positively related to course performance and the number of attempted hours was negatively related to course performance; both were statistically significant at the .01 level. Cumulative grade point average may reflect attitude toward learning, motivation, an environment conducive to learning, and ultimately, mastery of course content. These factors are reflected in performance in the business finance course. The negative relationship between the number of

attempted hours and performance in business finance suggests that students who have attempted a large number of hours before taking the course are at risk of performing poorly in the course; the fewer the number of hours taken before business finance, the better a student will perform.

In Regression 3 (see Table IV), the grade earned in business finance was regressed against the average grade received in the two required English courses and the average grade received in college algebra and calculus. As shown in the significance column, the math variable was statistically significant at the .01 level but the English variable was not statistically significant. It is logical that the math courses would be significant since the business finance course is heavily quantitative.

In Regression 4 (see Table V), the grade earned in business finance was regressed against the grade received in the business communications course, the average grade received in the two required statistics courses, the average grade received in the two required accounting courses, and the average grade received in the required micro and macro economics courses. The statistics and economics variables are statistically significant at the .05 level and the accounting variable is significant at the .01 level; the business communications variable was not statistically significant. It is logical that the statistics courses would be significant because the business finance course is quantitative and students who perform well in statistics would be expected to do well in business finance. Further, since finance is a subset of economics, it is logical that a student's performance in economics would be an indicator as to their performance in business finance. The strong significance of accounting is expected since some of the material taught in accounting is used directly in business finance. Students who have not mastered the relevant accounting concepts are not likely to perform well in finance. The insignificance of the business communications variable here, and the insignificance of the average grade in English courses and the verbal SAT score in previous regressions, is somewhat puzzling. It appears that students who possess good writing and reading skills are no more likely to perform well in business finance than students whose skills in these areas are weaker.

In Regression 5 (see Table VI), the grade earned in business finance was regressed against whether or not the student was a transfer student. This variable is not statistically significant, indicating that transfer students perform as well in business finance as do nontransfer students.

In summary, we found the following variables to be positively related to performance in the introductory business finance course: high school grade point average, university grade point average before taking business finance, the number of hours attempted before taking business finance, the math SAT score, and grades earned in college algebra, calculus, economics, statistics, and accounting. Not statistically significant were gender, the verbal SAT score, transfer status, and grades earned in English and business communication.

## V. Testing the Model

The test of a model is whether that model can predict future results. After all, the purpose of this study is to assist teachers and advisors in identifying students who may encounter problems or difficulties when taking the introductory finance course. Therefore, it is not enough to look at the past and choose variables that explained past behavior. The model must be able to

predict future behavior reasonably well so those students who may encounter problems can be identified and helped.

To this end, the models, in this study, were tested on students in three sections of the introductory finance course for the fall semester of 2005. The number of students in the three sections was 70. However, due to missing data, in some of the models the number of students was less than 70. The coefficients from the first four regression models were applied to the student data to calculate a predicted grade for each student. The first four regression models were used because these models were statistically significant.

Table VII shows the results of the tests of the four models. The best results were obtained from regressions 1, 2, and 4, where 90% or more of the students' actual grades were either accurately predicted or were within one letter grade of the predicted grade. Overall, then, the ability of the models to predict students' grades within one grade of the actual grades was very high. Although, obviously, we would prefer that the model predict the exact grade 100 percent of the time, the results obtained in this study do provide teachers and advisors a powerful tool in identifying students who may have problems in the introductory finance course. By identifying those students who may have difficulty, both teachers and advisors can provide needed assistance prior to the student taking the introductory finance course

#### **VI. Developing a Remediation Procedure**

Since the regression models developed in this research are able to identify students likely to experience difficulty in the course, our next question is: Can we develop a procedure to assist those students in completing the course successfully? Models 1, 2, and 4 had the greatest degree of predictive accuracy; thus we decided to use them in the next phase of this study. These three models were applied to sixty-one students taking the introductory business finance course during the fall semester of 2007. Thirty of the students were registered in a class that met from 8:30 – 9:50 am on Tuesday and Thursday, and the other thirty-one students met from 1:00 – 2:20 pm on Tuesday and Thursday. The same material was covered in both sections, and the same instructor taught both classes.

Complete data were available for the calculation of predicted grades for each student on at least two of the three models. Since most of the students taking the course are required to earn a grade of C or higher in the course, we concluded that a student was at risk of poor performance in the course if any of the models predicted a grade of D or F. Using this criterion, three students were determined to be at risk of poor performance by all three models, eighteen were identified as at risk students by two of the models, and nine students were deemed to be at risk by at least one of the models. Thus, thirty students, about half of the students registered for the two classes, were predicted by at least one of the models to receive a final grade of D or an F in the course. (A grade of F was assigned to two students who registered for the course, never attended, and never withdrew; calculations for these students were not included in this study.)

It is these thirty students that are the focus of this investigation. Can we, as instructors, who know which students are likely to encounter difficulties in the course, design a set of intervention techniques that will salvage most of these students? And can the techniques be

applied in an unobtrusive manner so that the at risk students are not identified, either publicly or privately?

Our approach was to apply our intervention techniques to all of the students in each of the two classes, since a large portion of each class consisted of the targeted students. In one-on-one conversations with at risk students outside of class, advice was discreetly provided, but students were not informed of their at risk status. Beyond the normal instructional procedures employed by the instructor, the following intervention techniques were utilized in an attempt to improve student performance.

### **The “Junior Year Drop” Stressed**

Students in the School of Business and Economics take general education and lower level business courses (introduction to business, accounting, economics, and statistics) in the freshman and sophomore years; they begin their major program requirements in the junior year. The first semester junior courses normally include business finance, intermediate or managerial accounting, money and banking, management concepts, and management science. These courses are much more demanding than courses taken during the first two years. It is not uncommon for students with high grade point averages at the end of the sophomore year to earn lower grades in the junior year because of the more rigorous courses. Students were warned on the first day of the introductory business finance class that more work will be required in all of their junior year classes than had been the case in their previous courses. Students were warned that a drop in the grade point average during the junior year could be avoided if they recognized that their study habits might need to be revised.

### **Homework Problems Reviewed**

Problems were assigned daily for homework after quantitative topics had been discussed in class. The homework problems were graded, returned to students, and discussed in class. The concepts which formed the basis for the problems were reviewed again to ensure student understanding.

### **Concept Sheet Provided**

After an exam students have often complained that “I didn’t know what to study” or “I didn’t know what you expected.” To ensure that students knew what was expected of them, a list of key concepts was distributed to students on the first day of class. There is a “language of finance” that students must learn. The concepts and issues were discussed in class, and students were asked to be able to explain, discuss, or describe the concepts and issues, or to be able to answer questions about them in a multiple choice context. Students were informed that their examinations would be based on the quantitative topics covered in their homework assignments as well as the concepts listed on the concept sheet. Thus, there should be no question as to what they were expected to know for the examinations.

### **Schedule of Daily Activities Solicited**

Students today are not just “students;” many are involved in a host of other activities that consume their time. So that students can see exactly how their time is being spent on all of their commitments, they were asked to complete a “Daily Schedule” form. Columns on the form consisted of days in the week (Sunday – Saturday), and hours in the day (6:00 am – 2:00 am of

the following day) were in the rows. There was particular interest by the instructor in the time allocated to study for the business finance course. Students who were carrying a full academic load and who were participating in other time-consuming activities found it difficult to schedule sufficient study hours. Completing the form helped some of them realize the need to reevaluate some of their commitments.

### **Feedback Provided in a Timely Manner**

Students need to know where they stand in each of their courses at all times. Thus, every effort was made to provide prompt feedback to the students during the course. Homework problems submitted were graded and returned the next class period and exams were returned and reviewed two class periods after the exams were given.

### **Extra Classes Conducted**

Review sessions were held to provide additional assistance for students in the course. Concepts discussed in class were reviewed, additional problems were worked, and questions were answered. Most of the questions raised were related to homework and other problems. Review sessions were conducted by the course instructor and by another business finance instructor.

### **Office Hours Extended**

The dean of the School of Business and Economics requires that each faculty member post and observe ten office hours per week. These hours were printed on the course syllabus which was distributed on the first day of class. Students were informed that additional hours were being held and that they were welcome to come and discuss the course material.

### **Questions Encouraged**

It is important that students feel comfortable asking questions in class. Students were informed on the first day of class that questions were welcome in the class, that the instructor could be stopped at any time if a question arose, and that there was no “dumb” question. If a section of a chapter was unclear, students were asked to bring that fact to the attention of the course instructor so that additional clarity could be provided. Students were asked to do their part – to read the assigned chapter before class so that they would have some knowledge of what was to be discussed in class.

### **Current Business News Incorporated in Class Discussions**

A concerted effort was made to incorporate current business activities into the class discussions. There were numerous opportunities to relate recent business events to material discussed in class. To include active student participation in these discussions, students were encouraged to subscribe to (at the student discount rate) and read the Wall Street Journal.

### **Tutoring Lab for Basic Math Skills Provided**

Students in the School of Business and Economics are required to complete a college algebra course and a calculus course (each with a minimum grade of C) in the freshman year. However, it was evident in the business finance course (taken in the junior year) that some students had forgotten some of the basic math skills – for example, rounding properly, finding the percent of a number, changing a fraction to a decimal or a percent. It is apparent that

extensive use of calculators has become a crutch for some students. The School of Business and Economics provides a math lab with personal instruction for those students who need to improve their basic math skills. The lab is staffed several hours each week for student review.

## **VII. Remediation Results**

These are the techniques that were used in two sections of the introductory business finance course in an attempt to improve the performance of students who were identified as at risk of performing poorly by regression models developed earlier. Most of the techniques had been utilized previously but were intensified for these students. Our results were not encouraging. Of the thirty students who were the main focus of our attention, twenty-three either received a D, an F, or withdrew; those that withdrew had failed one or two exams prior to the deadline for dropping a course. Thus, in spite of our extra efforts, approximately 77% of the students expected to have difficulty were, in fact, not successful in the course. These students will of course have to repeat the course if they expect to earn their degrees.

Where do we go from here? What advice can we give to students that we know are expected to perform poorly? There are several factors that we can consider.

First, there are many students at the university who receive no financial support from their families and do not qualify for scholarships; they are supporting themselves with loans and employment. Most students who work full-time and attempt to carry a full academic load find it nearly impossible to perform well in all of their classes, especially during the junior year. It would be advisable for business finance instructors and advisors who find students in this situation to advise them very strongly to consider reducing their course load or the number of hours worked each week.

Secondly, some students do not know how to study – they do not know how to read a chapter in a textbook, how to take notes in class, or how to prepare for an exam. There are some techniques that successful students use, but other students have never learned them. Perhaps a study skills workshop could be offered at the beginning of each semester, and our at risk students could be encouraged to attend.

Thirdly, some students entering the introductory business finance course have a weak academic background and an inadequate foundation upon which to build. They have just barely managed to pass some of their earlier courses, and are confronted with courses that are more complex and more time-demanding. These students need strong academic advisors early in their college careers to assist them in improving their weak academic backgrounds, which may have been apparent from their high school records.

Fourthly, some students are highly motivated to learn while others seem to demonstrate a lack of a culture of academic achievement. Some students show a joy and excitement for learning; they want to excel, they ask penetrating questions, and they participate enthusiastically in classroom discussions. Other students enjoy the college life but academics are decidedly secondary. They are often tardy or absent from class, written assignments are too often prepared carelessly, and reading assignments are sometimes not completed. The following questions may be evidence of a lack of a culture of academic achievement: “Do I need to know that for the

exam?” “Can we have some extra credit?” “What do I need to get a C in this course?” “Can you reduce the amount of material covered on the exam?” “Would you tell us exactly what is going to be on the final exam?” Students who are highly engaged and who are interested in learning for the sake of learning would not generally ask questions of this type. See Jones (2007) for a discussion of creating a culture of academic achievement.

Fifthly, there is significant evidence that students' confidence and belief in themselves play a very important role in their academic success. Students with low self-esteem and little confidence in their academic ability may perform poorly in finance (and other courses) no matter what procedures the instructor attempts to implement. See Jones (2006) and Okpala, Okpala, and Ellis (2000) for a discussion of this issue.

Finally, some students may not have an appropriate combination of interest, motivation, aptitude, and prior experiences to perform well in an introductory business finance course. Some students may have a proclivity for success in electrical engineering; others may be more inclined to succeed in biology, art, accounting, or English literature. Success in business finance does require a certain level of motivation, aptitude, and background. For some students that are lacking in these areas, the best advice might be for them to consider a major that does not require a course in business finance.

### **VIII. Conclusion**

This paper is a continuation of a study that was designed to provide helpful information for advisors and faculty members teaching the introductory business finance course. Since the federal government requires that universities participating in the federal loan program report their graduation rates, there is great concern by university administrators with improving those rates. The introductory finance course is required by most of the programs in the School of Business and Economics; thus poor performance in this course has a negative impact on the university's graduation rate. The identification of students likely to perform poorly in the course and the application of appropriate measures to help them succeed would provide a valuable service to the students and to the university.

Models were developed which quite accurately predicted students' grades in the introductory business finance course. Students whose grades were predicted to be a D or an F became the focus of this study. Techniques were developed and applied to those students in an attempt to generate a successful outcome for them. These methods were not generally successful in improving the performance of students who were predicted to perform poorly. Of the thirty students who were deemed to be at risk, twenty-three did in fact receive a grade of D or F, or they withdrew from the course.

We suggest that there are three possible conclusions that can be drawn from these results:

1. Students at risk of performing poorly might be informed discreetly of our models and their status as predicted by the models. Such knowledge might encourage students to focus better, to reduce their employment hours, and to allocate more time to preparing for their classes. There might be an emergence of the attitude that “If you tell me that there is something that I cannot do, I will show you that I can do it.”

2. There may be some students who, no matter what techniques are implemented by the instructor, are not likely to perform well in the introductory business finance course. These students should be encouraged to pursue other majors that are more suited to their aptitudes and interests.

3. There may be other techniques that were not considered in this study which might improve the performance of the at risk students. We will attempt to find them and implement them in future classes.

What is the answer to our question: Can we improve student performance in the Introductory Business Finance Course? We answer with a resounding yes; yes, but there must be a combination of student commitment to excellence and instructor willingness to reach out to his students if the performance of the at risk students is to be improved. Techniques implemented by the course instructor can be successful only when there is cooperation between the instructor and his students; the course instructor cannot do it alone.

**TABLE I. Variables Used In The Study**

GBF: Grade in business finance  
 GENDER: 1=Male, 0 = Female  
 HSGPA: High School Grade Point Average  
 VSAT: Verbal SAT score  
 MSAT: Math SAT score  
 GPABBF: Cumulative GPA just before taking business finance  
 HRSBBF: Number of hours attempted before enrolling in the business finance course  
 AVACC: Average grade achieved in the first two accounting courses  
 AVENG: Average grade achieved in the first two English courses  
 AVMAT: Average grade achieved in college algebra and calculus  
 BUSCOM: Grade in business communication  
 AVSTA: Average grade achieved in the first two statistics courses  
 AVECO: Average grade achieved in micro and macro economics  
 TRANS: 1= transfer student, 0 = nontransfer student

**TABLE II. Regression 1**

**Regression 1**

$$GBF_i = b_0 + b_1GENDER + b_2HSGPA + b_3VSAT + b_4MSAT \quad (1)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-2.270	-3.421	.001
GENDER	-.104	-.529	.598
HSGPA	.869	4.340	.000
VSAT	.001	.739	.461
MSAT	.003	1.972	.051

$R^2 = .275$   
 F-Value = 13.093  
 Significance = .000

**TABLE III. Regression 2****Regression 2**

$$GBF_i = b_0 + b_1GPABBF + b_2HRSBBF \quad (2)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-1.025	-1.633	.105
GPABBF	1.306	7.875	.000
HRSBBF	-.007	-2.648	.009

$$R^2 = .443$$

$$F\text{-Value} = 55.674$$

$$\text{Significance} = .000$$

**TABLE IV. Regression 3****Regression 3**

$$GBF_i = b_0 + b_1AVENG + b_2AVMAT \quad (3)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-.172	-.445	.657
AVENG	.202	1.516	.132
AVMAT	.239	5.299	.000

$$R^2 = .260$$

$$F\text{-Value} = 24.551$$

$$\text{Significance} = .000$$

**TABLE V. Regression 4****Regression 4**

$$GBF_i = b_0 + b_1BUSCOM + b_2AVSTA + b_3AVACC + b_4AVECO \quad (4)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-.384	-1.559	.121
BUSCOM	.135	1.394	.166
AVSTA	.191	2.000	.048
AVACC	.458	4.111	.000
AVECO	.250	2.133	.036

$$R^2 = .494$$

$$F\text{-Value} = 33.697$$

$$\text{Significance} = .000$$

**TABLE VI. Regression 5**

**Regression 5**

$$GBF_i = b_0 + b_1 TRANS \quad (5)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	1.867	17.562	.000
TRANS	.256	1.501	.135

R<sup>2</sup> = .001  
 F-Value = .09  
 Significance = .765

**TABLE VII. Model Results**

	Regression 1	Regression 2	Regression 4	Regression 4
Number of students with complete data	69	70	58	39
Number (and percent) of Students Whose Grades Were Predicted Accurately	25 (36%)	33 (47)	12 (21)	19 (49)
Number (and percent) of Students Whose Grades Were Within One Grade of the Predicted Grade	38 (55%)	30 (43)	31 (53)	17 (43)
Number (and percent) of Students Whose Grades Were Either Accurately Predicted or Were Within One Grade of the Predicted Grade	63 (91%)	63 (90%)	43 (74%)	36 (92)

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## **Poison Pill Redemption: Evidence from the Commercial Banking Industry**

Elisabeta Pana

### **Abstract**

Poison pills adopted by commercial banks add another layer of complexity to an already intricate corporate governance mechanism of the banking industry. Using a sample of 164 poison pills adopted by commercial banks between 1984 and 2004, I show that the likelihood of redeeming a pill is a function of the level of capital and the economic conditions prevalent before pill adoptions. Poison pill adopters have similar characteristics with banks of similar size not protected by pills. Moreover, the average structure of the poison pills adopted by commercial banks seems to be less rigid than the structure of the pills adopted by non-financial companies.

### **I. Introduction**

It is widely accepted that the merger wave of 1980s was brought to an end by changes in the financial environment, new regulations initiated by policymakers, and the emergence of antitakeover defenses such as poison pills, also known as shareholder rights plans. The decade of the 1990s witnessed an increase in poison pill popularity and culminated with more than 2,200 companies across all industries having poison pills in force. Despite their widespread acceptance, poison pills have been subject to permanent litigation challenges. Court decisions, shareholder proposals, and independent director initiatives have led to a series of evolutionary changes on the poison pill structure or even to the demise of poison pills in some cases. More recently, the shareholder activism has led to an overall decline of the number of first time adopted poison pills.

The purpose of this study is to advance our understanding of the use of poison pills by investigating the adoption of the poison pills in the commercial banking sector. The special nature of bank takeovers makes the poison pill adoption by commercial banks the ideal empirical setting for testing two prevalent hypotheses: management entrenchment vs. shareholders' interest. On the one hand, bank takeovers are characterized as being "friendly" and not requiring defensive measures (Becher, 2000; Brewer and Jagtiani, 2008). Hostile banking takeovers are rarely undertaken and usually fail because the lengthy approval process gives targets enough time to develop additional defense measures (Brewer, Jackson, and Wall, 2006). Moreover, in several instances regulators have encouraged acquisitions of distressed banks in order to increase the overall financial stability. On the other hand, bank acquirers are willing to pay a high premium for mergers that allow them to attain the "too-big-to-fail" status (Brewer and Jagtiani, 2007). In this case, part of the bank merger premium is considered a low-cost insurance against bankruptcy.

This study contributes to the literature on takeover defenses in several ways. First, the examination of poison pill adopted by non-financial firms provides evidence on management and the shareholders' effort to balance the cost of deterrence and the benefit of added bargaining power associated with these antitakeover measures. The examination of poison pills adopted by commercial banks should mainly reveal the benefit of added bargaining power, as the need to deter hostile acquisitions is minimal. Second, the analysis of poison pill announcements and amendments in the banking industry avoids the misspecification arising from industry-specific

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antitakeover measures in the other sectors. Finally, the availability of financial data for privately held banks allows an investigation of the poison pill adoption by both publicly traded and privately held banks. Previous studies on the main characteristics of poison pill adopters have been limited to samples of publicly traded firms.

The results of this study indicate that poison pills adopted by commercial banks have a less rigid structure than those adopted by non-financial companies. The difference in the average poison pill structure reflects the fact that takeover activity in banking is less hostile than that of other sectors (Brewer, Jackson, and Wall, 2006). The empirical analysis reveals that poison pills adopted during economic booms by banks with a higher leverage are more likely to be redeemed. Based on these results, one can argue that poison pills are used by some commercial banks as a temporary antitakeover shield. The argument is strengthened by additional evidence that poison pill redemption is not necessarily triggered by merger and acquisition negotiations. The remainder of this study is organized as follows. The next section presents an overview of the extant theoretical and empirical literature and develops the testable hypotheses. Section 3 describes the sample and presents the results of the empirical analyses and the conclusions derived. A summary of the main findings concludes the study.

## **II. Previous literature and hypotheses development**

### **A. Previous literature**

As part of the ongoing debate on the use of antitakeover defenses, several empirical studies examine poison pill adoptions in the context of agency relationships. Several studies document negative stock price reaction around the poison pill adoption date, hence providing support for the managerial entrenchment hypothesis (De Angelo and Rice, 1983; Malatesa and Walking, 1988; and Ryngaert, 1988). In contrast, other empirical studies document insignificant stock price reaction around poison pill adoption announcements (De Angelo and Rice, 1983; Malatesa and Walking, 1988; and Ryngaert, 1988). More recently, the price reaction puzzle is explained by the fact that there are two indistinguishable components at work: the bargaining effect and the deterrence effect (Comment and Schwert, 1995). The negative wealth effect at the announcements of pill adoption shows that market overestimated the cost of deterrence and underestimated the benefit of added bargaining power. Comment and Schwert (1995) find support for the shareholder interest hypothesis, which suggests that poison pills are used in manners that benefit the shareholders by raising the takeover premium without hampering the takeover success. Using a large sample of unsolicited takeover attempts, Heron and Lie (2006) provide additional evidence supporting the shareholder hypothesis. According to their study, poison pills are associated with both higher takeover premiums and shareholder gains. The bargaining power benefits are associated not only with poison pills adopted before the takeover attempts but also with “morning-after” pills, adopted after firms received takeover offers.

In a recent study, Danielson and Karpoff (2006) show that poison pill adoption is followed by a period of better operating performance. However, the improvement in operating performance seems to be explained by factors other than a shift in policies due to pill adoption. Bebchuk (2002) and Danielson and Karpoff (2006) argue that the mixed evidence on poison pills efficiency justifies the middle-of-the-road policy regarding poison pills. The policy allows board of directors to adopt poison pills under the condition that pill can be breached in a takeover

situation. Fleischer and Sussman (2000) identify one of the three conditions that should govern the adoption process, as “the pill must be neither coercive nor preclusive and should represent a proportional response to a reasonable perceived threat”. At the time of adoption, the structure of the poison pill is determined by the general takeover environment and the firm’s strategic position within the industry. As a result, changes in structure of the poison pills over time should reflect changes in the takeover climate and firm’s characteristics. The efficiency of the poison pill as a measure against takeovers is based not only on the deterrent structural provisions at the date of the announcement, but also on the option to change these provisions<sup>1</sup>.

## **B. Hypotheses development**

The takeover climate in the banking industry has been greatly affected by the adoption of the Riegle-Neal Act of 1994. Fully implemented in June 1997, the Riegle-Neal Act allows banks to consolidate existing out-of-state bank subsidiaries and acquire out-of-state banks or individual branches of banks. An extensive line of literature has identified acquirer and target financial attributes explaining the bank takeover probability and merger premium, while controlling for the impact of Riegle-Neal Act on the takeover activity. Hannan and Pilloff (2006) present two rationales explaining the positive relationship between a bank’s capital asset ratio and the likelihood of being acquired. The two hypotheses are built on the arguments that capitalization is an index of bank’s inability to diversify its assets and that the acquisition of a better capitalized target is one way to increase capitalization. According to the former argument, banks with less diversified assets need to maintain higher capitalization levels, thus being worth more to diversified acquirers than to current owners. The latter argument is built on the premise that banks with lower capitalization levels face regulatory pressure to increase capitalization. Therefore, banks with higher level of capital are more likely to be subject to merger offers by banks in need to adjust their capital to higher levels. Similarly, banks with lower capitalization are less likely to receive offers from potential acquirers, hence less likely in need of the antitakeover shelter provided by a poison pill. Thus:

Hypothesis 1: Banks with lower capitalization levels are more likely to subsequently redeem the poison pills.

I control for other bank characteristics documented to be significantly associated with the likelihood of takeover attempts and merger premium, such as profitability, revenue diversification, and size. Several empirical studies document the relationship between bank’s profitability and the likelihood of being acquired. Akhigbe, Madura and White (2004) and Hannan and Pilloff (2006) argue that the probability of a bank being acquired is higher for larger banks with lower return on assets. The main argument is that completed mergers allow the transfer of assets from owners who use them less efficiently to owners who can use them more efficiently. However, Hannan and Rhoades (1987) and Hadlock, Houston and Ryngaert (1999) do not find evidence that banks with lower profitability are more likely to be acquired. This may be due to the fact that the incorporation of a target with a low profitability would eventually prove to be a very expensive process, thus undermining the success of the merger. One of the factors associated with market perception of bank mergers is the revenue diversification, measured by the Herfindahl-Hirschman revenue index. The level of uncertainty linked to the bank activities is related to the revenue diversification. Santomero and Chung (1992) and Saunders and Walters (1994) argue that diversification leads to less volatile market returns, and thus to a reduction in risk. However, Demsetz and Strahan (1997) find that banks with very high

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<sup>1</sup> A brief description of some of the major poison pill provisions is presented in Appendix 1

level of diversification are riskier as they pursue riskier lending than less diversified banks. Finally, Shawki, Kilb and Staas (1996) find that smaller banks receive larger premiums. However, Hannan and Pilloff (2006) argue that “The relationship between a banking institution's size and its prospects for being acquired is a complicated one”. Based on the above mentioned arguments, one can make no inferences on the sign or the significance of the coefficient for the three control variables. Takeover decisions are based on the assessment of bank specific factors, as well as macroeconomic factors (Buch and De Long, 2004). Bernanke and Gertler (1989) argue that bank asymmetric information and agency costs are exacerbated by economic downturns, when the assessment of the creditworthiness of corporate borrowers becomes more difficult. The ability to raise capital for merger purpose is greatly reduced and the number of bank merger attempts is lower during economic slowdown. During such periods poison pill adoption may not be seen as a priority. Thus:

Hypothesis 2: Poison pills adopted during economic downturns are less likely to be redeemed.

### III. Sample and methods

The list of poison pill adoptions comes from the Thompson Financial Security database (Security Data Corporation-SDC- *Poison Pills*). Besides the adoption date, the SDC reports other information about the poison pill, such as amendment dates, names of issuers, main Standard Industrial Classification (SIC) codes, to mention a few. It also reports a brief description of each poison pill amendment and its expected impact. I select only poison pills adopted by domestic commercial banks (SIC 602, 617). The announcement date and other characteristics of the poison pill come from the SDC database. Only banks with complete annual data from the Reports of Condition and Income (“Call Reports”) are retained in the final sample. There are 164 adoptions during the period 1986 to 2004 that involved public and private banks. Only 42 banks subsequently redeem shareholder plans, while the remaining 122 banks choose to amend them, let them expire or renew them. While the average survival age of a poison pill adopted by a bank is around ten years, the pills redeemed survive for no more than seven years. However, due to an increased shareholder activism, poison pills adopted during the last decade are less likely to have a similar survival chance.

Table I presents the distribution of poison pills over the period 1986-1997 and 1997-2004. The popularity of poison pills during the late 1980s is not reflected by the poison pill adoption activity during the late 1990s. With respect to geographic distribution (Table 1) of the poison pill issuer, it is evident that the Midwest and the Southwest banks are underrepresented in the total sample. The Northeast banks dominate the sample of banks, with a large number of banks adopting poison pills in the late 1980s. The geographic distribution of the poison pill adopters might be explained by the fact that in the mid-1980s, some states formed regional compacts (i.e Northeast and Southeast compacts) that allowed mergers among banks within the same region but prevented banks headquartered outside the region from participating. It is worth noting that none of the poison pills adopted during the first years was still in force at the end of 2005<sup>2</sup>. This result is explained by the fact that most of the pills expired, while some others were redeemed. Although many of the poison pills adopted after 1995 were in force the end of 2005,

<sup>2</sup> The status of the shareholder plan is reflected by the data collected at the end of 2005. The results remain unchanged if the sample is limited to poison pills adopted during 1980s and 1990s to allow for a longer change in status period.

the structure of the pill was not very rigid. Provisions such as dead hand or the affiliation with staggered boards are not common for bank poison pills. The average structure of the poison pills adopted by commercial banks seems to be less rigid than the structure of the pills adopted by non-financial companies. More importantly, the average poison pill with subsequent amendments seems to survive no more than 10 years, the average life of the poison pill adopted by non-financial firms.

Several empirical studies have shown that the wealth distribution at the announcement of a takeover depends on the public status of the target firm (Faccio, McConnell, and Stolin, 2005; Mantecon, 2007). The differential wealth distribution is explained by the fact that private targets have less relative bargaining power than the public targets. Based on this argument, private banks should increase their bargaining power by adopting poison pills. However, the fact that only two commercial banks in the sample are private provides support to the public status argument put forth by Hwang (1993) and Mantecon (2007). They posit that target firms with high level of uncertainty have fewer solicitors because the information acquisition is more costly. In this case, private banks do not find the antitakeover deterrent effect of the poison pill to be beneficial. Public availability of financial information for private banks reduces to some extent the level of uncertainty usually associated with the private non-financial companies. However, privately held banks and privately held non-financial companies lack a public price and do not benefit from analysts' research.

In order to test the impact of bank capitalization at the end of the year prior to poison pill adoption on the decision to subsequently redeem the poison pill, I match all the banks in the sample with banks of similar size with no poison pill in place. I test for differences in performance and main characteristics of the poison pill adopters and the matched banks.

Then, I estimate the following regression equation:

$$Poison\ pill\ adoption_t = c_0 + c_1 * Equity\ capital\ ratio_{i,t-1} + c_2 * ROA_{i,t-1} + c_3 * Revenue\ Diversification_{i,t-1} + c_4 * Size_{i,t-1} + c_5 * Gross\ domestic\ product_{i,t-1} + e_{it} \quad (1)$$

where *Poison pill adoption* is a dummy defined as the 1 for poison pills subsequently redeemed and 0 otherwise, *Equity capital* is the amount of equity capital of the bank divided by total assets, and *ROA* is the return on total assets. For the second model, I use *ROE* as an alternative measure of profitability. *Gross domestic product* is the real gross domestic product, *Size* is the log of bank's total assets, and *Revenue Diversification* is the revenue Herfindahl-Hirschman index. Following Stiroh (2004), *Herfindahl-Hirschman index* measures the revenue diversification as follows:

$$HHI_{REV} = \left( \frac{NON}{NETOP} \right)^2 + \left( \frac{NET}{NETOP} \right)^2 \quad (2)$$

$$NETOP = NON + NET$$

where *NON* is noninterest income, *NET* is net interest income, and *NETOP* is net operating revenue. As Herfindahl-Hirschman Index (HHI) rises, the bank becomes more concentrated and less diversified. In contrast, a lower Herfindahl-Hirschman Index (HHI) characterizes banks that diversify by expanding the number and type of noninterest income activities. If the interest income and noninterest income activities are weakly correlated, the diversification strategy could result in an improved risk-return performance of the bank.

Table 2 reports the non-parametric test for the differences in performance one year before the poison pill adoption between the pill adopters and the banks without poison pills. The results indicate that poison pill adopters have similar characteristics with non-adopters of poison pills. Danielson and Karpoff (2006) show that poison pill adopters across different industries have a slightly lower operating performance than non-pill adopters. However, the significant difference in operating performance is restricted to the sample of poison pill adopted around mid-1980s. After 1986, poison pill adopters have similar or better performance than non-adopters for the year before adoption. Therefore, the characteristics of the sample of commercial banks with poison pills are in line with the characteristics of the larger sample of firms documented by Danielson and Karpoff (2006). Moreover, the data indicate that the characteristics of poison pill bank adopters have not changed over time. Following Danielson and Karpoff (2006), I test for the differences in bank characteristics between poison pill adopters and banks without poison pills for the period before the Riegle-Neal Act implementation. The results on panel B indicate that the characteristics of banks with pills adopted before the enforcement of the Riegle-Neal Act, in June 1997, are similar with those of the matched sample of banks. Overall, the univariate tests indicate that the characteristics of the poison pill adopters remain similar to those of the matched sample of banks.

Next, I investigate the differences between the sample of 42 banks adopters of poison pills that were subsequently redeemed and the sample of 122 banks adopters that choose not to redeem their poison pills. The results presented in Table 3 indicate that there are no statistical significant differences in terms of size, return on equity, or revenue diversification between the two groups of banks. However, the parametric and nonparametric tests reveal the banks with poison pills that are subsequently redeemed have, on average, a lower return on asset ratio (0.006) and a lower capitalization (0.066) than banks without poison pills. Commercial banks with poison pills in place may not be subject to takeover attempts because the process of incorporating a target with poor performing asset portfolio may jeopardizes the success of the merger. In this case, the benefit of being protected by a poison pill is minimal and the process of redeeming the pill comes as a natural choice. Similarly, lower capitalization can be seen as an antitakeover deterrent. The acquisition of a bank with a lower capitalization would result in a lower capitalization of the newly created entity and an increased regulatory scrutiny. Therefore, banks with a lower equity capital ratio for the year before the pill adoption are more likely to subsequently redeem the pills. The univariate results are supported by the results of the logistic regression. The coefficient of equity capital variable is negative and statistically significant. As stated above, lower capitalization increases the likelihood of subsequent poison pill redemption. The coefficient of return on asset is negative but statistically insignificant. Additionally, the results indicate that revenue diversification and size are not significant factors on the decision of subsequently redeeming the pill. The insignificant coefficient of revenue diversification variable suggests that diversification by expanding into lines of business generating noninterest income is not perceived as a takeover deterrent. This argument supports the recent empirical evidence of no improvement in bank performance associated with revenue diversification (Mercieca, Schaek, and Wolfe, 2007). Moreover, it may be possible that, for some banks, the increase in revenue diversification is motivated by managerial desire for empire building. As expected, the coefficient of the gross domestic product variable is positive and statistically significant. Poison pills adopted during periods of economic slowdown are less likely to be subsequently redeemed.

Banks adopt poison pills during periods of reduced takeover activity as a long-term antitakeover deterrent.

#### **IV. Conclusion**

The adoption of a poison pill by a bank is expected to improve bank's bargaining power during a potential acquisition or merger attempts. The major regulatory changes implemented during the 1990s have also improved the bargaining power of potential target banks. Moreover, the structure of a poison pill adopted by a commercial bank seems to be slightly different than that of non-financial companies. The different, less rigid structure of the poison pill illustrates the fact the hostile bank takeovers are quite rare. I find that commercial banks adopters of poison pills have similar characteristics with bank non-adopters. The results indicate that commercial banks adopt poison pills for reasons other than the performance during the year before the pill adoption. Commercial banks with lower level of capital are more likely to redeem the pills. Pills adopted during periods of economic booms are more likely to be subsequently redeemed.

#### **Appendix 1**

##### **Description of poison pills provisions**

*Adverse person* - This provision establishes a general flip-in level applicable to all non-board-approved stock acquisitions, but empowers the board to trigger the pill when a "substantial block" of its stock had been acquired by a person or group posing a risk for the company.

*Dead hand* - The pill can be redeemed only by the board of the target company. Therefore, a proxy contest is not affecting canceling the poison pill effect. "Dead hand" and "no hand" provisions are invalid under the Delaware law.

*Flip in* - Under this provision, an acquirer is prohibited from exceeding a threshold level of beneficial ownership of the target's securities (typically 20%)

*Inadvertent triggering exception* - Poison pills with the inadvertent triggering feature allows the accumulation of stocks above the flip in percentage by the non-board-approved persons or groups whose ownership is considered beneficial.

*Permitted offer exception* - Under this provision, the flip-in is inapplicable to any acquisition considered to be adequate and in the best interest of the company and its shareholders.

*Qualified offer (chewable pill)* - the poison pill is not exercised by offers meeting certain criteria

*Sunset* - The provision stipulates that either the board of directors or the shareholders must review the shareholders right plan every few years to determine whether it should be renewed

*TIDE*- In 1997, Pfizer developed the Three-year Independent Evaluation (TYDE) rights plan, connecting the pill to an independent board and periodic review.

Table 1

Panel A: Geographic distribution of the poison pill issuer

Year	Northeast	Southeast	Others	Total
1985-1997	67	20	33	120
1997-2004	19	6	19	44
Total	86	26	52	164

Panel B: Poison pill status

Year	Adopted	Redeemed	Amended	In force
1985	2	1	1	0
1986	2	0	1	0
1988	14	2	7	0
1989	44	22	12	0
1990	25	9	8	0
1991	6	3	2	0
1992	4	1	3	0
1993	2	0	2	0
1994	1	0	1	0
1995	7	0	4	2
1996	9	1	6	2
1997	6	0	2	3
1998	11	0	4	7
1999	8	2	2	4
2000	8	1	0	7
2001	10	0	4	6
2002	1	0	0	1
2003	2	0	0	2
2004	2	0	0	2
Total	164	42	59	36

Table 2

## Descriptive Statistics

This table presents the summary statistics for variables of the sample of 164 commercial banks with poison pills and 164 matched banks. P-values from t-test and Wilcoxon signed-rank test of difference from zero are reported in parentheses. \*, \*\*, and \*\*\* indicate statistical significance at the 10, 5, and 1% levels, respectively.

## Panel A: Commercial banks adopters of pills between 1985 and 2004

Variable	Mean/ Median Poison Pill Adopters	Mean/ Median Matched Banks	Difference
Equity Capital	0.081 (0.074)	0.077 (0.071)	0.312 (0.482)
Return on Assets	0.010 (0.009)	0.009 (0.009)	0.563 (0.938)
Return on Equity	0.120 (0.128)	0.097 (0.126)	0.218 (0.531)
Revenue Diversification	0.684 (0.673)	0.690 (0.678)	0.627 (0.696)
N	164	164	

## Panel B: Commercial banks adopters of pills between 1985 and 1997

Variable	Mean/ Median Poison Pill Adopters	Mean/ Median Matched Banks	Difference
Equity Capital	0.082 (0.069)	0.071 (0.069)	0.057* (0.784)
Return on Assets	0.009 (0.009)	0.008 (0.009)	0.415 (0.927)
Return on Equity	0.114 (0.125)	0.081 (0.124)	0.187 (0.714)
Revenue Diversification	0.681 (0.659)	0.692 (0.674)	0.477 (0.648)
N	120	120	

Table 3

This table presents the summary statistic for variables of 42 commercial banks with poison pills subsequently redeemed and 122 commercial banks with poison pills kept in place. P-values from t-test and MannWhitney test of difference from zero are reported in parentheses. \*, \*\*, and \*\*\* indicate statistical significance at the 10, 5, and 1% levels, respectively.

Variable	Mean/ Median Redeemed Poison Pill	Mean/ Median Not-Redeemed Poison Pills	Difference
Equity Capital	0.066 (0.065)	0.087 (0.078)	0.000*** (0.000)***
Return on Assets	0.006 (0.008)	0.011 (0.011)	0.080* (0.030)**
Return on Equity	0.116 (0.123)	0.121 (0.131)	0.750 (0.780)
Size	13.99 (14.15)	13.79 (13.73)	0.574 (0.427)
Revenue Diversification	0.673 (0.655)	0.687 (0.678)	0.488 (0.672)
Number of observations	42	122	

Table 4

This table presents results of logistic regressions where the dependent variable is 1 if the poison pill has been subsequently redeemed and zero otherwise. The sample size is 164 banks adopters of poison pills with 42 commercial banks with poison pills subsequently redeemed and 122 commercial banks with poison pills kept in place. The explanatory variables are as follows: *Equity capital* is the amount of equity capital of the bank divided by total assets, *Return on assets* is net income divided by total assets, and *Return on Equity* is net income divided by capital equity. *Gross domestic product* is the real gross domestic product, and *Diversification* is the revenue Herfindahl-Hirschman index. P-values from t-test and Mann-Whitney test of difference from zero are reported in parentheses. \*, \*\*, and \*\*\* indicate statistical significance at the 10, 5, and 1% levels, respectively.

Model	(1)	(2)
Constant	-0.338 (0.922)	-0.281 (0.936)
Equity Capital	-38.021** (0.014)	-39.289*** (0.010)
Return on Assets	-18.940 (0.507)	....
Return on Equity	...	0.071 (0.971)
Revenue Diversification	1.536 (0.513)	1.639 (0.486)
Size	-0.157 (0.277)	-0.169 (0.249)
GDP	0.503*** (0.009)	0.496*** (0.009)
Nr. of observations	164	164
-2 Log likelihood	156.458	156.288
Cox and Snell R square	0.168	.156
Nagelkerke R square	0.247	.230

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## **The IPO Portfolio: An Alternative Approach to Higher Returns?**

George S. Swales, Jr., G. Michael Swales and C. Edward Chang

### **Abstract**

Investors in today's financial markets continue to look for ways to enhance portfolio returns. Unfortunately, investments that offer the potential for higher gains may also include increased volatility, which can diminish some investor's desirability to hold these types of securities. Many portfolio managers, seeking to increase the return on their portfolios, will selectively choose riskier securities and practice risk reduction through diversification.

Initial public offerings (IPOs) may offer the investor an investment alternative to use in an effort to enhance portfolios returns. IPO research, however, shows IPO returns can be quite volatile. Combining IPOs into a single, separate portfolio may reduce overall risk, while minimizing the potential of jeopardizing the investor's total holdings.

Several research questions arise. Could a portfolio of IPO equity securities produce a rate of return comparable to a widely held index, such as the S&P 500? Specifically, can a diversified portfolio of IPO stocks out-perform the S&P 500 over short-term and longer-term time periods? If so, how risky would such an IPO portfolio be, compared to the widely-followed S&P 500 index? Finally, would combining an IPO portfolio with the S&P 500 portfolio result in overall risk reduction? This research seeks answers to these questions.

### **I. Literature Review**

In recent years, initial public offerings (IPOs) have again been hot topics among investors looking to catch the next wave of rising stock prices in hope of enhancing portfolio returns. With the overwhelming success of Google's initial public offering fresh in their minds, IPOs have caught the attention of investors seeking to increase wealth.

Theoretically, higher-risk investments should provide higher rates of return for investors. There is consensus that IPOs under-perform seasoned issues in the intermediate and long term. Ibbotson (1975) and Ritter (1991) found IPO stock issues provide positive performance within the first year, but tend to under-perform similar stocks the following three years.

Difficulty in determining a correct portfolio balance using strictly IPOs to make up a portfolio is apparent. IPOs, generally, are more risky investments due to the companies' relatively unknown nature. Investors have little or no historical information prior to issuance of an IPO to reassure them about the overall health of the organization. Lack of public information and historical data are just a few of the factors that add to this uncertainty. As this information is introduced to the market, the stock price fluctuates. One way to minimize these fluctuations is to add more stocks to the portfolio.

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In theory, as one stock falls, another stock may rise, minimizing overall investment loss. Does this theory also hold true in the case of an IPO portfolio? Little research has been conducted on this topic.

#### Efficient Portfolios and Semi-Strong Form Market Efficiency

Efficient portfolios are defined by Brigham and Ehrhardt (2005) as, “those portfolios that provide the highest expected return for any degree of risk, or the lowest degree of risk for any expected return.” Simply, it is possible the current market price of the IPO reflects all relevant information. This could explain the fluctuation in market price of the IPO for a period of time after its issue. The market is essentially “reacting” to the new information about the organization made public by the IPO.

The semi-strong form efficiency of the Efficient Market Hypothesis (EMH) states all market data as well as publicly known and available data such as earnings, dividends, stock split announcements, new product developments, financing difficulties, and accounting changes are reflected in current stock prices. Semi-strong form tests of the EMH indicate the speed of adjustment of stock prices to announcements of new information (Jones 2002). For the semi-strong form of the EMH to hold true, investors will not be able to profit for long on new data introduced into the market because the new data is instantaneously reflected in the price. Consequently, investors should not expect to do better than the returns predicted using Security Market Line analysis unless they have access to information not available to the public.

In theory, new IPOs could be tested under the semi-strong form efficiency of the EMH. IPO organizations are typically private entities, minimizing the available information to the investor thus increasing the risk of the stock. When a new IPO is sold on the primary market, the previously unknown information is rapidly reflected in the market price of the stock. This sudden inflow of information contributes to the risk of the IPO. It is the semi-strong efficiency reaction to this new information that makes it hard for an investor to obtain a profit over time, unless he or she had access to non-public information.

Empirical research on the validity of the semi-strong form efficiency often involves an event study. An event study is an empirical analysis of stock price behavior surrounding a particular event (Jones 2002). Event studies look to find an abnormal return based upon an index factor, or a combination of a market factor and a unique company factor following a certain event. Commonly cited studies of semi-strong efficiency events include stock splits, accounting changes, and initial public offerings. Evidence indicates investors who are able to purchase these new IPOs at the offering price yield abnormal returns, but subsequent investors are unable to earn abnormal returns as the market prices have adjusted to their “true” values (Ibbotson, Sindelar and Ritter 1988).

#### IPO Pricing and Returns

Early studies of IPOs (Block and Stanley 1980; Brown 1970; McDonald and Fisher 1972; Logue 1973) suggest an IPOs’ initial high returns were due to the underpricing of the IPO by underwriters subsequently resulting in an adjustment in share price within a few weeks. These findings mirror the semi-strong form of the efficient markets hypothesis.

Beatty and Ritter (1986) provide evidence the underwriting price differential is a result of the uncertainty of investors regarding its value and the reputation of the investment banker. “There is a monotone relation between the (expected) underpricing of an initial public offering and the uncertainty of investors regarding its value. We argue that the resulting underpricing equilibrium is enforced by investment bankers, who have reputation capital at stake.” An investment banker who “cheats” on this underpricing equilibrium will lose either potential investors (if it doesn’t underprice enough) or issuers (if it underprices too much), and thus forfeit the value of its reputation capital. Tinic (1988) also provides strong evidence supporting the underpricing phenomenon calling it “implicit insurance” against legal liabilities bankers.

Underpricing an IPO can prove costly for the issuing firm. Rock (1986) argues that the underpricing of the IPO is compensation for the added risk of minimal information. As a result, informed investors are less likely to buy the IPO than uninformed investors. There is little doubt that investing in an organization that has minimal available market information is looked upon as a more risky venture than investing into an established firm. Human nature causes us to feel uncertain about future events, which plays a vital part in our emotional decision to invest.

#### Managerial Ownership

A 1992 study by Lee, Rosenstein, Rangan, and Davidson, noted decreased agency costs were a result of increased managerial ownership of the firm. Jain and Kini (1994) argue that post IPO operating performance is directly related to better monitoring by boards with higher ownership stakes. Howton, Howton, and Olson (2001) find insiders and the percentage of independent outside shareholders directly relate to initial IPO returns and long-run IPO returns are directly related to ownership by insiders.

All these studies reflect how a “vested interest” plays a vital role in IPO performance. A board that monitors its managers to ensure shareholder wealth maximization can potentially achieve greater, more sustained, positive returns. Other factors may account for IPO returns. The role of the day of the week and its effect on the IPO return can also be informative.

#### Day-of-the Week Effect

Several studies suggest a correlation to lower returns and the day of the week. French (1980) and Flannery and Protopapadakis (1988) suggest lower returns occur at the beginning of the week and are most prevalent on Monday and Tuesday. A study by Perfect and Peterson (1997) suggests IPOs have stronger day-of-the-week patterns than other securities with the magnitude of the effect declining from the first to the third year of trading. Expanding on this phenomenon, Higgins, Howton, and Perfect (2000) suggest investors make their buying decisions based upon the previous day market returns, rather than previous day returns of the actual security. The results of the Higgins, Howton, and Perfect (2000) study indicate IPOs have a similar autocorrelation pattern to other firms around the weekend, suggesting IPOs respond to market information with a lag around the weekend.

## **II. Methodology**

We constructed two individual portfolios from calendar years 2001 and 2006, composed of 50 randomly selected domestic IPOs. There were approximately 90 and 150 domestic IPOs

issued in each year, respectively. The two time periods were selected so that relatively short-term and longer-term performance and risk measures could be calculated. Several of these companies merged or went out of business, which resulted in a net portfolio of 45 IPOs each year. First day performance of each IPO and value of the S&P 500 at that time as indicated by Yahoo! were recorded.

Mean and standard deviation analyses of each portfolio were calculated for the offer price, first day open price and first day close price, S&P 500 first day open price and first day close price, IPO and S&P 500 opening day percent changes, and overall IPO and S&P 500 percent changes and changes in portfolio value since inception to determine overall diversification benefits of the portfolio. Additional data on the second day through fourth day price movements was also gathered.

### III. Results

Table I shows the exchanges on which the 45 data set IPOs selected traded in 2001 and 2006. In both years, the majority of the new firms were listed on the NASDAQ. Many new issues were also listed on the New York Stock Exchange.

Table II displays the first day trading results of each IPO portfolio. Dollar and percentage average change in values were relatively small, with the 2006 IPO portfolio actually declining in value that first day. In each year, the number of declining issues exceeded the number of advancing issues.

Table III compares the first day average percentage change in value of each IPO portfolio with the same day's change in the S&P 500 and their resulting standard deviations. Mean IPO and S&P values were calculated using beginning and ending prices, without dividends or stock splits. While the 2001 IPO portfolio value results were positive, the S&P 500 value results were negative. The 2006 IPO and S&P 500 results were just the opposite. In both years, however, the risk of the IPO portfolio, as measured by the standard deviation, was significantly higher than the S&P 500 risk.

Table IV displays the Day 1 through Day 4 IPO portfolio average value and standard deviation for both years studied. Changes in the average value of each portfolio were relatively small. The 2001 portfolio initially shows a gain over two days, but then declines in value. The 2006 portfolio initially falls, recovers and reflects a gain in day 4. Although the average portfolio values for 2001 and 2006 were similar, the standard deviations for the first four trading days in 2001 were higher than for the first four trading days for 2006.

Table V reflects the change in IPO portfolios and S&P portfolio average values since inception in 2001 and 2006. As expected, the change in values in the 2001 portfolio over the five-year holding period to year-end 2006 is greater than for the 2006 portfolios held for a much shorter timer period. The average gain for the 2001 IPO portfolio was significantly higher statistically than for the S&P portfolio over the five-year time period. Results for the 2006 IPO portfolio, however, were not statistically different than results for the S&P 500. In both years (2001 and 2006), the percentage change in average value for the IPO portfolio is significantly

greater than the percentage change in average value for the S&P 500. Risk, as measured by the standard deviation, for the IPO portfolios is also higher than for the S&P 500 portfolios.

Table VI reflects the association between each IPO portfolio and the S&P 500 index. In 2001, the Pearson Product Moment Correlation was negative. The Pearson Product Moment Correlation showed a low positive association in 2006. This association may provide insight for potential risk diversification.

#### **IV. Conclusions**

This research has shown IPO portfolios may produce a rate of return comparable to the S&P 500. In the two years studied (2001 and 2006), overall performance of the IPOs and S&P 500 portfolios were mixed. Since inception, however, IPO portfolios returns were significantly higher than the S&P 500 portfolio over a comparable period of time. Risk, as measured by the standard deviation, was found to be higher for the IPO portfolios than for the S&P 500 portfolios. The potential exists to enhance portfolio returns through inclusion of IPOs in a portfolio, albeit with the possibility of higher risk. Efficient diversification, however, may enable investors to add significant numbers of IPOs to their holdings to potentially enhance their returns. The low positive and the negative correlations from this study indicate that combining an IPO portfolio with the S&P 500 index can result in overall portfolio risk reduction.

Several opportunities for further research are available. An analysis of a portfolio with varying quantities of IPO stocks could be conducted to possibly create a more efficient portfolio balance, potentially reducing overall risk and increasing return. This research concentrated exclusively on domestic IPO firms and use of the S&P 500 as a measure of performance. An analysis of a portfolio containing international as well as domestic IPOs could potentially even further diversify risk and increase returns.

Table I  
Exchanges on Which Data Set IPO Companies Traded

Exchange	Number of Companies	
	2001 (n = 45)	2006 (n = 45)
NYSE	19	13
AMEX	1	2
NASDAQ	25	30

Table II  
Results of First Day IPO Portfolio Trading

	2001 (n = 45)	2006 (n = 45)
Portfolio Change in Value (\$)	\$0.01	-\$0.06
Portfolio Change in Value (%)	0.0820%	-0.7415%
Number of Advancing Issues	19	17
Number of Declining Issues	20	27
Number of No Change Issues	6	1

Table III  
First Day Average Percentage Change in Return

	2001 (n = 45)	2006 (n = 45)
IPO Mean	0.0820%	-0.7415%
IPO Standard Deviation	0.0768	0.0889
S&P 500 Mean	-0.3411%	0.0154%
S&P 500 Standard Deviation	0.0101	0.0072
Significance Level	**	**

\*\* Significant difference at the 0.05 level

Table IV  
IPO Portfolio Average Value: Day 1 through Day 4

Day	2001 Portfolio		2006 Portfolio	
	Average Value	Standard Deviation	Average Value	Standard Deviation
1	\$17.19	\$8.56	\$17.90	\$7.45
2	\$17.37	\$8.73	\$17.81	\$7.28
3	\$17.18	\$8.61	\$17.87	\$7.48
4	\$17.06	\$8.66	\$17.94	\$7.82

Table V  
IPO and S&P 500 Change in Portfolio Average Value:  
Day 1 through Year-End 2006

	2001 (n = 45)	2006 (n = 45)
IPO Dollars	\$12.18	\$2.37
IPO %	77.70%	10.10%
IPO Standard Deviation	1.3027	0.3489
S&P 500 Dollars	\$201.92	\$120.93
S&P 500 %	17.17%	9.40%
S&P 500 Standard Deviation	0.0915	0.0388
Significance Level	**	

\*\* Significant difference at the 0.05 level

Table VI  
Correlation Matrix  
IPO Portfolio and S&P 500

	2001		2006	
	IPO Portfolio	S&P 500	IPO Portfolio	S&P 500
IPO Portfolio	1.0000	-0.0650	1.0000	0.1679
S&P 500	-0.0650	1.0000	0.1679	1.0000

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## Using The ACSI As An Investment Guide

Chan-Wung Kim and Mark A. Wrolstad

### Abstract

This research uses the level and changes in the American Consumer Satisfaction Index (ACSI) to inform investment decisions. Firms with increases in ACSI scores of  $\geq 3$  points are found to provide significantly better investment performance than firms with decreases of  $\leq -3$  points. Industries most positively affected by improvements in the ACSI score are found in the department and discount store industries. The industry most hurt by declining ACSI values is found to be the electric service industry. It is also found that firms with scores less than 75 out of 100 that achieved an increase in the index of  $\geq 3$  points had significantly better investment performance than those with scores greater than 75 that made the same ACSI index improvement.

### I. Introduction

What happens to the value of a firm when they earn a respectable profit but treat their customers rudely, make products that break down, and generally behave on the theory that there's a sucker born every day? Claes Fornell, the Donald C. Cook professor of business administration at the University of Michigan, wondered about this as he applied for and obtained a grant from the Swedish post office in the late 80s to construct a "satisfaction barometer" for major corporations in Sweden. Who came out on top in the first annual satisfaction ratings in Sweden? Toyota! There is a rumor that the top management over at Volvo was not pleased with the results. Since this early use of the model, Prof. Fornell has continued to develop and refine the model.

In 1994 the University of Michigan's National Quality Research Center sponsored the creation of the American Customer Satisfaction Index (ACSI) which was created by Fornell and others to see how household customers felt about the products and services that they were using in the United States. What differentiates this effort from traditional opinion polls is that only actual customers of the various companies were asked about their products and services. The survey currently tracks over 200 providers of goods and services in 43 industries annually and converts customer satisfaction to a numerical value between 1 and 100 with 100 being the greatest satisfaction possible (i.e., they were truly delighted!). Perhaps not surprisingly, the highest ACSI scorers over the years are also household names in customer satisfaction -- Ralston Purina in pet foods; Quaker Oats in cereals; Amazon.com in e-commerce; Hilton in hospitality; Coca-Cola in beverages; and Unilever in personal care products. (Fornell, 2001)

The ACSI has been around for over 10 years now. It is currently reported in the national media on a regular basis. Each quarter, ACSI scores are presented in the Wall Street Journal (WSJ) and on the ACSI website ([www.theacsi.org](http://www.theacsi.org)) along with commentaries. The relationship between ACSI and stock price is not yet well known among the public or among investors. Our interest in the ACSI is centered around the question of whether the index could be used to aid investors in making decisions about additions to their investment portfolios. Although there

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have been a number of studies in the marketing literature about the effects of consumer satisfaction upon various aspects of the firm including its cash flows, the finance literature has not extensively addressed the issue. We feel that investors could potentially benefit from a more rigorous analysis of the effects of customer satisfaction announcements on shareholders' market value.

## II. Literature Review

A study by Anderson et al. (2004) developed a theoretical framework that specified how customer satisfaction (as measured by the ACSI) affects future customer behavior and in turn, the level, timing and risk of future cash flows. They used Tobin's  $q$  which they felt was a forward-looking, capital market-based measure of the value of a firm. A firm's  $q$  value is the ratio of its market value to the current replacement cost of its assets (Tobin 1969). Empirically, they found a positive association between customer satisfaction and shareholder value. As expected, they also found significant variation in the association across the various industries and firms.

Most of the measured economy in the United States deals with production, prices and supply. Nearly all measures quantify the economic output and very few refer to the quality of the output. The ACSI index attempts to enable the voice of the customer to be heard in economic measurement. Fornell (2003) asserts that it is not quality per se that brings about economic returns, it is the improved consumption experience of the buyer that leads to repeat business and increased demand. In other words, unless investment and efforts to improve quality shift the demand curve upward or reduces costs, the investments in improving quality will not pay off.

In a later study, Fornell et al. found that customer satisfaction does lead to excess returns (Fornell et al, 2006). They also found that ACSI scores were significantly related to the market value of equity but that score announcements do not seem to move share prices. Their conclusion was that it is possible to beat the market consistently by investing in firms that do well on the ACSI.

## III. Data and Methodology

The sample chosen for this research was selected from the more than 200 providers of goods and services followed by the ACSI. To prevent extraneous events from biasing the results of the analysis, observations were eliminated when certain firm-related announcements were made within 3 days of the annual ACSI score announcements. The *Wall Street Journal* was scanned for evidence of merger announcements, spin-offs, stock splits, CEO or CFO changes, layoffs, restructurings, earnings announcements, and lawsuits. In cases where any of the preceding announcements were found, the observations were eliminated from the analysis.

The final sample consists of 761 announcements of ACSI scores from the 145 companies for the periods from 1995 to 2005 whose common stock returns are available in the Center for Research in Securities Prices (CRSP) Daily Return File. Table I shows the number of firms and samples selected from each industry and the pattern of quarterly announcements followed by the ACSI each year. For each quarter, the announcement date is clustered on the same date, which may cause the cross-sectional correlation among the stock returns. Our test statistics are corrected for the cross-sectional correlations.

The behavior of stock returns around the ACSI announcement date was studied using the standard event-study procedures suggested by Brown and Warner (1980, 1985). Abnormal returns for sample  $j$  on day  $t$  in the event period was calculated as the prediction error from both the market model and the Fama-French three factor model (1993):

$$AR_{jt} = R_{jt} - [\hat{\alpha}_j - \hat{\beta}_j R_{mt}]$$

Where:

$R_{jt}$  = return on day  $t$  to firm security  $j$

$R_{mt}$  = return on day  $t$  to market return

$\hat{\alpha}$ ,  $\hat{\beta}$  = estimated regression coefficients from the market model.

$$AR_{jt} = R_{jt} - \hat{\alpha}_j - \hat{\beta}_j R_{mt} - \hat{s}_j SMB_t - \hat{h}_j HML_t$$

Where:

SMB= the difference between the average returns on the small stock portfolios and those on the big stock portfolios

HML= the difference between the average returns on high (Book Equity)/(Market Equity) portfolios and those on low BE/ME portfolios

$\hat{\alpha}$ ,  $\hat{\beta}$ ,  $\hat{s}$ ,  $\hat{h}$  = estimated regression coefficients from the Fama-French three factor model.

The daily stock returns are obtained from the Center for Research in Security Prices (CRSP) at the University of Chicago. The factor returns for the Fama-French three factor model are obtained from Kenneth French's data library which is available on the internet. The announcement date was defined as the first published date of ACSI scores in the *Wall Street Journal*. One of the unique features in the sample is that the announcement day for each quarter is the same, which entails cross-correlation among the returns. We calculated the standard deviation corrected for the cross-correlation as suggested by Brown and Warner (1980, 1985) for determining the statistical significance of the average abnormal returns during the event period.<sup>1</sup> The estimation period for both model parameters runs from day -250 through day -6 with the announcement day defined as day 0. The CRSP value weight index return was used for the market return in the market model estimation.

#### IV. Empirical Findings

The behavior of common stock returns around the ACSI announcement date is studied using the standard event-study procedures. Table II shows the average daily market model and Fama-French three factor model adjusted returns surrounding the various ACSI announcement dates from 1995 to 2005. Table II shows the average abnormal returns for both instances where

<sup>1</sup> We employed the "Crude Adjustment" procedure suggested by Brown and Warner (1980, 1985).

the ACSI scores had increased or decreased by 3 or more points on a year-to-year basis.<sup>2</sup> On the announcement date of score increases, the average abnormal return for the sample was a +0.53 percent for the market model and +0.43 percent for the Fama-French three factor model benchmark. Both results are found to be statistically significant at the 5 percent level. It appears that on average, investors regarded the ACSI score increases as positive news regarding the firms in question. When we look at the instances where the ACSI scores had decreased by 3 or more points, the average result was a + 0.23 percent for the market model and +0.15 for the Fama-French benchmark. These results are found to not be statistically significant. It appears that the announcement of the ACSI score decreases does not have a significant impact on the stock prices.

We also investigated the possibility of our results being driven by firm size. From the CRSP database, we found that 95 out of 121 observations where the scores changed by +3 points or more were from the largest companies in the decile portfolio 10. For the samples of negative score changes, 108 out of 126 observations are from the largest decile portfolios.<sup>3</sup> Many of these large companies offer a wide range of products and services to consumers and the ACSI scores may reflect a small proportion of their overall product portfolios. Also, these really large companies have a great deal of other information being made public on a regular basis. The ACSI announcement may simply be lost in the deluge of information that occurs on a daily basis for these large firms. It may not be possible to consistently predict stock market reactions about customer satisfaction for individual companies. What we have learned from our data is that whether the ACSI has had a positive or negative move from year-to-year of 3 or more points, the adjusted returns are not always statistically related to the index changes.

We further test the announcement effect by the industry. Table III reports the average daily market model adjusted returns surrounding ACSI announcement dates by industry over the sample period. When the ACSI score increased by 3 or more points over the previous year, only the Department & Discount Stores industry had a statistically significant positive impact on the stock price. When the ACSI score changed negatively by 3 or more points, the Electric Service industry had a statistically significant negative effect. The result that is harder to explain is the statistically significant +1.43 percent change in the Gas & Electric Service industry. Perhaps these larger companies had variety of business lines that together offset information from the negative ACSI announcements as mentioned above.

The final issue that we investigated is whether there might be an "optimal" ACSI score. It is possible that up to that optimal ACSI score, a firm would be positively rewarded for improvements in their score. An improvement in consumer satisfaction may have more impact on the stock price when their score is low than when their score is high enough. This would mean that the stock price impact would be less when companies improve the consumer satisfaction scores above the optimal level. If a company already has a high ACSI score, they may be viewed as wastefully spending even more of the company's resources in an effort to

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<sup>2</sup> We also tried many different score changes and found that score changes more than or equal to 3 are most significant.

<sup>3</sup> We also checked the overlaps of the same companies. We have one company whose scores have increased 3 or more three different times during the ten years. For the score decreases, there was one company whose events have three frequencies.

delight customers who are already quite happy with the products and services that the company provides.

Table IV shows the average daily market model and Fama-French three factor model adjusted returns for the samples whose ACSI scores increased by 3 or more points and had index scores more or less than 75. We found that when ACSI scores are less than 75, there is a statistically significant return of +1.0% on the announcement date. However, when the ACSI score is higher than 75, the stock returns were only a positive 0.20 and not statistically significant. We also looked at the results for samples where the ACSI scores decreased by 3 or more points. We found that there was no statistically significant stock price reaction on the announcement date for both the high or low ACSI score companies.

## **V. Conclusion**

The results of this research suggest that the announcement affect of the ACSI is mixed. When ACSI scores change positively, the stock price reaction is positive. These statistically significant positive stock price reactions are concentrated when the companies have ACSI scores less than 75. When the score changes negatively, the impact is not statistically significant. These stock price adjustments are not universal across all of the industries as just one industry in each case is responsible for the majority of the observed price reaction.

The main conclusion of this research is that the announcement effect of ACSI score changes may provide only limited information to the market. ACSI score improvements of 3 or more points by companies with low ACSI scores may identify companies that merit further consideration as potential investment opportunities. Certainly further research is warranted as additional data on perhaps more companies becomes available in the future.

**Table I. Industry and number of ACSI sample firms per each quarter.**

First quarter Observations	Number of firms	
Utilities		
Electric service	8	55
Gas & electric service	16	77
Transportation & warehousing		
Airlines	7	57
Fixed line telephone service	5	36
Cable & satellite TV	4	9
Hotels	4	15
Limited-service restaurants	5	33
Second quarter		
Manufacturing/Durable goods		
Personal computers	5	32
Major appliances	3	9
Automobiles & light vehicles	16	41
E-business		
News & information	3	6
Portals	3	10
Third quarter		
Manufacturing/Durable goods		
Food manufacturing	12	96
Pet food	4	25
Soft drinks	3	18
Apparel	5	34
Personal care & cleaning products	5	36
Fourth quarter		
Retail trade		
Supermarkets	6	45
Department & discount stores	9	57
Specialty retail stores	6	15
Finance & insurance		
Banks	4	24
Life insurance	3	7
Property & casualty insurance	3	9
E-commerce		
Retail	3	9
Travel	3	6
<b>TOTAL</b>	<b>145</b>	<b>761</b>

**Table II. Average daily market model and Fama French 3-factor model adjusted returns surrounding ACSI announcement dates over the period 1995-2005. T-statistic is calculated after adjusting for the cross-sectional correlation.**

Event day	Score increase $\geq 3$			Score decreases $\geq -3$				
	Average market model adjusted return (%)	t-statistic	Fama French 3-factor model adjusted returns (%)	t-statistic	Average market model Adjusted return (%)	t-statistic	Fama French 3-factor model adjusted returns (%)	t-statistic
-5	0.11	0.43	0.10	0.41	0.33	1.25	0.31	1.22
-4	-0.37*	-1.43	-0.38	-1.53	-0.32*	-1.24	-0.27	-1.06
-3	0.27	1.04	0.13	0.53	0.33	1.27	0.26	1.01
-2	-0.01	-0.06	0.09	0.38	-0.23	-0.87	-0.14	-0.56
-1	-0.06	-0.24	-0.11	-0.44	0.07	0.25	0.04	0.16
0	0.53*	2.03	0.43*	1.76	0.23	0.88	0.15	0.59
1	0.18	0.68	0.19	0.78	-0.00	-0.01	0.01	0.05
2	0.13	0.50	0.05	0.20	0.18	0.75	0.10	0.39
3	0.04	0.16	0.06	0.26	-0.05	-0.20	-0.00	-0.00
4	0.05	0.18	0.08	0.33	-0.00	-0.00	0.01	0.03
5	0.18	0.68	0.08	0.32	0.22	0.84	0.10	0.38

\* Significant at the 5% level.

**Table III. Average daily market model adjusted returns surrounding ACSI announcement dates by industry over the period 1995-2005, N>5. T-statistic is calculated after adjusting for the cross-sectional correlation**

	Number in Sample	Score increases $\geq 3$ Average market model Adjusted return (%)	number in sample	Score decreases $\leq -3$ Average market model Adjusted return (%)
<b>First quarter</b>				
Utilities				
Electric service	11	-0.65	11	-1.14*
Gas & electric service	18	0.92	16	1.43*
Transportation & warehousing				
Airlines	11	0.88	13	-0.05
Fixed line telephone service	N/A		12	-1.18
<b>Second quarter</b>				
Manufacturing/Durable goods				
Personal computers	8	0.90	6	0.17
<b>Third quarter</b>				
Manufacturing/Durable goods				
Food manufacturing	11	0.44	10	0.32
<b>Fourth quarter</b>				
Retail trade				
Supermarkets	6	0.90	7	0.89
Department & discount stores	9	2.13*	10	0.19

\* Significant at the 5% level.

\*\* Significant at the 1 level.

**Table IV. Average daily market model and Fama French 3-factor model adjusted returns depending upon the scores of 75 surrounding ACSI announcement dates over the period 1995-2005. T-statistic is calculated after adjusting for the cross-sectional correlation.**

Event day	Score<75 and Score changes≥3				Score≥75 and Score changes≥3				
	Average market model adjusted return (%)	t-statistic	Fama French 3-factor model adjusted returns (%)	t-statistic	Average market model Adjusted return (%)	t-statistic	Fama French 3-factor model adjusted returns (%)	t-statistic	
-5	-0.23	-0.58	-0.16	-0.43	0.35	1.08	0.28	0.90	
-4	-0.65*	-1.63	-0.68*	-1.79	-0.18	-0.56	-0.17	-0.55	
-3	0.30	0.74	0.17	0.45	0.25	0.78	0.10	0.32	
-2	-0.06	-0.16	0.24	0.64	0.02	0.06	-0.01	-0.12	
-1	0.10	-0.24	0.10	0.26	-0.17	-0.54	-0.25	-0.80	
0	1.00**	2.50	0.87*	2.29	0.20	0.64	0.14	0.43	
1	0.27	0.67	0.32	0.84	0.12	0.36	0.11	0.34	
2	0.29	0.73	0.29	0.77	0.02	0.06	-0.12	-0.38	
3	-0.34	-0.84	-0.35	-0.93	0.30	0.93	0.35	1.11	
4	0.49	1.21	0.49	1.28	-0.25	-0.78	-0.20	-0.63	
5	0.07	0.17	0.04	0.10	0.25	0.77	0.11	0.35	

\* Significant at the 5% level.

\*\* Significant at the 1% level.

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**Biases and Fundamental Investing Knowledge: An Assessment of College Students**

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