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The Effects of Credit Union Service Organizations on Credit Union Performance

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Abstract

This study examines the effects of credit union service organizations (CUSOs) on credit union performance for the period 2009 through 2014. I use random effects models with Mundlak (1978) correction to estimate the relationships between CUSOs and credit union performance variables. Credit union participation in CUSOs increased over the sample period and participation increases with credit union size. CUSO participation is divided based on whether the credit union wholly owned the CUSO or was required to collaborate with other institutions. I find evidence that participation in wholly-owned CUSOs increases the interest rate spread, collaborative consumer mortgage origination reduces loan rates, and insurance brokerage or agency significantly increases non-interest income for credit unions. The results of the study support existing findings that small organizations are reluctant to give up autonomy and offer insight on which CUSOs benefit credit unions and their members.

I. Introduction

Credit unions are a significant and growing source of retail banking services in United States. As of June 2014, approximately 100 million Americans were members of a credit union up from 80 million in 2000 following a consistent trend of two percent growth for the past several years (Marte, 2014). In May of 2015, deposits in US credit unions passed the $1 trillion threshold (Rick, 2015). Despite the increase in demand for credit union services, the number of credit unions has been declining, primarily due to mergers of smaller institutions (Bauer, Miles, and Nishikawa, 2009). Despite this, the average credit union is still significantly smaller than the average commercial bank (Anderson and Liu, 2013). Because of their small size and restrictions on activities, credit unions finance wholly-owned firms to provide additional services, collaborate with other credit unions to offer services, or seek out non-credit union third party firms that provide specialized services to many credit unions. All of these approaches result in the formation of credit union service organizations (hereafter "CUSOs").

Per the National Credit Unions Association Examiner's Guide, "a credit union service organization (CUSO) is a corporation, limited liability corporation, or limited partnership that provides services primarily to credit unions or members of affiliated credit unions" (pg. 25-1). CUSOs are required to have a board of directors that is separate from the board of the credit unions and may not be dominated by the credit unions officers and directors. Federally chartered credit unions are limited to investing and/or loaning up to one percent of their unimpaired capital and surplus to CUSOs (National Credit Union Administration, n.d.). Per NCUA Regulation 712.5, there are twenty allowable types of CUSOs. The most common CUSOs are electronic transfer, shared branching, loan support services, consumer mortgage origination, and business loan origination CUSOs.

In this paper I differentiate credit union participation in CUSOs into two categories based on the ownership of the CUSO. Participation in a CUSO that the credit union wholly owns is designated

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as Wholly-Owned and participation in a CUSO that the credit union owns partially or not at all is designated as Collaborative.

This paper seeks to determine if participation in a CUSO impacts credit union performance using measures for member utility, asset quality, and revenue diversification. As presented in Section IV, credit union participation in CUSOs consistently grew between the years 2009 and 2014. CUSO participation was first reported by the NCUA in the call report database in 2009. The operations of CUSOs are more opaque than those of the credit unions that participate in them as the financial information of CUSOs is not reported. This increased opacity may result in increased member vs. manager agency problems. To determine the relationships between CUSOs and credit union performance I use a panel data methodology utilizing random effects models with Mundlak (1978) corrections. The sample for the paper consists of all credit unions in the United States that have data available for the model variables for the period 2009 through 2014.

The results of this paper provide evidence that participation in CUSOs increases with the size of the credit union. The effects of CUSO participation on credit union performance is mixed. Participation in a wholly-owned CUSOs may not be beneficial for credit union members as it is positively related to the interest rate spread (difference between the rates charged for loans and paid on deposits) and negatively related to asset quality. Participation in collaborative CUSOs is negatively related to both the loan rate and saving rate, providing no significant impact on the interest rate spread for members. One type of collaborative CUSO, consumer mortgage origination, is sufficiently negatively related to the loan rate without an offsetting decrease in the saving rate to result in a negative relation with the interest rate spread.

Participation in wholly-owned insurance broker or agency CUSOs is related to a significant increase in non-interest income for the credit union. Additionally, participating in collaborative CUSOs in general, and specifically electronic transaction services or shared branch operations CUSOs that are collaborative, is positively related to non-interest income. Finally, participation in collaborative shared branch operations or business loan origination CUSOs is negatively related to asset quality.

This paper adds to the literature on financial institutions by discussing the unique ownership structure of credit unions as it relates to external stakeholders (i.e. CUSOs), the trends with regard to CUSO participation over the past several years, and the effects of CUSOs on credit union performance. The results demonstrate that wholly-owned CUSOs may result in rent-seeking behavior on the part of managers and participation in specific CUSO types may result in monitoring neglect.

II. Literature Review

Credit unions are similar to commercial banks in the types of services that they provide to borrowers and savers. Unlike commercial banks, credit unions are nonprofit organizations. Existing theoretical literature on the governance of for-profit firms ties the connection between stockholders and managers together through a relationship in which the managers and stockholders both seek to maximize their own utility through the firm. As the desires for both parties likely conflict with regard to the activities of the firm, monitors exist to diminish

managerial rent extraction from shareholders via excessive compensation, non-pecuniary compensation, shirking, and risk avoidance. These monitors include the board of directors, active shareholder groups, and government agencies. Traditional tools used to deter rent extraction include performance-based pay and the threat of termination (Jensen and Meckling, 1976). This explanation for the relationship between managers and stockholders, their motivations, and the resulting tools to minimize rent extraction is commonly referred to as agency theory.

Counter to agency theory, the predominant governance theory for nonprofit organizations, stewardship theory, suggests that principals of the organization seek to fulfill the objectives of the organization and are effective monitors of its resources (Donaldson and Davis, 1991; and Muth and Donaldson, 1998). As a result, the role of the board is as a partner offering guidance on strategic planning and community contacts and the role of government monitoring is virtually non-existent.

Eikenberry and Kluver (2004) describe the resource dependency theory for nonprofit firms and state that it assumes that organizations need resources to survive and must interact with other organizations to acquire these resources. For credit unions, the emergence of CUSOs largely comes as a result of increasing competition among financial institutions in two areas. The first providing services that generally fall outside of the traditional depository/lending role of credit unions, to which credit unions are constrained due to regulations. The second providing affordable access to services that credit unions can provide, but are cost prohibitive due to the small size of individual credit unions when compared to other financial institutions, such as commercial banks. Eikenberry and Kluver raise the point that reliance on organizations that may include for-profit firms and other organizations with contradictory missions can result with the organization diverging from its own mission and no longer serving its intended purpose.

Because of a general lack of quantifiable goals, the nonprofit organizational structure allows for less external governance of mission achievement and greater autonomy for expert workers. Guo and Acar (2005) explore the idea of a desire for autonomy by examining collaboration among ninety-five charitable organizations in Los Angeles. They find that collaboration is more likely and more significant among organizations that would lose less autonomy as a result of collaboration. Specifically, they find that nonprofits that have greater resource sufficiency and have been in existence longer engage in more formal collaboration than younger, less financially secure nonprofits. Their results provide evidence that nonprofit managers do desire autonomy and react to dependence on external resources in such a way as to maintain autonomy. A lower level of monitoring and governance is a natural result of maintaining autonomy.

Credit unions differ from many other types of nonprofits in that their customers may take an active role in the management of the organization by voting for the board of directors and other organizational decisions. In the United States, each member of a credit union receives a “share” which allows them a single vote. The dilution of ownership due to credit unions’ one vote per member results in member passivity. Per Hoel (2011), since switching costs are low, credit union members will often choose to move their financial relationship, in part or in whole, rather than become active participants in the governance of the credit union. Moreover, the existence of deposit insurance generally eliminates potential losses that members would have should the credit union fail.

The lack of external investors and protection afforded to depositors results in the primary monitors of credit unions being regulatory agencies and deposit insurers. Both of these monitors focus on risk reduction rather than maximizing member utility. As a result, when compared to for-profit financial institutions, credit unions may take on less risk by having higher capital ratios which often result in lower returns for their members.

The literature on agency costs for for-profit firms effectively establishes significant evidence demonstrating a negative relation between firm performance and the extent of agency problems. For example, Core, Holthhausen, and Larcker (1999) find a significant negative relation between excess executive compensation (a visible agency cost) and firm financial performance. Additionally, excess compensation is limited through effective governance by easily identifiable agents, specifically the board of directors and external institutional shareholders (Fahlenbrach, 2009). Contrasted with that is the weak governance provided by boards of nonprofits (Chait, Ryan, and Taylor, 2005) and a lack of significant block stockholders.

Unlike most nonprofit organization types, credit unions have governance measures that have been identified in the existing literature. Two agency conflicts dominate the discussion of the governance of credit unions: 1) members vs. managers conflict, and 2) net-borrower vs. net saver conflict (Cuevas and Fischer, 2006). The identifiable and measurable governance measures tend to revolve around the members vs. managers conflict.

Brown and Davis (2009) identify capital structure as a potential source of agency conflict between managers and members. Because credit unions have limited access to external capital markets to raise funds, they rely largely on retained earnings to accumulate capital for economic downturns and future growth. Unlike for-profit financial institutions, credit unions do not face capital market discipline so their managers have the discretion to target capital structure weights that differ significantly from industry norms and set capital ratios that exceed regulatory minimums. Capital market discipline in the United States forces for-profit banks to converge to regulatory minimum capital ratios, which increases the risk associated with the industry. Conversely, risk-averse behavior on the part of credit union monitors may result in the credit union accumulating more equity than is optimal for maximizing member utility with lower interest rates on loans and higher rates on deposits (Rasmusen, 1988).

Brown and Davis (2009) hypothesize that the optimal "profit" for credit unions working on behalf of their members is zero, resulting in no capital accumulation. A profit of zero provides for the greatest amount of present day benefit to savers and borrowers of the institution. However, regulatory requirements often force credit unions to accumulate capital. Brown and Davis examine the determinants of return on assets (ROA) for fifty Australian credit unions for the period of 1992 through 2004. They find that ROA is negatively related to the capital adequacy ratio, indicating that regulations do affect the capital structure of credit unions; ROA is negatively related to the firm recently acquiring another firm; and ROA is negatively related to firm size. The last result is somewhat surprising as the authors hypothesized that profitability (resulting in capital accumulation) reduces the benefit to current members and that smaller credit unions should be more, not less, sensitive to the desires of their members. The accumulation of capital may be due to additional risk-aversion on the part of credit union CEOs as the ratio of

their incentive-based compensation to salary is consistently lower than that of commercial bank CEOs (Dettmann and Cartwright, 2013).

III. Data and Methodology

I use call report data provided by the NCUA for the years 2009 through 2014. Panel data was used to examine the effects of the explanatory variables on the spread, savings rate, loan rate, delinquencies-to-total loans and leases, and non-interest income-to-assets over a six year period from 2009 through 2014. A firm was included in the sample if it had data available for each of the variables for each of the six years. A panel data approach was chosen as the results for a single year might be due to macroeconomic conditions for that year, especially for those years at the beginning of the sample period. CUSO data was first made available by the NCUA for 2009.

Panel data methodologies are generally limited to pooled OLS regression, fixed effects, or random effects models. Pooled OLS regression assumes that there are no differences among the firms (or other treatment levels). A fixed effects model controls for the time invariant relation between each firm and the dependent variable. This model is generally used when differences among firms are of concern to the study. A random effects model is appropriate when the study is not concerned with the differences among treatment levels, but when the variance in the dependent variable due to the variance of means across the levels of a random factor needs to be accounted for. The Durbin-Wu-Hausman test indicates if a random effects model is appropriate by determining if the random effects estimator is consistent (Greene, 2011).

The results of this test for the models presented in this study indicate that the random effects estimators are inconsistent. However, the CUSO variables are generally constant for each firm across the sample period. Out of 37,764 firm-year observations, there were only 786 incidences (2.08% of observations) of a firm beginning or ending participation in wholly-owned or collaborative CUSOs. A fixed effects model would provide consistent estimators; however the variation in the dependent variables due to the CUSO variables would largely be attributed to the firm, rather than to the CUSO variables. Mundlak (1978) recommends a correction which allows for inclusion of time invariant and time variant dependent variables to control for both the between and within variability. Bell and Jones (2012) propose a method in which the means of the time variant regressors for each group are used to model fixed effects within the framework of a random effects model. Hedman, Manley, van Ham, and Östh (2015) construct a model based on this proposition which includes the means of the independent regressors and takes the form of:

$$y_{ij} = \beta_0 + \beta_1\left(x_{ij} - \bar{x_j}\right) + \beta_2\bar{x}_j + \left(u_{0j} + \varepsilon_{0i}\right)$$

The within estimator, β_1, is unbiased because the between firm-level variations are modelled in β_2. The residuals, u_{0j} and ε_{0i}, for the within and between estimators, respectively, are assumed to be normally distributed.

The model for this study regresses the dependent variables on the demeaned time variant control variables, CUSO variables, and the mean for each firm of the control variables, and dummy variables for the year using a random effects model.

Three of the dependent variables are based on Bauer (2008), which calculates Savings Rate as the sum of interest expense and dividends divided by average total shares and deposits and Loan

Rate as interest income on loans divided by average total loans and leases. These are used as measures of credit union member utility. Member utility should be higher with a higher savings rate and with a lower lending rate. A third measure, Spread, which is the Loan Rate less the Savings Rate, is used as a measure of total utility. A lower Spread is indicative of higher member utility.

Two additional dependent variables included to determine the effect of CUSOs on asset quality and income diversification are Delinquencies-to-Loans and Leases and Non-Interest Income-to-Assets, respectively. The Savings Rate, Loan Rate, Spread, and Non-Interest Income-to-Assets are reported in basis points. One percent is 100 basis points.

The control variables are also based on the variables in Bauer (2008) and include the natural log of the inflation-adjusted assets of the credit union (Size), net income less dividends divided by total assets (ROA), the percent change in total assets from the prior year (Asset Growth), and a measure of the capitalization of the firm (Reserves-to-Assets). Using ROA net of dividends is based on the reporting of net income of credit unions net of dividends. The ROA measure represents the additional percent of assets that is retained within the firm at the end of the year.

The CUSO variables consist of dummy variables for if the firm participates in a wholly-owned CUSO, if the firm participates in a collaborative CUSO, and variables for subcategories of CUSOs that can be either wholly-owned or collaborative. A wholly-owned CUSO is a CUSO that is owned entirely by the credit union. A CUSO that is not wholly-owned by the credit union is considered to be collaborative as the credit union will have to engage with outside parties to be a part of the CUSO as officers and directors of a credit union are not allowed have ownership of a CUSO in which their credit union participates. Additionally, a CUSO can be defined based on whether a credit union would be allowed to engage in the primary activity of the CUSO if the CUSO didn't exist. For example, credit unions can and do actively engage in electronic transaction services, so this is an allowable activity for a credit union. Alternatively, credit unions are not allowed to engage in insurance brokerage, so this is a not allowable activity. Figure 1 summarizes the major types of CUSOs and the categories in which they lie.

Figure 1
Major Types of Collaborative and Wholly-Owned Cusos

	Collaborative	Wholly-Owned
Allowed	Electronic Transaction Services Shared Branch Operations Loan Support Services Business Loan Origination	
Not Allowed	Consumer Mortgage Origination	Insurance Brokerage or Agency Financial Counseling Services Consumer Mortgage Origination

Notes: Allowed activities are activities in which credit unions can legally engage. *Not Allowed* are activities in which credit unions cannot legally engage, but are services that are provided to members through third party CUSOs.

IV. Results and Discussion

The National Credit Union Administration began reporting CUSO information for credit unions beginning in 2009. Per Table 1, while the number of credit unions has declined over the six year period, the number of CUSOs and the percent of credit unions that participate with a CUSO has increased for the same time period.

Table 1. Credit Union Participation In Cusos By Year For The Population Of Credit Unions In The United States.

Year	2009	2010	2011	2012	2013	2014
Number of Credit Unions	7710	7491	7240	6960	6687	6402
Number of Credit Unions that participate in a CUSO	2457	2489	2562	2588	2659	2698
Mean number of CUSOs per credit union that participates in a CUSO	2.26	2.3	2.36	2.35	2.41	2.5
Percent of Credit Unions that participate in a CUSO	31.87%	33.23%	35.39%	37.18%	39.76%	42.14%
Percent of Credit Unions that have a wholly-owned CUSO	6.33%	6.69%	6.86%	7.10%	7.58%	7.78%
Percent of Credit Unions that participate in a collaborative CUSO	30.19%	31.60%	33.87%	35.70%	38.25%	40.66%
Percent of Credit Unions that participate in both	4.66%	5.06%	5.35%	5.62%	6.07%	6.29%

Comparing the information provided in Tables 1 and 2 demonstrates that the trend and rates of CUSO participation between the population and the sample are consistent. Between wholly-owned and collaborative CUSOs, participation in collaborative CUSOs has been growing at a greater pace and a significantly larger proportion of credit unions participate through collaboration than in wholly-owned CUSOs. Within the sample set, the participation rate in CUSOs grew from 34.06 percent in 2009 to 41.75 percent in 2014. CUSO participation through collaboration dominates, with 40.40 percent of credit unions participating through collaboration in 2014. Collaboration may require the participating credit union give up autonomy over its operations.

Table 2. Sample Statistics For Credit Union Participation In Cusos By Year.

Year	2009	2010	2011	2012	2013	2014
Number of Credit Unions	6294	6294	6294	6294	6294	6294
Number of Credit Unions that participate in a CUSO	2144	2218	2336	2411	2525	2628
CUSO	2.29	2.33	2.37	2.36	2.41	2.47
Percent of Credit Unions that participate in a CUSO	34.06%	35.24%	37.11%	38.31%	40.12%	41.75%
Percent of Credit Unions that have a wholly-owned CUSO	7.05%	7.31%	7.34%	7.39%	7.63%	7.55%
Percent of Credit Unions that participate in a collaborative CUSO	32.21%	33.44%	35.32%	36.73%	38.56%	40.40%
Percent of Credit Unions that participate in both	5.20%	5.51%	5.70%	5.82%	6.07%	6.05%

As presented in Table 3, CUSO participation rates increase with credit union size. The lower participation rate for smaller credit unions is consistent with Guo and Acar's (2005) findings that organizations with fewer resources engage in fewer collaborative efforts to preserve autonomy. Additionally, per 12 CFR 712.2, federally-chartered credit unions are limited to investing no more than one percent of paid-in and unimpaired capital and lending no more than one percent of its paid-in and unimpaired capital to CUSOs (Legal Information Institute, n.d.). While state-chartered credit unions may exceed the one percent rule, each state does place a limit on the percent of capital that a credit union may use to finance CUSOs (Leggett, 2011). Finally, many smaller credit unions exist solely to provide depository services to a few members. The average size in assets of credit unions in the smallest decile at the end of 2014 was $862,000. These credit unions may simply have too few members interested in services provided by CUSOs to participate in one.

Table 4 provides descriptive statistics for the sample. The sample is a balanced panel of 6,294 credit unions over six years. The variability of the Delinquencies-to-Total Loans and Leases is due in part to overall improving credit quality for the six year period following the 2008 financial crisis. The mean (median) Delinquencies-to-Total Loans and Leases for 2009 is 2.32 percent (1.37 percent) compared to 1.76 percent (0.86 percent) for 2014. The subcategories of the Wholly-Owned CUSOs make up a small percent of the overall sample, but a significant portion of the Wholly-Owned CUSOs. The Insurance Broker or Agency, Financial Counseling, and Consumer Mortgage Origination CUSO make up 38.5 percent, 12.6 percent, and 8.5 percent of the wholly-owned CUSOs, respectively.

Table 3. Sample Statistics for Credit Union Participation in Cusos at The End of 2014.

Size Decile	1	2	3	4	5	6	7	8	9	10
N	629	629	630	629	629	629	630	629	630	629
Average Asset Size (in $000s)	862	3,389	6,937	11,886	19,204	30,629	51,282	91,182	198,728	1,330,191
Percent of Credit Unions that participate in a CUSO	2.23%	7.00%	12.06%	22.89%	34.18%	43.24%	53.65%	71.54%	79.84%	90.94%
Mean number of CUSOs per Credit Union that participates in a CUSO	1.07	1.18	1.16	1.32	1.6	1.79	1.97	2.19	2.69	4.04
Percent of Credit Unions that have a wholly-owned CUSO	0.00%	0.16%	0.16%	0.16%	1.11%	0.95%	2.22%	4.77%	17.62%	48.33%
Percent of Credit Unions that participate in a collaborative CUSO	2.23%	7.00%	11.90%	22.73%	33.39%	42.77%	52.70%	69.79%	75.08%	85.06%
Percent of Credit Unions that participate in both	0.00%	0.16%	0.00%	0.00%	0.32%	0.48%	1.27%	3.02%	12.86%	42.45%

Notes: *N* is the number of credit unions in each size decile.

Table 4. Sample Statistics for The Dependent and Independent Variables

Variable	N	Mean	Percent of Sample	Median	Standard Deviation
(1) Dependent Variables					
Savings Rate (in basis points)	37764	83.45		66.17	72.92
Loan rate (in basis points)	37764	670.78		638.98	178.35
Spread (in basis points)	37764	587.33		554.23	180.05
Delinquencies-to-Total Loans and Leases	37764	2.03		1.09	3.92
Non-Interest Income-to-Assets	37764	102.37		85.37	115.31
(2) Control Variables					
Size	37764	16.89		16.88	1.97
Return on Assets	37764	0		0	0.27
Asset Growth	37764	0.04		0.03	0.18
Reserves-to-Assets	37764	0.14		0.12	0.07
(3) CUSO Variables					
Wholly-owned CUSO	37764		7.38%		
Insur. Broker or Agency	37764		2.84%		
Financial Counseling Services	37764		0.93%		
Consumer Mtg. Origination	37764		0.62%		
Collaborative CUSO	37764		36.11%		
Electronic Transaction Services	37764		16.43%		
Shared Branch Operations	37764		11.87%		
Loan Support Services	37764		5.04%		
Business Loan Origination	37764		5.45%		
Consumer Mtg. Origination	37764		4.80%		

Notes: N is the number of firm-year observations in the sample. The sample is a balanced panel of 6,294 credit unions for each of the six years beginning in 2009 through 2014. *Savings Rate* is the sum of interest expense and dividends divided by average total shares and deposits. *Spread* is the Loan Rate less the Savings Rate. *Loan rate, Savings Rate,* and *Spread* are reported in basis points. *Delinquencies-to-Loans and Leases* is the ratio of loan delinquencies-to-total loans and leases multiplied by 100. *Non-Interest Income-to-Assets* is non-interest income divided by total assets. *Size* is the natural log of the inflation-adjusted assets of the credit union. *Return on Assets* is net income divided by total assets. *Asset growth* is the percent growth in assets from the previous year. *Reserves-to-assets* is the reserves in equity divided by total assets.

An Insurance Broker or Agency CUSO sells insurance products to credit union members. A Financial Counseling Services CUSO provides financial planning services to members. Consumer Mortgage Origination CUSOs provide services to credit unions that usually include the processing, funding, and servicing of consumer mortgages. Consumer mortgages may then be sold off or retained by the credit union. Electronic Transaction Services CUSOs provide ATM network services and debit, credit, and prepaid credit card services to credit unions. Shared Branch Operations CUSOs are collaborative CUSOs by nature as they allow members of participating credit unions to use any credit union branch that is served by the CUSO as a branch of their home credit union. Loan Support Services CUSOs provide loan origination services, such as automatic underwriting and approval, often for automobile loans, for members of participating credit unions. Business Loan Origination CUSOs offer business loan underwriting, loan documentation, loan review, and loan participation services to participating credit unions.

Table 5 provides the results of the multivariate models for each of the dependent variables. The CUSO variables used are the dummy variables for if the firm participates in a wholly-owned CUSO and/or in a collaborative CUSO. No significant relation is reported for the Loan Rate and Saving Rate and the firm participating in a wholly-owned CUSO. However, the Spread is positively related to participating in a wholly-owned CUSO. A positive coefficient on the Spread coefficient indicates that credit union member utility declines with participation in a wholly-owned CUSO, as members should prefer narrower to wider spreads. Specifically, participation in a wholly-owned CUSO results in a 7.5 basis point increase in the spread. The results for participation in a collaborative CUSO show a negative relation (-6.5 basis points) between the loan rate and participation and a negative relation (-5.3 basis points) between the saving rate and participation. The net effect is that there is no significant relation between the spread and participation in a collaborative CUSO. These results provide evidence that a credit union's participation in a collaborative CUSO benefits borrowers at the expense of savers.

The results in Table 5 also reveal a negative relation between asset quality and credit union participation in a collaborative CUSO with a positive and significant relationship between delinquencies-to-loans and leases and the collaborative CUSO dummy. The final estimation in the table, unsurprisingly, shows a positive and significant relation between non-interest income and participation in a CUSO.

The significant results for the CUSOs in Table 5 may be driven by participation in the specific CUSO types. Table 6 presents the number of CUSOs per service type per year between the two primary categories of Wholly-Owned and Collaborative. The numbers of the service types presented are not cumulative between the two larger categories, e.g. there are a total of 228 Consumer Mortgage Origination CUSO in 2009, 29 in the Wholly-Owned category, and 199 in the Collaborative category. The service types included in Table 5 and the following analysis are the types that make up five percent or more of the total CUSO service types for the respective CUSO participation category, Wholly-Owned or Collaborative, for the sample period.

Table 6 provides the statistics on the number of CUSOs by service type for each year of the study. Participation in CUSOs grew for each of the service types during the sample period.

Table 7 provides the regression results when the individual CUSO service types are included. Controlling for the marginal effects of the major service types reveals significant positive coefficients for the Wholly-Owned CUSO variable in the Spread and Delinquencies-to-Total Loans and Leases regressions. Having a wholly-owned insurance brokerage or agency is a negatively related to both the Loan Rate and the Savings Rate. Having a wholly-owned insurance brokerage or agency increases the non-interest income-to-assets ratio for the firm by 27 basis points.

The negative relations between collaborative participation in a CUSO and the Loan and Savings Rates provided in Table 5 are maintained with the inclusion of the individual service types. Electronic Transaction Services CUSOs are negatively related to both the Loan Rate and Savings Rate, but not the spread. Shared Branch Operations CUSOs are positively related to the Loan Rate, Delinquencies, and Non-Interest Income. Loan Support Services CUSOs are

negatively related to the Loan and Savings Rates. Business Loan Origination CUSOs are negatively related to the Loan Rate and positively related to Delinquencies. Consumer Mortgage Origination CUSOs that aren't wholly-owned are negatively related to the Loan Rate and Spread.

Table 5. Multivariate Results of The Estimation Of The Credit Union Performance Variables On The Wholly-Owned And Collaborative CUSO Variables.

	Loan Rate		Savings Rate		Spread		Delinq.-to-Total Loans and Leases		Non-Interest Income-to-Assets	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std.Error	Coef.	Std. Error	Coef.	Std. Error
(1) Time Variant Variables (deviation from individual mean)										
Size	-48.99***	3.22	8.97***	2.16	-58.02***	3.76	0.12	0.15	-43.05***	3.35
Return on Assets	-8.25***	1.31	4.07***	0.88	-13.33***	1.53	-0.47***	0.06	-7.05***	1.36
Asset Growth	30.72***	1.9	12.78***	1.28	17.91***	2.22	-0.46***	0.09	13.37***	1.98
Reserves-to-Assets	-83.09***	17.06	-217.11***	11.46	133.86***	19.93	3.38***	0.79	191.03***	17.79
(2) CUSO Variables										
Wholly-Owned CUSO Dummy	5.3	3.4	1.25	1.82	7.48*	3.84	0.03	0.12	12.20***	3.17
Collaborative CUSO Dummy	-6.52***	1.83	-5.33***	1.01	-2.14	2.08	0.15**	0.07	10.62***	1.74
(3) Individual Means of Time Variant Variables										
Size	-39.53***	1.01	5.70***	0.36	-45.31***	1.03	-0.60***	0.02	9.14***	0.72
Return on Assets	-20.62	15.91	-0.83	5.25	-19.83	15.89	1.11***	0.32	10.97	10.81
Asset Growth	123.54***	21.96	57.51***	7.25	66.09***	21.93	-1.94***	0.44	95.84***	14.92
Reserves-to-Assets	394.44***	29.7	133.20***	9.83	259.69***	29.67	1.49**	0.6	-219.76***	20.2
Constant	1332.55***	18.55	47.86***	6.47	1286.58***	18.71	12.23***	0.4	-21.50*	12.99
N	37748		37748		37748		37748		37748	
R-Square	0.38		0.54		0.14		0.04		0.04	

Notes: This table presents the coefficients and standard errors of the random effects model with Mundlak (1978) correction for each of dependent variables provided. Year dummies are included in the models but not shown. *Loan Rate* is interest income on loans divided by average total loans and leases. *Savings Rate* is the sum of interest expense and dividends divided by average total shares and deposits. *Spread* is the Loan Rate less the Savings Rate. *Loan rate, Savings Rate,* and *Spread* are reported in basis points. *Delinquencies-to-Loans and Leases* is the ratio of loan delinquencies-to-total loans and leases multiplied by 100. *Non-Interest Income-to-Assets* is non-interest income divided by total assets. *Size* is the natural log of the inflation-adjusted assets of the credit union. *Return on Assets* is net income divided by total assets. *Asset growth* is the percent growth in assets from the previous year. *Reserves-to-assets* is the reserves in equity divided by total assets. *N* is the number of firm-year observations in the sample. The sample is a balanced panel of 6,294 credit unions for each of the six years beginning in 2009 through 2014.* Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

Table 6. Sample Statistics Of CUSO Variables By Year And Type.

Year	2009		2010		2011		2012		2013		2014		Total	
	n	Percent	n	Percent	n	Percent	n	Percent	n	Percent	n	Percent	n	Percent
Wholly-Owned	551		569		572		583		614		608		2914	
Insur. Broker or Agency	138	25.05%	139	24.43%	138	24.13%	207	35.51%	233	37.95%	233	38.32%	881	30.23%
Financial Counseling Services	40	7.26%	36	6.33%	34	5.94%	74	12.69%	88	14.33%	82	13.49%	280	9.61%
Consumer Mtg. Origination	29	5.26%	29	5.10%	29	5.07%	50	8.58%	49	7.98%	52	8.55%	188	6.45%
Collaborative	4352		4589		4961		5097		5471		5885		25258	
Elect. Transaction Services	1045	24.01%	1094	23.84%	1140	22.98%	1429	28.04%	1710	31.26%	1789	30.40%	6778	26.84%
Shared Branch Operations	705	16.20%	711	15.49%	743	14.98%	849	16.66%	915	16.72%	972	16.52%	4046	16.02%
Loan Support Services	220	5.06%	243	5.30%	272	5.48%	458	8.99%	548	10.02%	577	9.80%	1860	7.36%
Business Loan Origination	283	6.50%	290	6.32%	305	6.15%	407	7.99%	442	8.08%	464	7.88%	1784	7.06%
Consumer Mtg. Origination	199	4.57%	210	4.58%	242	4.88%	369	7.24%	430	7.86%	457	7.77%	1538	6.09%

Notes: This table provides the number and percentages of CUSO types by year that make up an average of 5% or more of all CUSOs within the sample during the sample period. The amounts provided in the Percent columns are the percentages that the CUSO service type makes up of the overall category (Wholly-Owned or Collaborative). The numbers of the service types presented are not cumulative between the two larger categories, e.g. there are a total of 228 Consumer Mortgage Origination CUSO in 2009.

Table 7. Multivariate Results Of The Estimation Of The Credit Union Performance Variables On The Wholly-Owned And Collaborative CUSO Variables.

	Loan Rate		Saving Rate		Spread		Delinq.-to-Total Loans and Leases		Non-Interest Income-to-Assets	
	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error
(1) Time Variant Variables (deviation from individual mean)										
Size	-47.53***	3.23	9.65***	2.17	-57.50***	3.78	0.1	0.15	-44.51***	3.37
Return on Assets	-9.10***	1.31	4.41***	0.88	-13.27***	1.53	-0.48***	0.06	-7.21***	1.37
Asset Growth	30.63***	1.9	12.73***	1.28	17.88***	2.22	-0.46***	0.09	13.35***	1.98
Reserves-to-Assets	-80.01***	17.06	-215.81***	11.46	135.30***	19.94	3.37***	0.79	188.82***	17.79
(2) CUSO Variables										
Wholly-owned CUSO	9.98***	3.73	3.96*	2.07	8.95**	4.24	0.83*	0.14	2.25	3.54
Insur. Broker or Agency	-9.09**	4.22	-4.61*	2.54	-2.4	4.86	-0.04	0.17	26.68***	4.18
Finan. Counseling Services	-7.74	5.71	-5.05	3.5	-3.21	6.6	-0.1	0.23	-4.56	5.71
Consumer Mtg. Origination	-6.71	7.44	-4.09	4.48	-1.66	8.57	0.06	0.3	7.13	7.38
Collaborative CUSO	-3.71*	2.02	-3.42***	1.16	-1.32	2.31	0.04	0.08	7.91***	1.95
Elect. Transaction Services	-3.86*	2.16	-4.62***	1.25	0.47	2.48	0.09	0.08	4.34**	2.08
Shared Branch Operations	4.77*	2.54	1.15	0.82	3.99	2.89	0.24*	0.09	4.36*	2.42
Loan Support Services	-6.07**	2.77	-2.98*	1.66	-2.33	3.2	-0.01	0.11	-0.29	2.75
Business Loan Origination	-5.15*	3	0.72	1.75	-4.42	3.44	0.20*	0.12	3.66	2.93
Consumer Mtg. Origination	-10.37***	2.94	-2.75	1.75	-7.43**	3.38	-0.03	0.12	0.66	2.9
(3) Firm-Level Means of Time Variant Variables										
Size	-39.39***	1.02	5.81***	0.36	-45.37***	1.03	-0.61***	0.02	8.77***	0.72
Return on Assets	-20.5	15.91	-0.77	5.25	-19.8	15.89	1.11***	0.32	10.8	10.81
Asset Growth	124.87***	21.97	57.95***	7.25	66.87***	21.94	-1.95***	0.44	95.61***	14.92
Reserves-to-Assets	384.13***	29.71	133.15***	9.82	259.21***	29.68	1.47**	0.6	-220.81***	20.19
Constant	1329.95***	18.64	45.80***	6.52	1286.58***	18.81	12.39***	0.4	-15.38	13.08
N	37748		37748		37748		37748		37748	
R-Square	0.38		0.54		0.14		0.04		0.04	

Notes: This table presents the coefficients and standard errors of the random effects model with Mundlak (1978) correction for each of dependent variables provided. Year dummies are included in the models but not shown. *Loan Rate* is interest income on loans divided by average total loans and leases. *Savings Rate* is the sum of interest expense and dividends divided by average total shares and deposits. *Spread* is the Loan Rate less the Savings Rate. *Loan rate, Savings Rate,* and *Spread* are reported in basis points. *Delinquencies-to-Loans and Leases* is the ratio of loan delinquencies-to-total loans and leases multiplied by 100. *Non-Interest Income-to-Assets* is non-interest income divided by total assets. *Size* is the natural log of the inflation-adjusted assets of the credit union. *Return on Assets* is net income divided by total assets. *Asset growth* is the percent growth in assets from the previous year. *Reserves-to-assets* is the reserves in equity divided by total assets. *N* is the number of firm-year observations in the sample. The sample is a balanced panel of 6,294 credit unions for each of the six years beginning in 2009 through 2014.

* Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

The six basis point decrease in the loan rate attributable to collaborative Loan Support Services indicate improved efficiency through collaborating in processing and managing loans. The negative coefficient for the collaborative Business Loan Origination CUSO in the Loan Rate regression and the positive coefficient for the same CUSO for the Delinquencies regression may be indicative of competition among credit unions seeking to diversify their loan portfolios into more business loans and/or lower quality underwriting of business loans by the CUSOs.

The negative coefficient for the Consumer Mortgage Origination CUSO variable in the Loan Rate and Spread regressions indicate that this collaborative CUSO type may provide value for credit union members without increasing the risk of the credit union.

V. Concluding remarks

This study investigates the trends of CUSO participation for the time period 2009-2014 and provides evidence of the effects of CUSO participation on credit union performance in the areas of pricing benefits to members, asset quality, and income from non-interest sources. Credit union participation in CUSOs grew over the sample time period and increases with the size of the credit union. Small credit unions may not be able to participate in wholly-owned CUSOs due to the capital required and capital restrictions for CUSO investment. However, collaboration with other credit unions to provide service may also be limited by an unwillingness to surrender autonomy.

Relations between performance variables and the CUSO types provide mixed results regarding the effects of CUSOs on credit union performance. The multivariate tests provide evidence that wholly-owned CUSOs might not benefit credit union members as they are associated with a larger interest rate spread. Collaborative CUSOs are negatively related to both Loan and Saving Rates, resulting in no significant relation with the Spread, but indicating that the CUSOs may benefit borrowers at the expense of savers. Collaborative Consumer Mortgage Origination is associated with higher member utility due to a 7.4 basis point reduction in Spread, indicating improved efficiency. The results indicate that some of the wholly-owned CUSOs in general and two service types of collaborative CUSO participations are related to lower asset quality. These results indicate that monitoring may decrease with participation in these CUSOs. In two of the three cases, the CUSOs are also related to higher Loan Rates, which may be a reward for taking on lower-quality loans.

Wholly-Owned Insurance Broker or Agency, Collaborative CUSOs in general, and Electronic Transaction Services and Shared Branch Services are positively related to Non-Interest Income-to-Assets. Per Goddard et al. (2008) the impact of income diversification on credit union performance is mixed, with benefits accruing to larger credit unions in their study. However, collaboration through CUSOs may help smaller credit unions overcome their reliance on non-specialist workers to provide specialized services that Goddard et al. cite in their study as a possible reason for the poor results of diversified small credit unions.

This paper adds to the literature for credit unions as it is the first to examine the effects of CUSOs on credit union performance. Additionally, it also introduces the use of the Mundlak (1978) correction for panel data studies to this area of the literature.

Further work on this topic should identify the whether the status of the CUSO as a for-profit or nonprofit organization impacts outcomes for credit union members or otherwise affects the ability of credit unions to achieve their missions. To this end, future work should specifically identify the nature of the wholly-owned CUSOs that result in the increase in interest rate spread and investigate whether the increases in non-interest income benefit credit union members and the communities that credit unions serve.

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Modified Dollar Cost Averaging Investment Strategy: Evidence from Major Developed International Stock Markets

Eric C. Lin and Helen Xu

Abstract

The Dollar Cost Averaging (DCA) method is widely used by individual investors as well as financial professionals and has been discussed extensively in the current literature. This study examines a modified DCA (MDCA) approach using a set of international stock market data. The research will test the hypothesis that the simple modification could enhance investor returns over those from the traditional DCA strategy. This is a subject of great interest to both academic researchers as well as to investors. Empirical results indicate that the MDCA strategy outperforms the DCA method across all of the international stock markets investigated.

I. Introduction

Due to behavioral bias and emotion, many investors do not truly follow the basic investing principle of 'Buy Low, Sell High.' Investors tend to chase high-flying stocks as the shares reach all-time-highs and tend to sell shares of beaten-down companies. Although it has been well-documented that stock markets around the world follow some form of 'mean-reverting' property, many investors still are not able to correct individual cognitive errors.

Several prominent authors and practitioners have discussed the Dollar-Cost Averaging (DCA) strategy that may help investors stay the course when stock markets go down. Malkiel (1999) refers to DCA as "A policy of staying the course and steadily putting new savings into your portfolio (no matter how uncertain the outlook) is the time tested and surest method to accumulate wealth." Statman (1995) states: "The rules of dollar-cost averaging serve to combat lapses in self-control as cognitive errors influence investors to terminate their investment plans". Hirt and Block (1990) discuss that "The intent of dollar-cost averaging is to avoid the common practice of buying high and selling low." Authors such as Constantinides (1979), Rozeff (1994) and Samuelson (1994) are more critical of the practical use of the DCA method.

The Wall Street Journal in an article titled, "How Investing Dimes Can Beat Dollars," contends that the DCA approach works well, especially when stock markets experience a long period of declines [see Geer (2013)]. Academic studies such as Bierman and Hass (2004), Brennan, Li, and Totous (2005) illustrate the importance of the DCA model and find that DCA

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outperforms a lump-sum approach. Other studies such as Richardson and Bagamery (2001), Chen and Estes (2007), Chen and Estes (2010) and Dunham, Friesen and Geoffrey (2012) make improvements to the DCA model.

On the other hand, Leggio and Lien (2003) find that the DCA approach is inferior to the lump-sum method. Atra and Mann (2001) and Grable and Chatterjee (2015) demonstrate that the DCA approach works well only during periods of stock market declines. During periods of stock market advances, the DCA method significantly underperforms the lump-sum approach.

In this study, we focus on investors who have economic constraints (i.e., cannot invest with a large lump-sum) and who must make investment contributions into a retirement account with installments. Therefore, we are focused on improving the current model of DCA, rather than entering into the debate as to whether investors should invest in a lump-sum or by installments. We examine a simple and intuitive modification to enhance the investment returns of the conventional Dollar-Cost Averaging (DCA) strategy. We study a modified DCA (or MDCA) approach to allow investors to systematically purchase more (less) shares of a given investment when stock markets decline (appreciate), when compared with the DCA method. The MDCA can be viewed as a 'magnified' version of DCA and it delivers superior investment results relative to DCA.

We select six developed stock market indices around the world to examine whether the MDCA strategy outperforms the DCA method. These stock markets are the S&P 500 (USA), NASDAQ Market Index (USA), FTSE 100 (UK), DAX (Germany), Nikkei 225 (Japan) and Hang Seng (Hong Kong). We select these major developed stock market indices because theses markets are well-established and investors in these markets already have had long-running defined contribution retirement plans available for savings. For example, 401(k), 403(b) and IRAs are available in the United States, National Employment Savings Trust (NEST) is offered in the United Kingdom and the private-sector Employees' Pension Insurance (EPI) plan in Japan.

We find that MDCA approach outperforms the DCA method in all of the six major stock markets over the period January 1996 through December 2015. The results suggest that an investor employing the MDCA strategy, on average, would realize an additional total investment return of over the traditional DCA approach. In addition, the results also indicate that the average cost per share purchased using the MDCA method is lower than that using the DCA approach. The results are robust in five-year and ten-year rolling period analysis.

II. Background and Hypotheses

The Dollar Cost Averaging (DCA) investment strategy involves fixed amount of funds invested on a regular basis over a period of time. Individual investors commonly utilize the DCA approach in their defied contribution retirement accounts (e.g., 401(k), 403(b) and IRAs) as this type of "automatic" investing strategy is simple to execute and is easily fit into a monthly/annual

budget. The rationale behind the DCA is that investors can purchase more shares of stocks, mutual funds or other types of investments when the stock market declines. Thus, the average purchase price of the investment would be lower as the investor is able to acquire more shares at lower stock market price levels. An example of the DCA approach can be found in Table 1. The example demonstrates how the same constant amount of monthly contribution is made to purchase index shares in the German DAX stock index over a twelve-month period.

The chief objective of this research is to determine whether the DCA could be modified to deliver enhanced investment performance in various international stock markets. Earlier studies are focused on either improving the DCA or on analyzing DCA performance in international markets, but our study combines both tasks by refining the DCA and testing a new modified DCA strategy in different major stock markets around the world.

We examine a modified Dollar-Cost Averaging (MDCA) strategy and test the following (null) hypotheses:

HO1-a: The MDCA strategy does not provide additional investment return over the traditional DCA approach.

HO1-b:The (null) relationship in HO1-a does not change when the MDCA and DCA methods are examined using five-year and ten-year rolling periods.

We consider the percentage change in investment gains from the two competing investment approaches. We investigate percentage change instead of total dollar of investment gains because the total amount of investment between the two methods would differ slightly due to stock market fluctuations.

HO2-a: The average price per share paid to acquire shares of an investment will be the same whether an investor employs MDCA or DCA method.

HO2-b: The (null) relationship in HO2-a does not change when the MDCA and DCA methods are examined using five-year and ten-year rolling periods.

We study an important property of the MDCA or DCA approach; that is, investors can expect to pay, on average, less for each share of investment if they purchase shares when stock markets go down. The goal is to determine the percentage of saving resulting from each of the investing strategy. The MDCA approach could also help investors correct some cognitive errors and behavior bias suggested by Kahneman and Tversky (1982) and Dichtl and Drobetz (2011).

III. Data and Methodology

We examine the MDCA strategy using stock market index data from six major developed countries: S&P 500 (USA), NASDAQ (USA), FTSE 100 (United Kingdom), DAX (Germany), NIKKEI 225 (Japan) and Hang Seng (Hong Kong). We collect monthly stock market index prices from the Yahoo Finance websites to compute monthly index returns over the period January 1996 through December 2015. Yahoo Finance provides historical stock market data to investors without a fee and the financial data can be easily downloaded and imported into Excel Spreadsheets for data analysis. Similar to previous studies, we exclude dividends generated by the stock market index since dividend yields are the same for both MDCA and DCA methods for each underlying stock market index studied.

For the DCA approach, we assume, for simplicity, that a monthly fixed amount of $1,000 is invested in the underlying stock market index during the period under investigation. We calculate each monthly purchase ($SH_{DCA,t}$) by dividing the constant amount of investment (C_t) by the corresponding stock index price (PI_{t-1}). Thus, average index price per share purchased ($\overline{PPS}$) following the DCA method is the total amount of investment accumulated over the period study divided by the total number of shares purchased during the same time period.

$$SH_{DCA,t} = {C_t}/{PI_{t-1}} \quad \text{(I)}$$

$$\overline{PPS} = {\sum_{t=1}^{N} SH_{DCA,t}}\Big/{\sum_{t=1}^{N} C_t} \quad \text{(II)}$$

The modification to the DCA is similar to that employed by Richardson and Bagamery (2011). In the first step of the modification, we start the initial amount of monthly investment at $1,000; however, all subsequent monthly investment contributions (*MCt*) are determined by the preceding month's index rate of return (RI_{t-1}). The objective of this first modification (expressed in Equation III) is to capture monthly fluctuations in the underlying stock index. The modification systematically varies the monthly investment amounts to take advantage of market advances and declines. It allows investors to invest more (less) funds when the market index is lower (higher) each and every month. For instance, if the underlying stock index (e.g., the FTSE 100 Index) had a positive (negative) return of 10% in January, then the MDCA investor would reduce (increase) the February contribution by 10% or $900 ($1,100).

$$MC_t = C_t \times (1 - RI_{t-1}) \quad \text{(III)}$$

Furthermore, we reset the initial investment amount each year to avoid "negative" investment contributions, resulting in short sale position. Negative amounts of investment may occur if the underlying stock index experiences a series of price appreciation during the year. Unlike earlier research, we do not reset the initial investment amount back to $1,000. Instead, we reset the initial amount each year by the process similar to the modification expressed in Equation III. Therefore, the initial investment amount for the current year is reset according to the previous year's stock index return. For example, for the year 2012, we reset the German

DAX Index initial investment amount to $1,146.92 since the DAX Index declined 14.692% in the year 2011 [See Table 1]. To compute the monthly share purchases as well as the average price per share for the MDCA method, we follow the same methods in Equations I and II above.

Table 1. Example MDCA & DCA Calculations (German DAX Index)

Month/	Index	Index	MDCA		DCA	
Year	Price Level	Return	Contribution	Shares	Contribution	Shares
Dec/2011	6914.19	3.374%	$1,000.00	0.1446	$1,000	0.1446
Jan/2012	7077.48	2.362%	$976.38	0.1380	$1,000	0.1413
Feb/2012	7272.32	2.753%	$949.50	0.1306	$1,000	0.1375
Mar/2012	7041.31	-3.177%	$979.67	0.1391	$1,000	0.1420
Apr/2012	7514.46	6.720%	$913.84	0.1216	$1,000	0.1331
May/2012	7293.69	-2.938%	$940.68	0.1290	$1,000	0.1371
Jun/2012	7376.24	1.132%	$930.04	0.1261	$1,000	0.1356
Jul/2012	7158.77	-2.948%	$957.46	0.1337	$1,000	0.1397
Aug/2012	5784.85	-19.192%	$1,141.21	0.1973	$1,000	0.1729
Sep/2012	5502.02	-4.889%	$1,197.01	0.2176	$1,000	0.1818
Oct/2012	6141.34	11.620%	$1,057.92	0.1723	$1,000	0.1628
Nov/2012	6088.84	-0.855%	$1,066.96	0.1752	$1,000	0.1642
Dec/2012	5898.35	-3.129%	$1,146.92	0.1944	$1,000	0.1695

Rate of returns from MDCA and DCA techniques are determined by the following equation:

$$R = \left[(PI_t \times SH_t) - \sum_{t=1}^{N} C_t\right] \Big/ \sum_{t=1}^{N} C_t \qquad \text{(IV)}$$

Using a set of international stock market index data, we examine whether the MDCA strategy is superior to the conventional DCA approach by comparing the average price paid to acquire the index shares and the investment returns from the two methods over the period January 1996 through December 2005. We also conduct five-year and 10-year rolling tests to determine if the MDCA approach outperforms the DCA method consistently. In particular, we investigate the following relationships between the two investment approaches:

$\overline{PPS}_{MDCA} - \overline{PPS}_{DCA} < 0$; and

$$R_{MDCA} - R_{DCA} > 0$$

IV. Empirical Results

Table 2 presents the descriptive statistics for the monthly stock market index returns of the S&P 500, NASDAQ, FTSE 100, DAX, NIKKEI 225 and Hang Seng. The time period under investigation is from January 1996 to December 2015. The descriptive statistics provides

preliminary information about the variation and the range of the index return series. The highest mean monthly returns are in the NASDAQ Market Index and German DAX Index, at 0.894% and 0.859% respectively and the lowest are in NIKKEI 225 Index. As expected, the NASDAQ and DAX also have very high level of volatility (as measured by standard deviation), while Hang Seng is the most volatile market index among six the developed stock markets. Moreover, Hang Seng has the highest range of monthly returns (28.813% to -29.407%), followed by DAX (21.378% to -25.422%) and NASDAQ (21.976% to -22.902%). The return distribution for all of the stock markets appears to be non-normal. All of the stock indices have negative skewness. The kurtosis for Hang Seng, DAX and NSASAQ suggests that each series exhibits fat tails. These results are consistent with those of Aggarwal, Inclana and Leal (1999).

Table 2. Descriptive Statistics

	S&P 500	*NASDAQ*	*FTSE 100*	*DAX*	*NIKKEI 225*	*Hang Seng*
Mean	0.606%	0.894%	0.302%	0.859%	0.145%	0.587%
Standard Deviation	0.044260	0.069117	0.040416	0.063618	0.056574	0.072415
Kurtosis	0.999939	1.161275	0.522453	1.885072	0.579807	2.210468
Skewness	-0.628910	-0.384651	-0.568124	-0.523112	-0.469239	-0.016950
Lowest Return	-16.942%	-22.902%	-13.024%	-25.422%	-23.827%	-29.407%
Highest Return	10.772%	21.976%	8.857%	21.378%	12.850%	28.813%

Table 3 provides results covering the entire period from January 1996 to December 2015. We find that MDCA approach outperforms the DCA method in all of the six major stock markets. The results suggest that an investor employing the MDCA strategy, on average, would realize an additional total investment return of 12.312% over the traditional DCA approach when investing in the NASDAQ Index. The MDCA strategy also provides additional returns of 2.079%, investing in FTSE 100, 2.767% in S&P 500, 6.008% in Hang Seng, 6.033% in Japan and 7.645% in DAX, respectively. Furthermore, we find that the MDCA approach results in lower cost per share purchased, relative to the DCA method across all of the stock markets. The MDCA investor pays, on average, 5.329% less per share of NASDAQ Index than the DCA investor. For the MDCA approach, the NASDAQ Index offers the highest 'discount' on index share acquisition while the S&P 500 Index provides an average of 1.593% savings per share. We also find similar savings in DAX at 3.695%, NIKKEI 225 at 4.031% and Hang Seng at 4.153%.

The findings are intuitive – as MDCA investors purchase more (less) shares when the markets go down (up), they would not only earn higher rate of returns per dollar of investment, but they would also pay less for each and every share of the investment. Tables 4 and 5 present additional analysis based on two rolling periods: 60-month rolling and 120-month rolling. The results from the two rolling periods are similar; the MDCA strategy consistently outperforms the DCA approach across all of the six stock market indices and the results are independent of the time periods.

In the five-year rolling analysis, we discover that MDCA outperforms the DCA in 158 of the 180 trails (or 87.78% of the time) in the S&P 500 Index. Moreover, MDCA performs even better than DCA in the other stocks markets. For instance, MDCA is superior to DCA, investing in NASDAQ (with probability of 95.56%), in FTSE 100 (of 91.67%), in DAX (of 89.44%), in NIKKEI (of 100%) and in Hang Seng (of 100%). It appears that the results are associated with the return volatility of the underlying stock market index as shown in Exhibit 1 and Table 2. Moreover, the ten-year rolling results suggest that the MDCA approach outperforms the DCA method in longer term investment horizon. Table 5 shows that MDCA is superior to DCA in all (or 100%) of the 120-month rolling trails across all of the six stock markets. The results also indicate that the longer the investment horizon, the greater the rate of return per dollar of investment and the lower the price per share purchased for MDCA investors. These findings are consistent with Strong and Taylor (2001). In short, we present evidence that the MDCA approach has delivered greater investment performance than the DCA method.

Given the apparent correlation between the volatility of the index returns and the enhanced performance of the MDCA approach (see Table 3), we believe that a future research study can focus on applying the modified investment strategy in emerging markets around the world. Emerging markets such as Brazil, China, India, and Turkey tend to have more volatile market return properties than the developed stock markets investigated in this study and thus the MDCA method may further enhance the performance of regular investing program like Individual Retirement Accounts (IRAs) and 401(k)/403(b) accounts. A study that focuses on performance of different types of DCA models in emerging markets would be of great interest to both academic researchers and practitioners.

Table 3. Total Period Results (January 1996 – December 2015)

Stock Market Index	S&P 500	NASDAQ	FTSE 100	DAX	NIKKEI 225	Hang Seng
	MDCA - DCA	MDCA - DCA	MDCA - DCA	MDCA - DCA	MDCA - DCA	MDCA - DCA
Total Shares Purchased	10.655	16.709	3.618	3.781	3.575	2.056
Total Contributions	$8,577.84	$22,240.65	$14,725.74	$10,377.41	$34,400.15	$20,330.11
Ending Investment Value	$21,778.10	$83,666.83	$22,583.24	$40,615.38	$68,037.56	$45,049.88
Amount of Investment Gain	$13,200.26	$61,426.18	$7,857.50	$30,237.97	$33,637.41	$24,719.77
Percentage of Investment Gain	2.767%	12.312%	2.079%	7.645%	6.033%	6.008%
Average Cost per Share	-$18.45	-$109.67	-$92.53	-$185.00	-$492.78	-$603.99
Percentage of Saving per Share	1.593%	5.329%	1.771%	3.695%	4.031%	4.153%

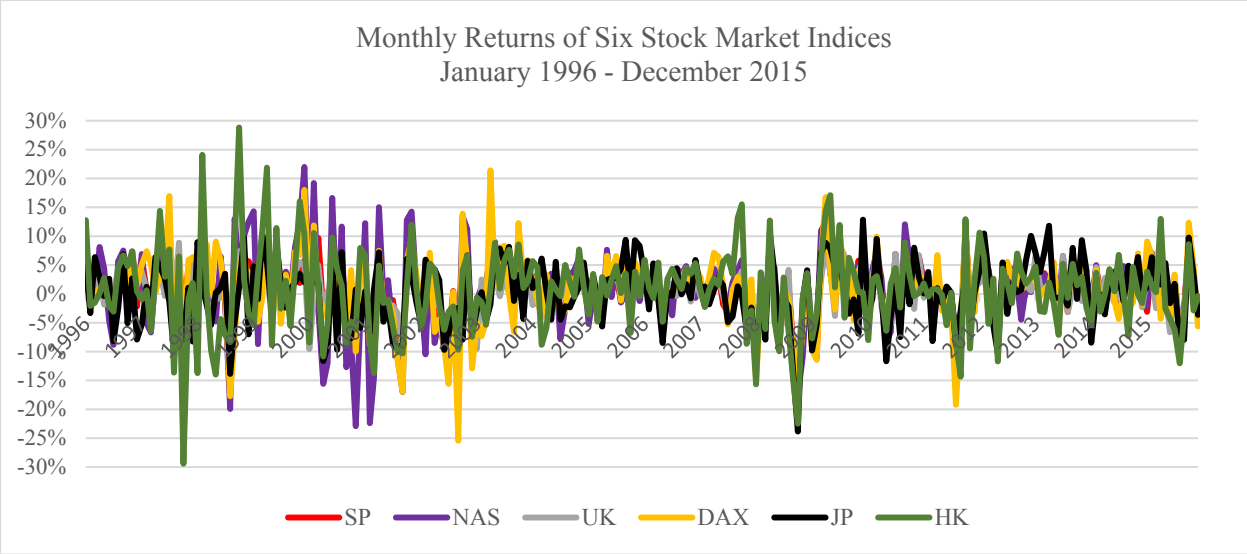
Table 4. Five-Year Rolling Period Results

Returns	S&P 500	NASDAQ	FTSE 100	DAX	NIKKEI 225	Hang Seng
Total trails	180 (100%)	180 (100%)	180 (100%)	180 (100%)	180 (100%)	180 (100%)
MDCA superior	158 (87.78%)	172 (95.56%)	165 (91.67%)	161 (89.44%)	180 (100%)	180 (100%)
MDCA inferior	22 (12.22%)	8 (4.44%)	15 (8.33%)	19 (10.56%)	0 (0%)	0 (0%)
Average Difference	2.123%	4.609%	1.761%	4.041%	3.493%	3.537%
Average Cost per Share						
Total trails	180 (100%)	180 (100%)	180 (100%)	180 (100%)	180 (100%)	180 (100%)
MDCA superior	158 (87.78%)	172 (95.56%)	165 (91.67%)	161 (89.44%)	180 (100%)	180 (100%)
MDCA inferior	22 (12.22%)	8 (4.44%)	15 (8.33%)	19 (10.56%)	0 (0%)	0 (0%)
Average Difference	-$21.99	-$82.24	-$85.53	-$163.28	-$393.23	-$426.77
Average % Difference	-1.884%	-4.038%	-1.636%	-3.117%	-3.359%	-2.742%

Table 5. Ten-Year Rolling Period Results

Returns	S&P 500	NASDAQ	FTSE 100	DAX	NIKKEI 225	Hang Seng
Total trails	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)
MDCA superior	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)
MDCA inferior	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Average Difference	2.728%	6.895%	2.351%	6.399%	4.177%	5.610%
Average Cost per Share						
Total trails	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)
MDCA superior	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)	120 (100%)
MDCA inferior	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Average Difference	-$26.62	-$107.72	-$108.33	-$226.56	-$456.76	-$546.49
Average % Difference	-2.304%	-5.067%	-2.108%	-4.559%	-3.952%	-3.674%

Exhibit 1. Monthly Return Chart of Six Major World Stock Market Indices
January 1996 – December 2015



V. Conclusion

Utilizing a set of international stock market data, we examine a modified version of the Dollar-Cost Averaging (MDCA) strategy. Over the period from January 1996 through December 2015, we find that the MDCA outperforms the conventional DCA approach across all of the six major world stock market indices studied: S&P 500 (USA), NASDAQ Market Index (USA), FTSE 100 (UK), DAX (Germany), Nikkei 225 (Japan) and Hang Seng (Hong Kong). The results are similar in the five-year and ten-year rolling period analysis. The findings are intuitive – as the MDCA investors purchase more (less) shares when the markets go down (up), relative to the DCA investors, they would not only earn higher rate of returns per dollar of investment, but they would also pay less for each and every share of the investment.

This study provides novel results about performance enhancement of the traditional DCA approach. Following the MDCA strategy, investors can take further advantage of the 'mean-reverting' characteristics of the stock markets. The MDCA method follows a systematic and disciplined approach to investing. It may help correct investors' behavioral bias and emotion when stock markets significantly decline or advance. In essence, the MDCA investor truly follows the 'Holy Grail' of investing – Buy Low, Sell High.

It appears that the results may be correlated with the volatility of the underlying stock market index. Table 3 and Exhibit 1 show that the three most volatile stock indices – NASDAQ, DAX and Hang Seng also have the best return performance and lowest cost per share paid in the analysis of the MDCA approach. A future study may examine whether the DCA framework performs better when the underlying asset is more volatile. Emerging markets such as Brazil, China, India, and Turkey tend to have more volatile market return properties than the developed

stock markets investigated in this study and thus the MDCA method may further enhance the performance of regular investing program like Individual Retirement Accounts (IRAs) and 401(k)/403(b) accounts.

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Does Deregulation Affect the Currency Markets?
Evidence from the Yen-Dollar Exchange Rate in Three Markets

Ingyu Chiou

Abstract

This paper examines how currency market deregulation affects the behaviors of the yen-dollar exchange rates in Tokyo, London, and New York. Using the intraday return (open to close) data, we find strong and consistent evidence that the three currency markets interact significantly, both before and after deregulation. For each of nine contracts, Tokyo positively affects London and New York, London positively affects New York and Tokyo, and New York positively affects Tokyo and London. In particular, the causality relationship is much stronger when one market trades right after another. When comparing basic statistics between the pre- and post-deregulation periods, we find that, after deregulation, the volatility of the yen-dollar exchange rate intraday returns increases, the range of the intraday returns broadens, the distribution of these returns becomes more left-skewed, and the distribution of the intraday returns moves further away from normality. These deregulation-induced changes hold true for all three markets and for most of nine contracts. We interpret our findings as evidence that foreign exchange deregulation encourages more participation and hence more competition, leading to a more efficient and unpredictable exchange rate in each currency market.

I. Introduction

The interdependence of national financial markets has long been of interest to academics, practitioners, and regulators. Academics tend to pay more attention to pricing mechanisms, practitioners to portfolio effects, and regulators to potential contagion effects. Studies of these relationships generally focus on portfolio diversification, the co-movements of equity prices, or the lead-lag relationships among national stock market indexes. For example, Schollhammer and Sand (1985) examine the co-movements of stock market indices in the United States and major European countries. They find a significant degree of interdependence between the stock prices of Germany, the UK, the Netherlands, and Switzerland. They also find evidence of the transfer of information between markets in that a change in US stock prices normally leads to a same-direction change in all the European markets except Italy.

Although most studies in market integration focus on national equity markets, a few papers explore non-equity markets. Chiou (2012) examines the gold markets in Hong Kong, London, and New York and shows that in terms of the intraday return, these three markets are not interdependent. However, he finds that when using the variable of the intraday return volatility, the Hong Kong market positively affects the London market, the London market positively affects the New York market, and the New York market positively affects the Hong Kong market. i.e., there are high degrees of volatility linkages between the three gold markets.

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Chiou, Jordan-Wagner, and Yu (2005) investigate how one currency market affects another currency market in a different time zone, using the opening and closing yen/dollar exchange rates in Tokyo, London, and New York. They find strong and consistent evidence that the three major currency markets interact significantly.

This paper extends the market integration literature by investigating the interdependence between the yen/dollar exchange rates in London, New York, and Tokyo. Our paper is different from Chiou, Jordan-Wagner, and Yu (2005) in three important aspects. First, we use nine contracts of opening and closing yen/dollar exchange rates traded in three major currency markets. Second, we study how the April 1998 foreign exchange deregulation in Japan affects the behavior of yen/dollar intraday returns in three major markets. Finally, we employ more sophisticated econometric models to capture the causality relations between these markets.

We find strong and consistent evidence that the three major currency markets have significant degrees of interactions. For each of nine contracts we examine, Tokyo Granger-causes London and New York, London Granger-causes New York and Tokyo, and New York Granger-causes Tokyo and London. In particular, the causality relationship is much stronger when one market trades right after another. Although our results violate market efficiency, these findings may be due to some unique characteristics of each of three currency markets and do not necessarily imply the existence of easy arbitrage between these markets.

The remainder of this paper is organized as follows. Section II briefly discusses existing literature. In Section III, we describe the foreign exchange deregulation in Japan, data, and methodology. Section IV presents and discusses empirical results. We summarize and conclude in Section V.

II. Literature Review

There has been a progression of research on the topic of financial market integration. Early research on the synchronization among equity prices across different countries (e.g., Grubel (1968), Levy and Sarnat (1970), Agmon (1972), Ripley (1973), Hilliard (1979), and others) focuses on the role of international diversification in reducing the systematic risk in an investment portfolio. These studies, which used primarily weekly or monthly return data, show that international equity markets normally have relatively low degrees of correlation.

Later studies used daily data and found higher correlations between equity markets in some countries. Jaffe and Westerfield (1985), using daily closing prices for five countries, find that correlations between equity returns in the U.S. and the other four markets are generally positive and significant for each day of the week. Eun and Shim (1989) use the vector autoregression (VAR) methodology to investigate cross-country price transmissions of nine national stock markets and detect a high degree of linkage among these markets. They also find that the U.S. market is the most important information producer, often affecting other national stock markets unilaterally.

More recently, Becker, Finnerty, and Gupta (1990), using the opening price to the closing price returns of the Japanese and U.S. stock markets, find that the U.S. market Granger-causes

the Japanese market, while the Japanese market has only a small impact on the U.S. market return. Campbell and Hamao (1992) find evidence of common movements in expected excess stock returns between the Japanese and U.S. financial markets, suggesting a high degree of integration between the long-term capital markets of these two countries.

Koch and Koch (1991) examine the relationships between daily closing index prices of eight national stock markets for the years 1972, 1980, and 1987, and find that the degree of interdependence among national stock markets increased over time. This evidence is consistent with the increase in trade and capital flows across country borders in the past 50 years.

Although a lot of studies on the interactions of national equity markets exist, little has been done in the integration of national currency markets. This paper extends the existing literature by investigating how deregulation affects the yen/dollar exchange rate behaviors in London, New York, and Tokyo and how these three currency markets interact.

III. Foreign exchange deregulation in Japan, data, and methodology

a. FX deregulation in Japan

On November 11, 1996, Japan's Prime Minister Ryutaro Hashimoto announced a plan to open up, reform, and substantially deregulate the country's financial sector. Modeled on the Big Bang reform that shook the UK financial markets in October 1986, the Japanese "Big Bang" reform plan aimed at reviving the country's financial markets by making them free in competition, fair on rules, and global in terms of participants by 2001. The ultimate goal was to make the Tokyo financial markets among the largest international financial centers, comparable with those of London and New York. Among the proposed deregulation measures, the first and most important was to liberalize the foreign exchange markets and their transaction services in order to facilitate inbound and outbound capital flows and to enhance competition (Chiou and White 2005).

Under the revised *Foreign Exchange and Foreign Trade Control Law of 1949* that went into effect in 1980, only government-authorized banks could conduct foreign exchange business in Japan. Individuals and companies had to go through these government-licensed banks to convert U.S. dollars into Japanese yen or to buy U.S. dollars using yen. The monopolization of foreign exchange services meant that licensed Japanese banks easily collected a lot of transaction commissions without too much competition.

The completely revamped foreign exchange law became effective in April 1998. This new law allows any consumers or companies to buy and sell foreign currencies without government authorization. Also, any entity such as a convenience store can, in theory, engage in foreign exchange businesses. More importantly, Japanese companies can significantly cut currency transaction costs because they have obtained greater flexibilities in handling their payments and receipts denominated in different foreign currencies.

To test whether or not the new foreign exchange law in Japan affects the behaviors of the yen/dollar exchange rates in major currency markets, we divide the whole sample into two sub-

periods: October 1994 to February 1998 (pre-deregulation) and May 1998 to August 2001 (post-deregulation).

b. Sample

We obtained daily opening and closing yen/dollar exchange rates for the Tokyo, London, and New York markets from a Wall Street firm over the period October 1994-August 2001 (82 months). Our exchange-rate data include the spot contract, 1-month, 2-month, 3-month, 4-month, 5-month, 6-month, 9-month, and 1-year forward contracts (9 contracts in total), which are considered as the most liquid for the yen/dollar pair. All of the yen/dollar exchange rates in this paper are expressed in European terms (yen/$); i.e., the foreign currency price of one U.S. dollar.

Because holidays in Japan, the UK, and the U.S. differ, we first aligned the opening and closing prices by date for each contract. To examine the pricing transmission of the yen/dollar exchange rate, we then calculated the intraday return (= (close - open)/open) for each day, for each contract, and for each of three markets. We deleted the dates, in which at least one market did not trade.

Table 1 shows the summary statistics of intraday (open-to-close) returns over the 82-month period for each contract, for each period (pre-deregulation and post-deregulation), and for each of three markets. For the spot contract (Panel A), the New York market has the highest average returns in both pre-deregulation and post-deregulation periods (0.047% and -0.0155%, respectively) while the Tokyo market has the lowest average returns for both periods (0.032% and -0.0261%, respectively). In the pre-deregulation period, the New York market has the highest standard deviation of the intraday returns (0.717%) while the Tokyo market has the lowest standard deviation of the intraday returns (0.672%). Interestingly, the standard deviation result turns opposite in the post-deregulation period in that the Tokyo market has the highest standard deviation of the intraday returns (0.852%) while the New York market has the lowest standard deviation of the intraday returns (0.824%). All else being equal, the April 1998 foreign exchange deregulation in Japan seems to increase the intraday volatility in the Tokyo market relative to those of London and New York.

Table 1 Summary statistics of the intraday returns of 9 yen/dollar exchange rate (yen/dollar) contracts in Tokyo, London, and New York for two different periods

Pre = pre-deregulation period from October 1994 to February 1998
Post = post-deregulation period from May 1998 to August 2001
N = sample size
J-B = Jarque-Bera statistic = $(N/6)[(\text{skewness})^2 + 0.25(\text{kurtosis}- 3)^2]$

Panel A: Spot contract (yen/US$)

Spot contract	**Tokyo**		**London**		**New York**
N (pre)	873		873		873
N (post)	873		873		873

Mean (pre, %)	0.03204236		0.042560329		0.047010847
Mean (post, %)	-0.026153696		-0.016974757		-0.015567172
Median (pre, %)	0.030994937		0.064929795		0.052283025
Median (post,%)	0		-0.018268177		0
SD (pre, %)	0.672319344		0.699718705		0.717310464
SD (post, %)	0.852547844		0.826445326		0.82443173
Max (pre, %)	3.244481968		3.442377592		3.833422317
Max (post, %)	3.858933696		3.168462743		3.398236591
Min (pre, %)	-3.805987468		-3.31769437		-3.554040896
Min (post, %)	-7.84848728		-5.983167559		-6.871401152
Kurtosis (pre)	4.474273168		4.094663458		4.510719303
Kurtosis (post)	12.63140222		5.013238999		7.14117278
Skewness (pre)	-0.402146132		-0.293491257		-0.337979469
Skewness (post)	-1.448739208		-0.774273955		-0.989182905
J-B (pre)	102.5908649		56.12067981		99.63815619
J-B (post)	3679.669172		234.6599227		766.1754741

When we compare the intraday return distributions, we find that the distribution of the Tokyo market has the largest peakedness in each of two periods with kurtoses equal to 4.474 and 12.63, respectively, while the London market has the smallest kurtosis in each of the same periods. Also, in each of two periods, the Tokyo market is the most left-skewed (the largest negative skewness) while the London market has the least skewness. In addition, the Jarque-Bera statistic of the Tokyo market is the highest in each of two periods (102.59 and 3679.67, respectively) while the null hypothesis of the normal distribution is rejected for each market and each period.

Furthermore, the summary statistics of 7 other forward contracts (1-month, 2-month, 3-month, 4-month, 5-month, 6-month, 9-month, and 1-year) show similar results we just discussed with a few exceptions. This seems not too surprising because the pricing of all forward contracts is related to the spot contract. To save space, we report only the summary statistics of the 1-month forward contract in Panel B.

Panel B: 1-month forward contract (yen/US$)

1-Month forward	**Tokyo**		**London**		**NY**
Sample size (pre)	866		866		866
Sample size(post)	866		866		866
Mean (pre, %)	0.031625188		0.041387617		0.048492034

Mean (post, %)	-0.026523517		-0.017380128		-0.016339699
Median (pre, %)	0.029804445		0.065608452		0.055528684
Median (post,%)	-0.003475601		-0.017481801		0.008995531
SD (pre, %)	0.677540844		0.702947137		0.72241285
SD (post, %)	0.858774836		0.832971738		0.828736071
Max (pre, %)	3.256264375		3.447164948		3.851104913
Max (post, %)	3.870086508		3.182533074		3.394207711
Min (pre, %)	-3.821062442		-3.330716609		-3.570031299
Min (post, %)	-7.882646893		-6.01659751		-6.879531081
Kurtosis (pre)	4.422519618		4.104129326		4.454655741
Kurtosis (post)	12.56577653		4.97925153		7.067902133
Skewness (pre)	-0.395390105		-0.2999082		-0.337462407
Skewness (post)	-1.445718722		-0.773287854		-0.983518554
J-B (pre)	95.58097583		56.97129958		92.78998149
J-B (post)	3603.443724		227.6617671		736.7156808

c. Methodology

To further examine the causality relationships between Tokyo, London, and New York, we first calculate the correlation coefficients between different pairs of currency markets. Then, we compare the intraday returns between different pairs of markets and between the pre-deregulation and post-deregulation periods. Finally, we conduct the Granger-causality tests.

IV. Major findings and interpretations

Table 2 presents the results of intraday return correlations between 4 pairs of currency markets. For each pair, the correlation coefficients of both pre-deregulation and post-deregulation periods are very close. Also, the correlation coefficient between the London and New York markets on Day t is the highest for each of two periods. This may be due to the traditional tie between these two markets and the trading-hour overlap. Notice that for each period, the correlation coefficient between the New York market on Day t and the Tokyo market on Day t+ 1 is lower than that between Tokyo market on Day t and the New York market on Day t. This seems to suggest that the pricing transmission is relatively weaker from New York to Tokyo over a trading-day change.

Table 2 Intraday return correlations between selected pairs of currency markets for 9 yen/dollar rate contracts

L = London market

NY = New York market
T = Tokyo market

t = calendar Day t
t + 1 = calendar Day t + 1

(L_t, NY_t) = correlation coefficient between Day t intraday return in London and Day t intraday return in New York
(NY_t, T_{t+1}) = correlation coefficient between Day t intraday return in New York and Day t +1 intraday return in Tokyo

Pre = pre-deregulation period from October 1994 to February 1998
Post = post-deregulation period from May 1998 to August 2001
N = sample size

		(L_t, NY_t)		**(T_t, L_t)**		**(T_t, NY_t)**		**(NY_t, T_{t+1})**	
	N	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Spot	873	0.9103	0.9135	0.6764	0.6534	0.5963	0.5819	0.3247	0.3773
1-Month	866	0.9130	0.9130	0.6786	0.6535	0.5964	0.5821	0.3252	0.3785
2-Month	868	0.9129	0.9136	0.6781	0.6539	0.5959	0.5843	0.3249	0.3719
3-Month	869	0.9128	0.9130	0.6784	0.6540	0.5956	0.5808	0.3247	0.3770
4-Month	864	0.9123	0.9128	0.6780	0.6535	0.5940	0.5798	0.3247	0.3740
5-Month	862	0.9128	0.9128	0.6777	0.6535	0.5949	0.5774	0.3247	0.3744
6-Month	868	0.9122	0.9107	0.6779	0.6534	0.5937	0.5774	0.3258	0.3740
9-Month	867	0.9129	0.9074	0.6786	0.6533	0.5959	0.5718	0.3239	0.3775
1-Year	868	0.9118	0.9069	0.6788	0.6551	0.5936	0.5754	0.3269	0.3734

Table 3 shows the results of paired t-tests for different pairs of markets and for the pre-deregulation and post-deregulation periods. As Panels A, B, and C show, all paired t-tests cannot reject, at the 5% level, the null hypothesis that the two samples are likely to have come from the same two underlying populations that have the same mean. The result in Panel D still cannot reject the null hypothesis at the 5% level. Overall, these results suggest that the behaviors of the yen/dollar intraday returns are similar across three major currency markets and that the foreign exchange deregulation in Japan does not significantly change the behavior of the yen/dollar intraday returns from the pre-deregulation period to the post-deregulation period.

Table 3 Paired t-test results of the spot-contract intraday returns between different pairs of markets and between the pre-deregulation and post-deregulation periods

L = London market
NY = New York market
T = Tokyo market

t = calendar Day t

t + 1 = calendar Day t + 1

Prob(L_t, NY_t) = the probability of the paired t-test result between Day t intraday return in London and Day t intraday return in New York
Prob(NY_t, T_{t+1}) = the probability of the paired t-test result between Day t intraday return in New York and Day t +1 intraday return in Tokyo

Pre = pre-deregulation period from October 1994 to February 1998
Post = post-deregulation period from May 1998 to August 2001

Table 4 presents the results of Granger-causality tests for the spot contract. Panel A shows that in the pre-deregulation period, the London market Granger-causes the Tokyo market with an adjusted R-square of 17.39%. The same result holds true in the post-deregulation period, as shown in Panel B.

Table 4 The results of Granger-causality tests for the spot contract

R = intraday return of yen/US$ = (close- open)/open
L = London market
NY = New York market
T = Tokyo market

t = calendar Day t
t - 1 = calendar Day t - 1
t - 2 = calendar Day t – 2

Panel A: Trading sequence: Tokyo, London, and New York

Dependent variable = T_t				
Regression Statistics				
Multiple R	0.421592178			
R Square	0.177739965			
Adjusted R Square	0.173941997			
Standard Error	0.006117397			
Observations	871			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.007005306	0.001751326	46.79870204
Residual	866	0.032407921	3.74225E-05	
Total	870	0.039413227		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.000150919	0.000208159	0.725015368	0.468638452

T_{t-1}	-0.505203555	0.048560092	-10.40367781	5.75237E-24
T_{t-2}	-0.260860141	0.045373941	-5.749118063	1.24294E-08
L_{t-1}	0.5878717	0.043951865	13.37535272	3.16066E-37
L_{t-2}	0.375898014	0.046909302	8.013293729	3.59851E-15

	Pre	Post
Prob(T_t, L_t)	0.573898982	0.698280344
Prob(T_t, NY_t)	0.479787214	0.683554566
Prob(L_t, NY_t)	0.661937224	0.903597645

Panel A (Spot rate): Pre-deregulation period

Panel B: Trading sequence: London, New York, and Tokyo

	Pre	Post
Prob(L_t, NY_t)	0.661937224	0.903597645
Prob(L_t, T_{t+1})	0.687449972	0.777927675
Prob(NY_t, T_{t+1})	0.562599264	0.732607041

Panel B (Spot rate): Post-deregulation period (**Dependent variable = T_t**)

Regression Statistics				
Multiple R	0.428568651			
R Square	0.183671089			
Adjusted R Square	0.179900516			
Standard Error	0.007723688			
Observations	871			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.011623661	0.002905915	48.71172649
Residual	866	0.051661535	5.96554E-05	
Total	870	0.063285196		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.000295377	0.000261987	-1.127449002	0.259864972
T_{t-1}	-0.43245358	0.046504924	-9.299092208	1.12508E-19
T_{t-2}	-0.247961134	0.043328216	-5.722855887	1.44308E-08
L_{t-1}	0.611661815	0.04445297	13.75975146	4.18663E-39
L_{t-2}	0.294211566	0.047945982	6.136313258	1.28396E-09

Panel C shows that in the pre-deregulation period, the Tokyo market Granger-causes the London market with an adjusted R-square of 55.36%. Panel D reveals the same result in the post-deregulation period.

Panel C: Trading sequence: New York, Tokyo, and London

	Pre	Post
Prob(NY_t, T_{t+1})	0.562599264	0.732607041
Prob(NY_t, L_{t+1})	0.868864241	0.989047023
Prob(T_{t+1}, L_{t+1})	0.579369107	0.663098028

Panel C (Spot rate): Pre-deregulation period (**Dependent variable = L_t**)

Regression Statistics				
Multiple R	0.74543701			
R Square	0.55567634			
Adjusted R Square	0.55362404			
Standard Error	0.00467935			
Observations	871			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.0237144	0.0059286	270.757422
Residual	866	0.01896225	2.1896E-05	
Total	870	0.04267665		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.00029082	0.00015927	1.8258984	0.06820978
L_{t-1}	-0.4776445	0.03456053	-13.82052	2.0985E-39
L_{t-2}	-0.1123213	0.02485534	-4.5190011	7.0756E-06
T_t	0.8368202	0.02551096	32.80238	4.95E-154
T_{t-1}	0.37680721	0.03593615	10.4854626	2.6756E-24

Panel D: Paired t-test for the pre-deregulation and post-deregulation periods

T: pre v. post	0.108876308
L: pre v. post	0.10185402
NY: pre v. post	0.085973667

Panel D (Spot rate): Post-deregulation period (**Dependent variable = L_t**)

Regression Statistics				
Multiple R	0.70659012			
R Square	0.49926959			
Adjusted R Square	0.49695675			

Standard Error	0.00586788			
Observations	871			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.02973116	0.00743279	215.868388
Residual	866	0.02981815	3.4432E-05	
Total	870	0.05954932		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.1478E-05	0.00019905	0.15814213	0.87438167
L_{t-1}	-0.3877656	0.03526193	-10.996722	2.0187E-26
L_{t-2}	-0.0858841	0.02598201	-3.3055239	0.00098696
T_t	0.74114642	0.02534177	29.2460354	2.514E-131
T_{t-1}	0.31034319	0.03417093	9.08208334	7.0711E-19

Panel E exhibits that in the pre-deregulation period, the Tokyo market Granger-causes the New York market with an adjusted R-square of 47.33%. The same result holds true in the post-deregulation period, as shown in Panel F. To save space, other Granger-causality results are not reported here. Because the results of other 8 contracts are very similar, we do not report them here.

Panel E (Spot rate): Pre-deregulation period (**Dependent variable = NY_t**)

Regression Statistics				
Multiple R	0.68977932			
R Square	0.4757955			
Adjusted R Square	0.47337424			
Standard Error	0.0052109			
Observations	871			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.0213434	0.00533585	196.506759
Residual	866	0.02351495	2.7154E-05	
Total	870	0.04485835		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.00040525	0.0001775	2.28316468	0.02266217
NY_{t-1}	-0.5075808	0.03607303	-14.070922	1.1945E-40
NY_{t-2}	-0.1458213	0.02815087	-5.1799921	2.7613E-07
T_t	0.81819752	0.0292999	27.9249255	7.055E-123
T_{t-1}	0.35996017	0.03839203	9.37590871	5.8211E-20

Panel F (Spot rate): Post-deregulation period (**Dependent variable = NY_t**)

Regression Statistics				
Multiple R	0.64096608			
R Square	0.41083752			
Adjusted R Square	0.40811621			
Standard Error	0.00634798			
Observations	871			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.02433456	0.00608364	150.970786
Residual	866	0.03489703	4.0297E-05	
Total	870	0.0592316		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.8764E-05	0.00021533	0.13358176	0.89376434
NY_{t-1}	-0.3736356	0.03671364	-10.177024	4.6855E-23
NY_{t-2}	-0.0920091	0.02897599	-3.1753558	0.00154946
T_t	0.68969298	0.02823268	24.4288903	1.124E-100
T_{t-1}	0.27813636	0.03548148	7.83891706	1.3317E-14

Overall, all Granger-causality tests indicate that the currency markets in Tokyo, London, and New York affect one another significantly.

V. Summary and conclusions

We study how the 1998 foreign exchange deregulation in Japan affects the behaviors of the yen-dollar exchange rates in Tokyo, London, and New York. We find strong and consistent evidence that the three major currency markets interact significantly in the pre- and post-deregulation periods. For each of nine contracts, Tokyo positively affects London and New York, London positively affects New York and Tokyo, and New York positively affects Tokyo and London. In particular, the causality relationship is much stronger when one market trades right after another. Although these results are violations of market efficiency, the findings seem due to some unique characteristics of each of three currency markets that cannot be explained easily.

When comparing basic statistics in the pre- and post-deregulation periods, we find that, after deregulation, the volatility of the intraday returns increases, the range of the intraday returns widens, the distribution of these returns becomes more left-skewed, and the distribution of the intraday returns moves further away from normality. These deregulation-induced changes hold true for all of the three markets and for most of nine contracts. These findings suggest that foreign exchange deregulation increases participation and hence competition, making the yen/dollar exchange rate more unpredictable and efficient in each currency market.

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Puerto Rico's Impending Defaults and Fall: Is There a Viable Solution?

Brandy Hadley and Jim Estes

Abstract

Puerto Rico has amassed critical amounts of debt through intertwined bond issues and the usage of Capital Appreciation Bonds. This paper explores the background leading to the impending defaults with a focus on the viability of alternative solutions including bankruptcy, the issuance of a Superbond, insurance coverage, revenue diversion, and PROMESA debt restructuring.

I. Introduction

Puerto Rico is carrying more debt, $72 billion according to Bloomberg, than all U.S. states with the exception of California and New York. This debt represents over 70% of its GDP and over 100% of its GNP; the interest requirement on the debt consumes more than a third of annual tax revenues. According to Walsh of the New York Times (2015), Puerto Rico is carrying a debt per capita ratio that is more than twice that of the two worst US states combined. At the same time, Puerto Rico has a population of under 3.5 million which has been declining by 9% per year since 2005, shrinking the labor force by 20% in sharp contrast to an average 8.4% increase for the U.S. as a whole over the same time period, according to Nick Timiraus of the Wall Street Journal. This high level of debt and historical poor fiscal performance combined with a lack of growth, increasing poverty, high unemployment (only 40% of adults are either working or looking for work), strong outmigration, and economic uncertainty have led to the downgrade of the Commonwealth's general obligation bonds to non-investment grade. This downgrade has resulted in a loss of access to market funding for the Commonwealth. In this paper, we explore Puerto Rico's already serious debt crisis, potential solutions, and their viability.

I. Background on Puerto Rico's Debt Crisis

Puerto Rico has faced a history of economic challenges. According to the United States Treasury report entitled "Puerto Rico's Fiscal Challenges" (2015), Puerto Rico has experienced a record of poor fiscal performance due to unrealistic budget and revenue estimates, lack of fiscal discipline, and opaque reporting and disclosure. Despite these challenges, historically the Commonwealth has been able to rely on the municipal bond markets for relatively low-cost financing. According to Wirtz, Timiraos, and Kiriloff of the Wall Street Journal (2015), the popularity of these bonds, due to their tax-free nature, led to the amassing of over $72 billion in total bond indebtedness. However, Puerto Rico's access to the capital markets has ended.

Given the lack of available further financing to support Puerto Rico's immediate fiscal needs, the Commonwealth has begun to run out of cash and to utilize emergency liquidity measures (Krueger, Teja, & Wolfe 2015). Payments to vendors are stretched, tax refunds are

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delayed, pension assets have been liquidated early, debt service has been withheld, and ultimately Puerto Rico will run out of cash. When that occurs, Puerto Rico will no longer be able to either repay its debts or continue municipal services. As explained in the U.S. Treasury report outlining Puerto Rico's fiscal crisis, "There is no doubt that there is a large gap between Puerto Rico's required operating expenses, contractual debt obligations and its available financial resources."

In addition to the fear of impending bankruptcy for the territory, the impact on the US Municipal Bond Market is massive. It is estimated that approximately half of municipal bond funds have Puerto Rican bond exposure according to Jeff Benjamin of Investment News (2015). However, according to the Soreide Law Group Website, UBS and Oppenheimer funds are much more heavily exposed than others. As can be seen from Table I below, which illustrates the largest exposures to these bonds, present losses equal almost $21 billion with value shrinking from $25.5 billion to $4.5 billion as of June 29th of 2015, a drop of over 82%. As this table represents only the top 20 mutual funds, there is actual remaining exposure of over $11 billion according to Tom Anderson of CNBC (2015). Obviously, a Puerto Rican default, in addition to having a significant impact on Puerto Rico's economy, would have large reverberations throughout the U.S. municipal bond mutual fund market.

Table I. Top 20 Mutual Funds holding Puerto Rican Bonds

Fund Name	Market Value of Puerto Rican debt as of June 29, 2015	Percentage of the portfolio invested in Puerto Rican de	Total Investment as of portfolio date	Category
Oppenheimer Rochester Fund Muni A	$1,376,856,503	22.30%	$6,185,980,085	Muni New York Long
Oppenheimer Rochester High Yld Muni A	$715,302,841	13.20%	$5,406,587,424	High Yield Muni
Oppenheimer Rochester LtdTerm NY Muni A	$726,558,930	20.60%	$3,515,612,163	Muni Single State Short
Oppenheimer Rochester Ltd Term Muni A	$608,173,909	19.20%	$3,160,840,263	High Yield Muni
MainStay High Yield Muni Bond A	$215,681,931	12.90%	$1,727,077,784	High Yield Muni
Oppenheimer Rochester CA Muni A	$150,523,359	11.40%	$1,328,984,067	Muni California Long
Oppenheimer Rochester AMT-Free NY Muni A	$190,431,569	16.30%	$1,166,986,059	Muni New York Long
Oppenheimer Rochester PA Muni A	$123,108,661	13.90%	$883,561,556	Muni Pennsylvania
Oppenheimer Rochester Ltd Term CA Muni A	$89,003,199	12.90%	$687,146,588	Muni Single State Short
Oppenheimer Rochester NJ Muni A	$82,876,129	17.30%	$479,016,636	Muni New Jersey
Franklin Double Tax-Free Income A	$110,282,812	47.20%	$233,553,864	High Yield Muni
Wells Fargo Advantage WI Tax-Free Inv	$24,420,696	15.30%	$160,092,126	Muni Single State Interm
Oppenheimer Rochester VA Muni A	$40,736,112	33.80%	$120,667,805	Muni Single State Long
Oppenheimer Rochester NC Muni A	$15,577,530	17.30%	$89,810,812	Muni Single State Long
Oppenheimer Rochester Ohio Muni	$10,310,176	14.60%	$70,479,154	Muni Ohio
Oppenheimer Rochester AZ Munici A	$12,059,832	18.80%	$64,312,517	Muni Single State Long
Oppenheimer Rochester MD Munici A	$23,093,065	36.90%	$62,603,594	Muni Single State Long
Oppenheimer Rochester MA Munici A	$9,850,542	16.10%	$61,339,160	Muni Massachusetts
Oppenheimer Rochester Michigan Muni A	$10,105,790	19.50%	$51,801,240	Muni Single State Long
Alpine High Yield Managed Dur Muni A	$5,835,739	13.80%	$42,105,336	High Yield Muni
Totals	$4,540,789,325		$25,498,558,233	

Source: CNBC Puerto Rico Municipal Bond Database: http://www.cnbc.com/2015/06/30/is-your-bond-fund-invested-in-puerto-rico.html

II. Puerto Rico's Intertwined Bond Usage

After a sales tax was introduced in 2006, the Puerto Rico Urgent Interest Fund Corporation (also known as the Puerto Rico Sales Tax Financing Corporation), issued COFINA bonds backed by Puerto Rico's future sales tax revenues, in 2007, 2008, 2009 and 2011. A significant portion of Puerto Rico's debt stems from these sales tax bonds, originally issued to "plug budget gaps and repay other lenders" (Kuriloff 2015). It is important to note that the Puerto Ruco Urgent Fund Corporation is a subsidiary of the Government Development Bank and was created by Law No. 291 of 2006. Thus, this corporation is effectively a government subsidiary which makes its bonds General Obligation Bonds backed by the full faith, credit, and taxing ability of Puerto Rico. However, the corporation asserts that the bonds are only backed by the sales tax revenue of Puerto Rico pointing to yet another future issue to be resolved in the courts.

In addition, many of these COFINA bonds were issued as Capital Appreciation Bonds (CABs). A CAB is a municipal security in which the investment return on an initial principal amount is reinvested at a stated rate until maturity, at which time the investor receives a single payment representing the face value of the bond and all accrued interest (Fudge 2013). CABs often are not callable and if they have a sinking fund (most do not have a mandatory payment provision in the bond indenture agreement), payments to that fund are often not started until after 15 or 20 years into the bond's life, leaving no debt service to be reported on financial statements (Ayala 2013). Despite the overwhelming risks and costs of CABs, these securities are often enticing to cash-strapped municipalities with a lack of financing options. Despite their appeal, at maturity municipalities face fiscal disaster when they are on the hook for accreted values that can be 10 to more than 100 times what was received at issue (Adelmann 2013; Lusvardi 2012). Given the significant accreted values to be paid in the future, the lack of funds being set aside to service the debt, and the growing liability for Puerto Rico, CABs present a particularly dangerous method of funding for Puerto Rico.

Current COFINA bonds, according to the Commonwealth of Puerto Rico's Government Development Bank (2015), total over $15.2 billion and are structured to be repaid from dedicated sales-tax revenue. The COFINA CABs have a face amount of $3.05 billion with a repayment amount of $94,722 billion, per the Wall Street Journal's Reuters Database as shown in Table II. Despite the massive required repayment, Puerto Rico received only $173.5 million at issue; only 5.7% of the face and less than .02% of the repayment amount. A significant problem is that Puerto Rico reports its debt in its financial statements as the face amount of the bonds, not the repayment amount. In the case of the CAB COFINA bonds, this difference is significant: According to Check on Bond View, an online service that quotes the estimated price of outstanding bonds, these bonds, with a face amount of $3.05 billion have a total value of only $16,731.00. According to the June 30, 2014 Basic Financial Statements of the Puerto Rico Urgent Interest Fund Corporation, audited by KPM, a financing deficit of at least $5,474.5 million has been accumulated. In addition, the bonds have been downgraded twice, on 5/11/2015 and 4/24/2015. After these downgrades, the senior bonds currently carry a credit rating of Caa2 and CCC+, from Moody's and S&P respectively, while the subordinated bonds have a credit rating of Ca and CC, respectively. It is important to note that the true repayment requirement of the COFINA bonds of $94,722 billion is deliberately omitted from Puerto Rico's financial statements, pointing to the extreme unlikelihood of Puerto Rico meeting its debt obligations.

Table II. COFINA Capital Appreciation Bonds

CUSIP	Issuer	Issue Year	Maturity Year	Repayment Amt $Million	Face Amt $Million
74529JPC3	PR Sls Tx Fin Corp	2011	2041	$ 1,006,000,000	$ 3,410,000
74529JPB5	PR Sls Tx Fin Corp	2011	2039	$ 1,006,000,000	$ 62,501,000
74529JPA7	PR Sls Tx Fin Corp	2011	2038	$ 1,006,000,000	$ 15,141,000
74529JNZ4	PR Sls Tx Fin Corp	2011	2037	$ 1,006,000,000	$ 15,512,000
74529JNY7	PR Sls Tx Fin Corp	2011	2034	$ 1,006,000,000	$ 5,226,000
74529JMP7	PR Sls Tx Fin Corp	2011	2050	$ 734,796,000	$ 28,137,000
74529JMN2	PR Sls Tx Fin Corp	2011	2049	$ 734,796,000	$ 32,903,000
74529JMM4	PR Sls Tx Fin Corp	2011	2048	$ 734,796,000	$ 38,093,000
74529JML6	PR Sls Tx Fin Corp	2011	2047	$ 734,796,000	$ 43,739,000
74529JMK8	PR Sls Tx Fin Corp	2011	2046	$ 734,796,000	$ 46,663,000
74529JMJ1	PR Sls Tx Fin Corp	2011	2045	$ 734,796,000	$ 53,231,000
74529JMH5	PR Sls Tx Fin Corp	2011	2044	$ 734,796,000	$ 47,998,000
74529JMG7	PR Sls Tx Fin Corp	2011	2043	$ 734,796,000	$ 46,273,000
74529JMD4	PR Sls Tx Fin Corp	2011	2033	$ 734,796,000	$ 4,549,000
74529JMC6	PR Sls Tx Fin Corp	2011	2032	$ 734,796,000	$ 2,864,000
74529JMB8	PR Sls Tx Fin Corp	2011	2041	$ 734,796,000	$ 2,443,000
74529JMA0	PR Sls Tx Fin Corp	2011	2024	$ 734,796,000	$ 10,470,000
74529JLZ6	PR Sls Tx Fin Corp	2011	2023	$ 734,796,000	$ 22,402,000
74529JLR4	PR Sls Tx Fin Corp	2010	2039	$ 1,619,000,000	$ 31,956,000
74529JLQ6	PR Sls Tx Fin Corp	2010	2038	$ 1,619,000,000	$ 45,764,000
74529JLP8	PR Sls Tx Fin Corp	2010	2037	$ 1,619,000,000	$ 20,000,000
74529JKT1	PR Sls Tx Fin Corp	2010	2036	$ 1,824,000,000	$ 36,743,000
74529JKS3	PR Sls Tx Fin Corp	2010	2035	$ 1,824,000,000	$ 28,376,000
74529JKR5	PR Sls Tx Fin Corp	2010	2034	$ 1,824,000,000	$ 7,554,000
74529JKQ7	PR Sls Tx Fin Corp	2010	2033	$ 1,824,000,000	$ 34,382,000
74529JKP9	PR Sls Tx Fin Corp	2010	2032	$ 1,824,000,000	$ 8,742,000
74529JKN4	PR Sls Tx Fin Corp	2010	2031	$ 1,824,000,000	$ 14,013,000
74529JHY4	PR Sls Tx Fin Corp	2009	2035	$ 1,218,000,000	$ 35,000,000
74529JGR0	PR Sls Tx Fin Corp	2009	2033	$ 1,218,000,000	$ 18,552,000
74529JHT5	PR Sls Tx Fin Corp	2009	2034	$ 4,118,000,000	$ 86,140,000
74529JHS7	PR Sls Tx Fin Corp	2009	2031	$ 4,118,000,000	$ 21,830,000
74529JHR9	PR Sls Tx Fin Corp	2009	2030	$ 4,118,000,000	$ 31,186,000
74529JFQ3	PR Sls Tx Fin Corp	2008	2036	$ 737,047,000	$ 25,338,000
74529JFP5	PR Sls Tx Fin Corp	2008	2035	$ 737,047,000	$ 26,270,000
74529JFN0	PR Sls Tx Fin Corp	2008	2034	$ 737,047,000	$ 21,582,000
74529JFM2	PR Sls Tx Fin Corp	2008	2033	$ 737,047,000	$ 22,670,000
74529JFL4	PR Sls Tx Fin Corp	2008	2032	$ 737,047,000	$ 22,470,000

74529JFK6	PR Sls Tx Fin Corp	2008	2031	$	737,047,000	$	23,077,000
74529JFJ9	PR Sls Tx Fin Corp	2008	2027	$	737,047,000	$	16,415,000
74529JFH3	PR Sls Tx Fin Corp	2008	2026	$	737,047,000	$	34,723,000
74529JFG5	PR Sls Tx Fin Corp	2008	2025	$	737,047,000	$	33,212,000
74529JFF7	PR Sls Tx Fin Corp	2008	2024	$	737,047,000	$	22,407,000
74529JEN1	PR Sls Tx Fin Corp	2007	2038	$	499,997,000	$	10,226,000
74529JEM3	PR Sls Tx Fin Corp	2007	2037	$	499,997,000	$	6,139,000
74529JEL5	PR Sls Tx Fin Corp	2007	2036	$	499,997,000	$	9,772,000
74529JEK7	PR Sls Tx Fin Corp	2007	2035	$	499,997,000	$	5,926,000
74529JEJ0	PR Sls Tx Fin Corp	2007	2034	$	499,997,000	$	8,463,000
74529JEH4	PR Sls Tx Fin Corp	2007	2033	$	499,997,000	$	13,272,000
74529JEG6	PR Sls Tx Fin Corp	2007	2031	$	499,997,000	$	6,622,000
74529JEF8	PR Sls Tx Fin Corp	2007	2030	$	499,997,000	$	1,952,000
74529JEE1	PR Sls Tx Fin Corp	2007	2029	$	499,997,000	$	358,824
74529JED3	PR Sls Tx Fin Corp	2007	2027	$	499,997,000	$	2,983,000
74529JEC5	PR Sls Tx Fin Corp	2007	2026	$	499,997,000	$	6,995,000
74529JEB7	PR Sls Tx Fin Corp	2007	2025	$	499,997,000	$	8,602,000
74529JEA9	PR Sls Tx Fin Corp	2007	2024	$	499,997,000	$	2,141,000
74529JDZ5	PR Sls Tx Fin Corp	2007	2023	$	499,997,000	$	725,899
74529JDY8	PR Sls Tx Fin Corp	2007	2022	$	499,997,000	$	513,217
74529JAQ8	PR Sls Tx Fin Corp	2007	2056	$	2,668,000,000	$	175,058,000
74529JAP0	PR Sls Tx Fin Corp	2007	2054	$	2,668,000,000	$	701,475,000
74529JAN5	PR Sls Tx Fin Corp	2007	2047	$	2,668,000,000	$	107,015,000
74529JAM7	PR Sls Tx Fin Corp	2007	2046	$	2,668,000,000	$	108,236,000
74529JAL9	PR Sls Tx Fin Corp	2007	2045	$	2,668,000,000	$	109,430,000
74529JAK1	PR Sls Tx Fin Corp	2007	2044	$	2,668,000,000	$	110,598,000
74529JAJ4	PR Sls Tx Fin Corp	2007	20432	$	2,668,000,000	$	112,133,000
74529JAH8	PR Sls Tx Fin Corp	2007	4042	$	2,668,000,000	$	113,630,000
74529JAG0	PR Sls Tx Fin Corp	2007	2041	$	2,668,000,000	$	114,698,000
74529JAF2	PR Sls Tx Fin Corp	2007	2040	$	2,668,000,000	$	15,446,000
74529JBE4	PR Sls Tx Fin Corp	2007	2032	$	1,333,000,000	$	34,499,000
74529JBD6	PR Sls Tx Fin Corp	2007	2031	$	1,333,000,000	$	14,498,000
74529JBC8	PR Sls Tx Fin Corp	2007	2029	$	1,333,000,000	$	26,798,000
74529JBB0	PR Sls Tx Fin Corp	2007	2027	$	1,333,000,000	$	12,008,000
74529JAB1	PR Sls Tx Fin Corp	2007	2030	$	1,333,000,000	$	29,299,000
74529JAA3	PR Sls Tx Fin Corp	2007	2028	$	1,333,000,000	$	30,001,000
				$	94,721,773,000	$	3,049,469,940

Source: Thompson-Reuters Data Base, provided by the Wall Street Journal

The required payments for debt maturity are beginning to mount, exponentially increasing Puerto Rico's liquidity issues. In the fiscal year that ended June 30 last year, the island collected $1.42 billion of sales-tax revenue. Nearly 50% or approximately $670 million of that revenue was used to offset COFINA bonds, according to the US Treasury. Taking steps to bolster its revenue, Puerto Rico has increased its sales tax from 7% to 11.5%, the highest in the U.S., and moved on April 1, 2016 to a value added tax system. Despite these steps, Puerto Rico's first default occurred on August 3, 2015 when it failed to make a $58 million payment on its Public Finance Corporation (PFC) bonds (Kuriloff 2015). Its second default of $800 million occurred on July 1 of this year. The increased likelihood of default is reflected in increased yields with senior COFINA bonds maturing in 2040 last trading with an average yield of 9.3 percent while subordinate bonds yielded approximately 15 percent.

Puerto Rico's debt issues are compounded when considering the impact on its public pension system. Puerto Rico's Employees Retirement System, covering 119,975 employees, is only 0.7% funded with a shortfall of $44 billion as of December 2015 (Kaske 2015c). While the pension fund represents government employees who only make up 3.3% of the population, it liabilities represent 63% of Puerto Rico's 2014 Gross National Product of $69.201 billion and 42% of the 2014 Gross Domestic Product of $103.675 billion. The pension system is poised to run out of money by 2020, which would leave the government on the hook for more than $2 billion in benefit payments the next year alone (Kaske 2015c). That's equal to about one-fourth of this year's general-fund revenue. A disastrous factor not included in these projections is that the market value of the bonds held is a fraction of their stated values, meaning that the pension fund will run out of funds substantially sooner than expected.

In 2008 in order to strengthen its position, according to the Thompson Reuters database, the pension fund issued three different tiers of zero coupon pension obligation bonds (rated BBB- at issue) with a value of $2.947 billion**.** Today, Moody's rates these bonds Ca, according to bondview.com. The bonds are to be repaid from contributions that the commonwealth and municipalities make to the retirement system with absolutely no guarantee from the Commonwealth of Puerto Rico. At maturity, in 2058, these bonds call for a repayment of $3.841 billion while the pension fund received only $71.3 million from the CABs at issue as shown in Table III. However, the market value of these bonds today is only $10,853 based on values taken from bondview.com.

Table III. Value of Bonds Issued by Puerto Rico's Pension Fund

Sale Date	Issuer	Amount of Issue ($ Million)	Amount at Maturity ($ Million)	Amount Received ($ Million)	Value on 24-Dec-15
1/29/2008	Puerto Rico Employee Retirement System	1,588,811	1,700,450	12.948	$ 4,020.00
5/8/2008	Puerto Rico Employee Retirement System	1,058,635	1,833,660	57.808	$ 5,954.20
6/26/2008	Puerto Rico Employee Retirement System	300.203	307.09	0.539	$ 878.90
Totals		2,647,746	3,534,417	71.295	$10,853.10

Sources: Thompson-Reuters Database; http://www.bondview.com/price-check/bond

In addition, during the fiscal year ended June 30, 2011, the Pension System received a special contribution of approximately $163 million from the Puerto Rico Infrastructure Financing Authority, an instrumentality of the Commonwealth. Surprisingly, this entire contribution of $163 million was invested in bonds issued by the Puerto Rico Sales Tax Financing Corporation (COFINA Bonds) which are intended to provide a 7% accretion rate with maturity dates between 2043 and 2048. These sales tax bonds are carried as assets on the Pension Fund's financial statements at an accreted value of $270 million per the Thompson-Reuters database. However, as can be seen from Table IV, these bonds have a market value of $3,490, representing only .001% of the stated value on the balance sheet, per bondview.com, an online bond quote service.

Table IV. Value of COFINA Bonds Held by Puerto Rico's Pension Fund

Value of the Bonds	CUSIP	Muni Issue Size	Issue Year	Coupon Type	Maturity Date
$ 60.10	29216MBM1	$ 300,203,000	2008	ZERO COUPON	7/1/2030
$ 940.36	29216MAZ3	$ 1,059,000,000	2008	ZERO COUPON	7/1/2034
$ 940.36	29216MAY6	$ 1,059,000,000	2008	ZERO COUPON	7/1/2033
$ 87.00	29216MAX8	$ 1,059,000,000	2008	ZERO COUPON	7/1/2032
$ 943.60	29216MAW0	$ 1,059,000,000	2008	ZERO COUPON	7/1/2031
$ 99.40	29216MAV2	$ 1,059,000,000	2008	ZERO COUPON	7/1/2030
$ 105.90	29216MAU4	$ 1,059,000,000	2008	ZERO COUPON	7/1/2029
$ 112.80	29216MAT7	$ 1,059,000,000	2008	ZERO COUPON	7/1/2028
$ 115.60	29216MAB6	$ 1,589,000,000	2008	ZERO COUPON	7/1/2028
$ 85.00	29216MAA8	$ 1,589,000,000	2008	ZERO COUPON	7/1/2028
$ 3,490.12		$ 10,891,203,000.00			

Sources: Thompson-Reuters Data Base; http://www.bondview.com/price-check/bond

According to the US Treasury, as of 2014, Puerto Rico's three public pension funds held just $2 billion in net assets, including the questionable sales tax bonds valued at $240 million, against a combined estimated pension liability of $46 billion. In 2013, as part of the total Employee Retirement System (ERS) legislation pension reform, employer contributions increased from 10% of payroll to over 20% which brings total employee and employer contributions to 30% of payroll. However, even with the legislative reform, the fact remains that with the Commonwealth's current deficit, the pension fund is only .7% funded. In 2013, Puerto Rico was forced to pay the current pension amounts due by prematurely selling $1 billion of the pension fund assets. At this rate of depletion and with the lack of contributions by Puerto Rico, the funds will be exhausted well before the projected 2020 date, inevitably forcing the cessation of pension payments all altogether.

II. Puerto Rico's Impending Default & Possible Solutions

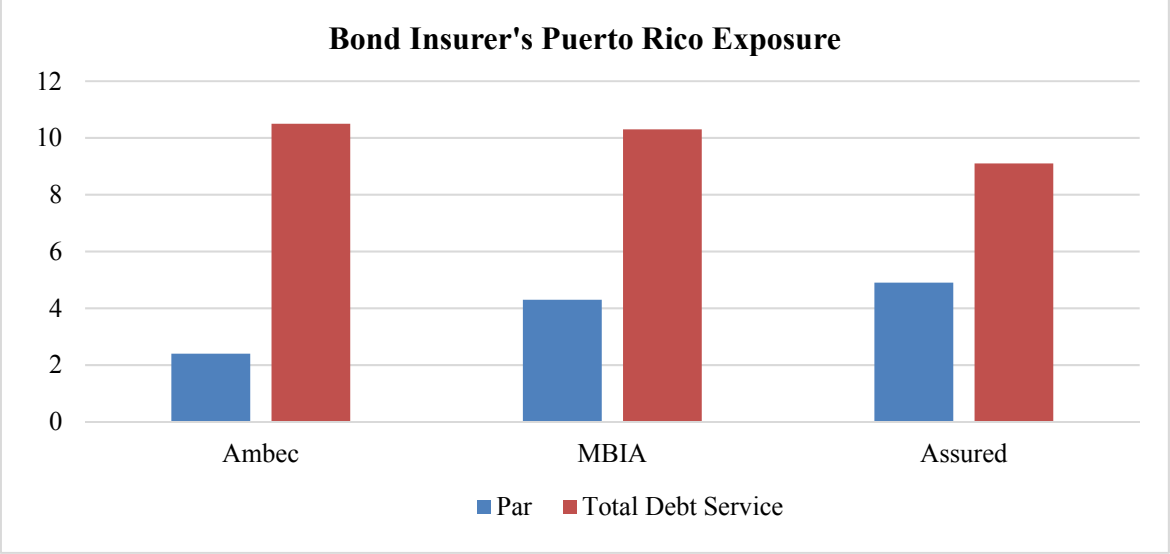
Given Puerto Rico's financial struggles, heaping levels of debt, use of capital appreciation bonds, and intertwined debt issues, continued impending defaults are inevitable. While many solutions have been proffered including bankruptcy, the issuance of a superbond, insurance coverage, revenue diversion, and debt restructuring, the viability of each option is

questionable. A collapse of the Puerto Rico debt market would have far reaching implications to its other general obligation bonds, and the funds holding those bonds throughout the U.S. However, the defaults have already mounted. Although Puerto Rico did meet its 2015 obligation to its General Obligation Bonds ($326.7 million) as well as $383 million in debt maturity, it did so by sacrificing its January 1 bond payment of $37.3 million to the Puerto Rico Infrastructure Financing Authority as well as $400 of the $422 million of the May 3rd payment due to the Puerto Rico Development Bank (Tiriraos 2016). Immediately following this default the Governor of Puerto Rico, Alejandro Garcia Padilla, stated that Puerto Rico would not make the $800 million payment due in July on its most senior bonds (Tiriraos 2016). This is all in addition to having missed the August 3, 2015 bond payment of $58 million on its Public Finance Corporation (PFC) bonds (Kuriloff 2015). Puerto Rico is simply choosing on which bonds to default in order to meet its constitutional obligation on the GO bonds. While this is a temporary solution, it forces the value of all non-GO bonds down to pennies on the dollar and simply postpones the eventual collapse of Puerto Rico's bond market.

In addition, under United States law, there is currently no bankruptcy protection for American states or territories and a US bailout has proven to be unfavorable among voters and taxpayers. However, according to Kaske with Bloomberg (2015, Sept 11), lawmakers and the Supreme Court are now considering establishing new bankruptcy protections for territories to address Puerto Rico's issues and, according to Wirtz, Timiraos, and Kiriloff with the Wall Street Journal (2015), the US Treasury has considered and subsequently rejected the issuance of a "superbond" to aid in restructuring. One major issue that is providing a significant stumbling block is that the inability to declare bankruptcy forces Puerto Rico to seek a restructuring with its bondholders. As the law requires a consensus to restructure, the subordinated debt holders are in a position to block any restructuring until they are satisfied with their protections.

While some have suggested that insurance coverage be used to aid with funding, only three of the seven bond issues are insured. The insured portion represents only 51.6% of the outstanding bonds, 39% of which are the senior bonds. As can be seen from Figure I, the exposure to the insurance companies who insure these bonds is large. Although there are no current interest payments due and therefore, no immediate risk of default, the large accreted values due at repayment combined with the lack of funding by Puerto Rico creates substantial long-term risk for the insurers. However, Puerto Rico will be still be left with a significant balance of liability in the event of a default.

Figure I. Bond Insurer's Puerto Rico Exposure



Source: Bloomberg: http://www.bloomberg.com/news/articles/2015-09-04/puerto-rico-balloon-payments-seen-as-risk-for-some-bond-insurers

Another option being considered, according to Aaron Kuriloff of the Wall Street Journal (2015), is the use of sales tax revenue as a source of funds for looming interest payments. This would only serve to compound the problems for these failing bonds to which those sales taxes are pledged, reducing the price even further. In addition, holders of these bonds have already told the government that they will sue to block any action to divert sales tax revenue from the bonds.

Puerto Rico has virtually no options other than a complete restructure of all debt. However, the Obama Administration rejected a bailout of more than $70 billion of debt (Kaske & Braun, 2016), a figure that appears to be some $16 billion short of the recently revised estimate according to Aaron Kuriloff of the Wall Street Journal. In addition, any restructure will require an agreement by the bondholders and should consider its impact on bond insurers. Despite challenges inherent in a U.S. led restructuring, on June 29, 2016, three weeks after the House overwhelmingly backed the measure, the U.S. Senate passed the PROMESA Act, the Promise Act in Spanish, on a bipartisan 68-30 vote in order to offer aid to Puerto Rico. According to NBC News, the vote came only two days before Puerto Rico was due to make a $2 billion payment to creditors. According to Bloomberg, Puerto Rico still failed to make almost half of that debt payment, which included $780 million on general obligation bonds, its fourth default. Only $380 million of this sum is covered by their insurers (Gillers & Timiros 2016). In addition, the Government Development Bank defaulted on an additional $9.9 million in interest on September 1, 2016 before being placed in a state of emergency.

In order to help the fiscally ailing territory, the PROMESA Act lowers the minimum wage to $4.25 an hour for workers in Puerto Rico who are 24 and under. It also establishes a seven member oversight board that will supervise Puerto Rico's bond restructuring and that can force the island to balance its budget. According to Steve Mufson of the Washington Post, on August 31, 2016, the White House named seven members to the PROMESA oversight board. The members include both Puerto Ricans and Americans with bankruptcy, banking, private

equity, insurance, Social Security, and law experience. The PROMESA oversight board will be primarily responsible for creditor negotiations in an attempt to relieve the Commonwealth of its $72 billion in debt obligations and its $43.7 billion pension fund shortage. While the government of Puerto Rico must still create and pass a budget and relief plan, should the inevitable impasse be reached between the government and its creditors, the oversight board has the power to impose a settlement. While the PROMESA oversight board provides many beneficial fiscal changes, the measures may serve to increase outmigration further multiplying Puerto Rico's financial problems.

III. Conclusion

Given the complexity of Puerto Rico's intertwined debt burden, there may be no viable solution other than a complete debt restructure orchestrated under the powers of the PROMESA oversight board. However, it is important that the board consider its impact on the citizens of Puerto Rico and resulting outmigration. The necessary debt restructuring is likely to touch nine separate Puerto Rican governmental agencies who are involved with the debt issue. According to Bloomberg's Brian Chappatta, the debt issued by these nine entities comprises 86% of the total debt load for Puerto Rico. The debt holdings of these nine agencies are outlined below. These bonds are all reported at their face values and the amounts reported do not reflect the significant paybacks associated with the capital appreciation bonds nor their market values. [2]

[2]

1) The Puerto Rico Government Development Bank holds $7.7 billion in debt. These bonds trade for $0.32 cents on the dollar with an effective yield of 1600%.
2) The Puerto Rico Highways and Transportation Authority holds $5.4 billion in debt. These bonds trade for an average yield of 29.4%.
3) The Puerto Rico Pension Fund holds $2.8 billion in debt. These bonds owe, but are not paying, $13.9 billion in interest each month and have an average yield of 21.9%.
4) The Puerto Rico Convention Center District Authority holds $397.7 million in debt. This debt, insured by FGIC and rated Caa3 by Moody's, matures in 2023 and has an average yield of 21%. The $2.65 billion of these bonds that were issued as CABs have an issue amount of $2.65 million but a market value of only $10,853.
5) Puerto Rican General Obligation Bonds provide the Commonwealth with a debt level of $12.9 billion. These bonds, following the recent default of $780 million, are trading at $0.675 cents on the dollar. They have a yield of 12.3% which equates to an equivalent 21.8% yield for corporate bonds for investors in the highest tax bracket.
6) The Puerto Rico Public Building Authority has a debt level of $4.2 billion and an average yield of 11%.
7) The Puerto Rico Sales Tax Financing Corporation (COFINA bonds) has a debt load of $16 billion. Yields range between 9.7% and 15.8% depending on the maturity of the bond. However, of the $16 billion, $3.1 billion of these bonds were issued as CABs. Although these CABs have a face value of $3.1 billion, they have a repayment amount of over $94.7 billion.
8) The Puerto Rico Electric Power Authority has some $8.6 billion in debt and its bonds maturing in 2030 yield approximately 11%.
9) The Power Rico Aqueduct and Sewer Authority has a debt load of $3.6 billion and its bonds have an average yield of 9.2%.

In conclusion, Puerto Rico is in serious trouble and will not be able to emerge on its own. The PROMESA oversight board will be forced to order a restructuring that will make no one happy and be challenged in courts for years to come. This restructure will have to be formed soon as the Puerto Rican debt is on the verge of collapse. This problem is compounded by the simple fact that the reported debt does not reflect the true amount owed because of the use of CABs. The big winners will be the consultants and attorneys who will be advising all sides in these workouts. The losers will be the people of Puerto Rico who will face higher taxes, school closures, and loss of jobs as their government struggles to match revenue with expenditures, most certainly a requirement of the federal oversight committee. United States mutual funds and hedge funds who hold these securities also face billions in losses that will ultimately have to be passed on to their shareholders.

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Deriving Unlevered Value – The REIT Approach

Walt A. Nelson and Kent Ragan

Abstract

This article demonstrates the application of the Modigliani and Miller valuation model to privately-held non-taxable real estate entities, such as real estate investment trusts (REITs). The International Financial Reporting Standards Foundation has recently published IFRS 13, which requires periodic valuation of privately held and publically held assets.

I. Introduction

Real estate appraisal is the professional estimate of market value, also interpreted as the "most probable selling price," where such a price is expected to be paid by a "typical" investor, ready, willing and able to purchase. Actual market prices for commercial property, while available to some extent, are not nearly as observable as are market prices for publically traded equities and debt.

The International Financial Reporting Standards Foundation has recently published IFRS 13 which establishes the definition of "fair value" and specifies the procedures for establishing same. Although IFRS 13 has not yet been wholly adopted in the United States, the U.S. Financial Accounting Standards Board has merged many aspects of IFRS 13 into ACS 820. Although IFRS 13 and ACS 820 are not exactly the same, accountant Hilary Eastman, writing for the online edition of *Economia* (May 2013) reports that:

> Consequently, during the financial crisis the IASB and the U.S. Financial Accounting Standards Board (FASB) began working more closely together to align their respective fair value measurement guidance. As a result, IFRS 13 is nearly identical to the U.S. GAAP standard (ASC 820, formerly Statement of Financial Accounting Standards (SFAS) No. 157 Fair Value Measurements).

The new standard requires that fair value be established, on an annual basis, as an exit value between participants at the entity level. IFRS 13 defines fair value as "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date." The fair value also includes a required assumption that the value be driven by its setting in the principal or most advantageous market.

The standard for "fair value" is not identical to "most probable selling price, "fair market value" or "market value" as used in the real estate appraisal industry. The purpose of this paper is to show how the income approach applied to property held by real estate investment trusts, or REITs, is likely to produce appraised property value estimates which most closely meet the definition of "fair value" as stipulated in IFRS 13 and ASC 820.

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II. Unlevered Value and Income Property

Appraisal theory states that the value of income property is based on the before tax income. That is, the net operating income drives property value estimates. Since net operating income (NOI) is unlevered, appraisal methodology conforms to the Modigliani & Miller Proposition I (no taxes) that the value of a firm is not affected by its capital structure. The valuation statement is typically:

$$V_L = V_U \quad [1]$$

Where the firm value with no debt financing, V_U, is the same as the value of the firm where leverage (debt financing) is employed. The simplest model used to estimate the most probable selling price is the perpetuity:

$$V = NOI/R_0 \quad [2]$$

This model, also called direct income capitalization, employs a "cap rate," or R_0, in the denominator to evaluate the net operating income, or NOI, expected to be produced by the property as of the end of the coming year. Thus, twelve months of positive cash flows are collapsed into the annual equivalent which is assumed to be received at the end of the last day of the last month of the coming year. The value, V, carries no subscript because the value should be independent of the capital structure which finances the purchase of the asset. The model is a perpetuity and as such it ignores capital appreciation, but it can be modified to accommodate such expectations. Combining the models:

$$V = NOI/R_0 = V_L = V_U \quad [3]$$

The process to estimate appraised market value (i.e. most probable selling price) is simplified if the appraiser need not be concerned with the capital structure used to finance the purchase of the investment. The property under review is termed the "subject property" in appraisal parlance.

III. Cell Tower Valuation

Suppose a cell tower produces annual NOI of $3.5 million and that a real estate investment trust, or REIT, owns the tower. REITs pay no income taxes at the entity level provided that the bulk of net income is paid out to shareholders each year. Thus, the value of the cell tower owned by the REIT conforms to M&M Proposition I. Let V_{UN} represent the value of the property having no debt and no income tax and stipulating that $R_0 = R_U = 0.10$, the unlevered value of the untaxed cell tower is:

$$V_{UN} = NOI(1 - T_C)/R_U \quad [4]$$
$$\$35{,}000{,}000 = \$3{,}500{,}000(1.0)/.10$$

The expression $(1 - T_C)$ reduces to unity, because there is no tax. Modigliani and Miller Proposition I (with taxes) states:

$$V_L = V_U + T_C D \quad [5]$$

In this case, of course, Equation 5 is reduced to the form of Equation 2 because the RIET income is not taxed. So the property value under REIT ownership is not distorted by taxes or influenced by the capital structure.

Modigliani and Miller Proposition II (with taxes) states that the tax deductibility of interest on corporate debt encourages managers to "lever up" the firm to increase value to shareholders. M&M states as managers use more debt in the capital structure, equity rates of return rise to adjust for the increasing risk of default. However, because income to REITs is not taxed at the entity level, there is only a benefit to using debt if the firm lacks enough equity funds to purchase the property. So, the REIT value, hence the property value, will remain uninfluenced by the use of debt.

To continue the example, suppose now that the cell tower owned by the REIT has this capital structure: 70% debt via a 7% amortizing mortgage with annual payments for a term of 25 years. The appraiser must make a separate evaluation of each position within the capital structure: debt and equity. Combining these two estimates then becomes the estimate of property value. Using the 7% annual loan factor 0.08581 and holding the overall return, R_U = 10% = R_0, the appraiser can use the "band of investment" technique to find the return to equity, R_E:

$$R_U = w_L R_L + w_E R_E \quad [6]$$

The band of investment is really nothing more than the weighted average cost of capital, or WACC, except that in this example the model is not burdened with the tax deductibility of the interest on debt. The equity stake is 30% because the loan-to-value ratio is 70% as mentioned earlier. By the numbers, then:

$$.10 = .7(.08581) + .3(R_E) \quad [7]$$

Rearranging and solving for the required return to equity shareholders where the capital structure is predominantly debt:

$$(R_E) = .1331 \quad [8]$$

And the appraised value is still $35 million. The appraiser is now in a position to compare the return to equity in this capital structure to returns to other shareholders having similar positions in similar properties. If the comparison is favorable, the appraiser may state with confidence that the fair value of the cell tower is the sum of its two capital structure components.

Now suppose the same property is held by a firm which pays income taxes at the entity level, such as a regular "C-Corporation." The net operating income, or NOI, as defined in the real estate setting, may be approximated by earnings before interest and taxes, or EBIT in the

corporate setting. Therefore, this example uses the $3.5 million income as the appropriate cash flow to evaluate throughout this example. The tax rate is 35%. So, the appraised value of the corporate-owned unlevered cell tower using Equation 4 is:

$$\$22,750,000 = \$3,500,000(.65)/.10 \quad [9]$$

Using Equation 5 the levered value in the taxable entity's cell tower becomes:

$$\$28,323,750 = \$22,750,000 + (.35 \times .7 \times \$22,750,000) \quad [10]$$

The appraiser may once again employ the band of investment technique to derive the prospective equity return, R_E, given the leveraged capital structure and the tax effects related thereto. As stated earlier, this model is nothing more than the weighted average cost of capital, or WACC:

$$WACC = w_d R_d(1.0 - t_c) + w_e R_e \quad [11]$$

The loan-to-value ratio is 70% and the equity stake is 30%, so:

$$.10 = (.7 \times .08581 \times .65) + .3R_e \quad [12]$$

Consolidating, rearranging shows the $R_e = .20319$.

In the example the highest appraised value is associated with the untaxed net operating income for the property with a leveraged capital structure held by a REIT. When using the perpetuity model shown here this will always be the case when compared to fair value of the same income property held by a typical corporation. It seems obvious that properties will be transferred into REITs to support the goal, stated or otherwise, of achieving the highest appraisal of fair value. Since IFRS 13 requires the appraisal of fair value be based on a transaction at the "entity level" it also appears that appraisals will assume the "transaction" will occur from one REIT to another. Where a transaction must occur between two standard "C-corps" the fair value will be lower than it would have been had the property been held in a REIT. Where a transaction is contemplated between a REIT and a standard corporation the appraiser must choose from a range of values.

IV. Conclusion

Real estate investment trusts offer what is perhaps the purest form of entity-level income property ownership because the income is not taxed and the use of debt is only driven by the need for capital. These two conditions conform neatly within the framework of financial theory originally derived by Modigliani and Miller. Appraisals of properties held either in non-traded or traded REITs are therefore likely to most closely meet the requirements on IFRS 13 and ASC 820.

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