The Relationship of Asymmetric Information, Financing Decisions and Cost of Capital in Brazilian Public Companies

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Case Study “Tomsel Corp.”: First-Time Adoption of International Financial Reporting Standards by U.S. Company

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From the Editor

Our journal is primarily designed to bring you articles from different business disciplines, and thus it includes various topics. This issue provides considerable diversity: articles concerning the asymmetry of information, elasticity of variance with respect to interest rates and testing the trade-off theories point to the complexity of issues affecting our markets. The recent banking crisis is also discussed from a historical perspective and with the view of post crisis developments.

I am very pleased that our recent addition of Corresponding Editors has started to bring results. The article from Brazil is due to diligent work of our corresponding editor Luiz Paulo Lopes Favero from the University of São Paulo. In the future, we hope to feature papers from other countries in our ongoing mission to provide a forum to exchange valuable research, ideas and information.

Igor M. Tomic, Ph.D.
Editor, Review of Business
The Relationship of Asymmetric Information, Financing Decisions and Cost of Capital in Brazilian Public Companies

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Executive Summary

**Purpose:** The purpose of this work is to analyze the influence of asymmetric information on the financing decisions and cost of equity capital of listed Brazilian companies between 2004 and 2007.

**Design/methodology/approach:** We construct two panel-data models, based on the model of Ohlson and Juettner-Nauroth (2005), using the debt level and cost of equity capital as the dependent variables. The variable explaining asymmetric information is based on analysts’ errors in forecasting earnings per share.

**Findings:** The results indicate that the control variables Tangibility, Profitability and Risk are important determinants of the capital structure of the firms analyzed, and the Size variable is the most significant to explain variations in their cost of capital. However, in both models the variable representing information asymmetry is not statistically significant, leading to rejection of the research hypotheses. Nevertheless, even faced with these results, it is not possible to affirm that information asymmetry has no influence on the financing decisions and cost of capital of Brazilian firms, only that asymmetry, when represented by the percentage of analysts’ errors in forecasting earnings per share, is not statistically significant to explain the variations in the indebtedness levels and cost of equity capital of the Brazilian companies analyzed in this study. This indicates the importance of the proxies utilized to represent the information asymmetry attribute. This result can also indicate a need to analyze the quality of analysts’ predictions regarding Brazilian companies.

**Research limitations/implications:** This work has only analyzed Brazilian public companies. Also, for future works, we suggest the use of other proxies representative of the information asymmetry and the analyses of the quality of analysts’ predictions regarding Brazilian companies.

**Practical implications:** Better knowledge of how information asymmetry affects the cost of capital will contribute to ratify the role of accounting in reducing this asymmetry in the capital market, since trustworthy accounting disclosure can reduce firms’ cost of capital.

**Originality/value:** Because most studies in the literature on capital structure focus on
developed economies, it is first important to analyze how well the existing theories fit the reality of different countries, mainly developing ones. Also, in this work we use the percentage error of analysts’ forecasts of earnings per share (EPS) as a proxy for information asymmetry. We believe that using this variable to measure this asymmetry in the Brazilian capital market is one of the most important contributions of this paper, by adding to knowledge on the theme and innovating on the methods used to date, to enable obtaining more statistically robust results.

1. Introduction

The pecking order theory (Myers and Majluf, 1984 and Myers, 1984) focuses on asymmetric information as an important determinant of firms’ financing decisions. According to this theory, firms should prefer internal over external financing for new investments, and if external financing is necessary, they should prefer issuing debt rather than equity securities, because of the information transmitted to the market by each type of security, with the type less sensitive to information preferable.

Some recent studies in the international literature relating information asymmetry with capital structure have found evidence that this asymmetry plays a strong quantitative role in determining firms’ capital structure (Halov and Heider, 2003; Halov and Heider, 2005; Berger et al., 2005; Agarwal and O’Hara, 2007; Bharath, Pasquariello and Wu, 2009).

Various studies also indicate there is a relation between information asymmetry and cost of equity capital. Easley and O’Hara (2004) developed an asset pricing model in which the return on assets depends on public and private information. According to their model, there is a relationship between a firm’s information structure and its cost of capital. The authors demonstrated that investors demand a higher return to hold shares appraised primarily by private information. This higher return reflects the fact that private information increases the risks of holding a firm’s shares. In another model, Hughes, Liu and Liu (2007) demonstrated theoretically that the higher the level of information asymmetry, the greater the risk premium, and hence the higher the cost of capital. Empirical works have also found a significant statistical relationship between disclosure and the cost of equity capital (Botosan, 1997; Botosan and Plumlee, 2002) and between information-based trading and stock returns (Easley, Hvidkjaer and O’Hara, 2002; Zhang, 2006).

In this context, in this paper we examine the following question: Does information asymmetry influence the financing decisions and cost of equity capital of Brazilian public companies? Therefore, our main objective is to analyze the influence of asymmetric information on the financing decisions and cost of equity capital of listed Brazilian firms.

In this effort, we formulated the following two hypotheses:

- \( H_a \): Information asymmetry influences the financing decisions of Brazilian public companies; and

- \( H_b \): Information asymmetry influences the cost of equity capital of Brazilian public companies.

Because most studies in the literature on capital structure focus on developed economies, it is first important to analyze how well the existing theories fit the reality of different countries, mainly developing ones. Better knowledge of how information asymmetry affects the cost of capital will contribute to ratify the role of accounting in reducing this asymmetry in the capital market, since trustworthy accounting disclosure can reduce firms’ cost of capital.
The Relationship of Asymmetric Information in Brazilian Public Companies

2. THEORETICAL FRAMEWORK

2.1 Information asymmetry and capital structure

After the seminal works of Modigliani and Miller (1958; 1963), various theories were proposed to explain what determines firms’ choices between debt and equity funding. Among these, the tradeoff and pecking order theories stand out.

According to Myers (2001), the tradeoff theory focuses on the effects of taxation: companies seek debt levels that permit balancing the tax benefits of deducting interest payments against the costs of possible financial distress, represented by the costs of bankruptcy or reorganization and agency costs. According to this theory, firms have a target debt level that is gradually adjusted; the more profitable a firm is, the greater the taxable income it will have to protect, so the more it will rely on debt financing because of the ability to write off interest payments. Another aspect of this theory is that firms will take a conservative posture in relation to the level of debt. A firm focused on shareholder value will never avoid using debt if the probability of financial difficulties is low. However, this theory does not explain the positive correlation found by many authors between profitability and low debt levels. Myers (2001), for example, found that in general debt levels are low when profitability or business risk is high.

The pecking order theory, developed by Myers and Majluf (1984) and Myers (1984), does not predict a target or optimum capital structure. Instead, it states that firms follow an order of preference for types of financing, first using internal resources, then issuing bonds, and finally floating shares. This order is based on the information transmitted to the market by each type of financing, with that less sensitive to information preferred. According to Myers (1984), firms will choose debt over equity when their internal cash flow is not sufficient to finance their capital expenditures. Hence, the amount of debt will reflect the firm’s accumulated need for external funding.

Myers (1984) further claimed that whenever a firm announces it is raising funds, either by issuing bonds or shares, it transmits information to the market. The issuance of new bonds tends to signal positive information about the company, such as growth opportunities and capacity for financing, besides reducing the information advantage of insiders. In contrast, issuing new shares tends to signal negative information, because assuming managers act in the interests of current shareholders by refusing to issue undervalued shares, the issuance of new shares can signal to the market that the firm’s shares are overvalued, prompting the price to fall just after the announcement of the new issue. Hence, the theory implies that issuing bonds is preferable to issuing shares.

The use of internal resources, besides avoiding transaction costs, is not information sensitive. For this reason, the pecking order theory’s main prediction is that the more profitable a firm is, the lower will be its debt level, because the use of internal resources to finance new investments is preferable to the other forms of financing. In this context, it can also be claimed that the greater the information asymmetry, the greater will be reliance on debt, if the firm cannot use internal financing, since debt is less sensitive to problems generated by asymmetric information (adverse selection and moral hazard).

Various studies of the Brazilian market (Brito and Silva, 2005; Medeiros and Daher, 2008; Albanez and Valle, 2009) and other economies (Shyam-Sunder and Myers, 1999; Berger et al., 2005; Bharath, Pasquariello and Wu, 2009) have found strong evidence that pecking order has an influence in determining firms’ capital structure. The exhibit below summarizes the variables used in these works, the period analyzed and the main results obtained.
### Exhibit 1. Main empirical articles on information asymmetry and capital structure

<table>
<thead>
<tr>
<th>Authors</th>
<th>Dependent Variables</th>
<th>Explanatory Variables</th>
<th>Period of Analysis</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brito and Silva (2005)</td>
<td>Target return and debt level</td>
<td>To analyze the target return, they used the variables: profitability; investment opportunities; volatility; leverage; and capital expenditures. To test the debt level they use the variables: investment opportunities; profitability; volatility; variation in capital expenditures; and dividends.</td>
<td>1995 to 2001</td>
<td>Their results confirm the common prediction of tradeoff and pecking order theories that profitability is the most important factor for payment of dividends. Hence, more profitable firms allocate a greater portion of remuneration to shareholders. They also find a negative relation between leverage and profitability, confirming the prediction of pecking order theory.</td>
</tr>
<tr>
<td>Medeiros and Daher (2008)</td>
<td>Debt level (to test the tradeoff model) and variation in debt (to test the pecking order model).</td>
<td>To test the tradeoff model, they used the variables: tangibility, price-to-book ratio; natural log of sales; and profitability. To test the pecking order model, they use funds flow deficit (difference between investments made and generation of cash flow).</td>
<td>1995 to 2002</td>
<td>Their results confirm the predictions of pecking order theory for the tangibility and profitability variables, whereby more profitable firms are less leveraged, and firms with more tangible assets are less leveraged. The result of their tests is favorable to pecking order theory in its semi-strong form, because the intercept of the deficit variable was different than zero.</td>
</tr>
<tr>
<td>Albanez and Valle (2009)</td>
<td>Debt level</td>
<td>They used proxies for asymmetric information (corporate governance dummy, ADR dummy, liquidity and trading volume) and control variables (size, tangibility, intangibility, profitability and risk)</td>
<td>1997 to 2007</td>
<td>Brazilian companies considered to have the lowest degree of information asymmetry are higher leveraged than the others; the result is contrary to the pecking order theory.</td>
</tr>
<tr>
<td>Shyam-Sunder and Myers (1999)</td>
<td>Changes in the debt ratio</td>
<td>To test the pecking order model, they used funds flow deficit. To test the target adjustment model (tradeoff) they used deviations of the current debt ratio from the target.</td>
<td>1971 to 1989</td>
<td>The results suggest greater confidence in the pecking order than in the target adjustment model.</td>
</tr>
<tr>
<td>Berger et al. (2005)</td>
<td>Debt maturity</td>
<td>Risk ratings and other contract terms of loans to small businesses.</td>
<td>1997 to 1998</td>
<td>Low-risk firms tend to have significantly shorter maturities than other firms, and these maturities tend to increase significantly when informational asymmetries are reduced. High-risk firms do not have significantly different maturities than intermediate-risk firms.</td>
</tr>
<tr>
<td>Bharath, Pasquariello and Wu (2009)</td>
<td>Debt level</td>
<td>They used a new information asymmetry index and control variables (size; Q ratio; tangibility, profitability and firm attributes).</td>
<td>1973 to 2002</td>
<td>Information asymmetry influences capital structure decisions of American firms – the greater the asymmetry, the more debt firms issue.</td>
</tr>
</tbody>
</table>
We use the percentage error of analysts’ forecasts of earnings per share (EPS) as a proxy for information asymmetry.

2.2. Information asymmetry and cost of equity capital

An important segment of the literature examines the relationship between asymmetric information and the cost of equity capital; that is, how private information affects the price of assets and the return demanded by shareholders under different scenarios. According to Easley and O’Hara (2004), there are three main currents in this literature.

The first of these is based on the classic analysis of Grossman and Stiglitz (1980) and analyzes the role of private information in rational expectation models. Wang (1993) presented a model in which asymmetric information has two effects on asset prices: one is that uninformed investors require a risk premium to compensate them for the adverse selection problem that arises in dealing with informed traders; and the other is that uninformed trading makes the price more informative, reducing the risk faced by uninformed traders and lowering the risk premium. In other words, the overall effect of asymmetric information on the required return in equilibrium in this model is ambiguous.

A second line of research examines the role of information when it is incomplete, but not asymmetric. A relevant work in this line is that of Merton (1987), who investigated the market equilibrium when agents are not informed of the existence of certain assets. He showed that in equilibrium, the value of a company is always lower when there is incomplete information and a smaller base of investors.

Finally, a third current of research considers the role of information disclosure by firms. According to Easley and O’Hara (2004), disclosure transforms private information into public information. Hence, this literature is related to the effect of public information on asset prices. Diamond (1985) developed an equilibrium model in which public information benefits all market traders. This result is based on the fact that producing information is costly, so its disclosure by the firm eliminates the need for each individual to expend resources to gather this information. Diamond and Verrecchia (1991) analyzed how disclosure affects share liquidity, and consequently the cost of capital. They showed that disclosure modifies the risk of market makers, inducing the entry or exit of traders. Therefore, in this model disclosure can improve or worsen the liquidity of shares, depending on traders’ decisions.

Starting from this scenario, Easley and O’Hara (2004) developed an asset pricing model in which the return on assets depends on public and private information, and established a relationship between firms’ information structure and their cost of capital. The authors demonstrated that investors require a higher return to hold shares about which there is more private information. This high return reflects the fact that private information increases investors’ risks in holding this stock, because informed investors are more likely to change the composition of their portfolios when incorporating new information.

Therefore, firms’ cost of capital is also influenced by information, which provides a link between asset pricing, corporate finance and the information structure of firms’ securities. An empirical prediction of the model is that when comparing two identical stocks, that with more private information and less public information will have a higher expected return. The authors tested and confirmed this prediction, demonstrating that the return on assets includes a risk premium that depends on the information structure of each stock.
### Exhibit 2. Main empirical articles on information asymmetry and cost of equity capital

<table>
<thead>
<tr>
<th>Authors</th>
<th>Dependent Variables</th>
<th>Explanatory Variables</th>
<th>Period of Analysis</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botosan (1997)</td>
<td>Cost of equity capital based on the models of Edwards and Bell (1961), Ohlson (1995) and Feltham and Ohlson (1995)</td>
<td>The author used a proxy for disclosure (index constructed by the author) and control variables (market beta and firm size).</td>
<td>1990</td>
<td>For a sample of firms with relatively low analyst following, the evidence suggests that greater disclosure is associated with a lower cost of equity capital. For firms with high analyst following, no significant relation between disclosure level and cost of equity capital is observed.</td>
</tr>
<tr>
<td>Botosan and Plumlee (2002)</td>
<td>Cost of equity capital based on the dividend discount model</td>
<td>They used a proxy for disclosure (AIMR scores) and control variables (market beta and firm size).</td>
<td>1986 to 1996</td>
<td>The cost of equity capital decreases in the annual report disclosure level but increases in the level of timely disclosures.</td>
</tr>
<tr>
<td>Easley, Hvidkjaer and O’Hara (2002)</td>
<td>Excess stock return</td>
<td>They used a proxy for information asymmetry (the probability of information-based trading) and control variables (portfolio betas, firm size, book-to-market spread, standard deviation of stock return and turnover).</td>
<td>1983 to 1998</td>
<td>Information disclosure does affect asset prices. Stocks with higher probabilities of information-based trading have higher rates of return.</td>
</tr>
<tr>
<td>Zhang (2006)</td>
<td>Excess stock return</td>
<td>The author used proxies for information uncertainty (firm size, firm age, analyst coverage, dispersion in analyst forecasts, return volatility and cash flow volatility) and control variables (analyst forecast revisions and price momentum).</td>
<td>1983 to 2001</td>
<td>Greater information uncertainty leads to relatively higher expected returns following good news and relatively lower expected returns following bad news.</td>
</tr>
<tr>
<td>Alencar and Lopes (2007)</td>
<td>Cost of equity capital based on the model of Ohlson and Juettner-Nauroth (2005)</td>
<td>They used a proxy for disclosure (index constructed by the authors) and control variables (firm size, internationalization, systematic risk, market-to-book ratio and leverage).</td>
<td>1998 to 2005</td>
<td>There is a negative relation between cost of capital and disclosure, which is more accentuated for firms with less analyst coverage and more dispersed ownership structure.</td>
</tr>
</tbody>
</table>

International empirical works have also found a statistically significant correlation between disclosure and cost of equity capital (Botosan, 1997; Botosan and Plumlee, 2002) and between information-based trading and stock returns (Easley, Hvidkjaer and O’Hara, 2002; Zhang, 2006). In Brazil, Alencar (2007) also found a significant relation between disclosure and the cost of equity. The exhibit above shows the variables used, study period and main results of articles that have examined the relationship between disclosure and other variables.

### 3. METHODOLOGY

#### 3.1 Sample

Our sample originates from all Brazilian public companies with information in the Thomson
One Analytics database, which as of this writing holds information on 173 Brazilian firms, 148 of them listed on the Bovespa. After excluding financial institutions, firms not listed on the Bovespa and companies without three or more consecutive years of analysts’ projections for the study period, 34 firms remained in the sample. We used the Economática database to obtain other information and construct the variables. The main winnowing of the sample occurred because a large number of companies did not have three or more years of earnings per share (EPS) projections, which ruled out measuring their cost of equity capital. As can be perceived, we used a non-probabilistic sample (intentional sample), which implies the impossibility of generalizing the results obtained.

The analysis covers the period from 2004 to 2007. The sample does not include 2008 because the data for that year are not comparable to those from the other years, mainly due to the changes in Brazilian accounting standards that took effect that year to bring them closer to international standards.

The pecking order theory’s main prediction is that the more profitable a firm is, the lower will be its debt level, because the use of internal resources to finance new investments is preferable to the other forms of financing.

3.2 MODELS AND VARIABLES

3.2.1 Relation between information asymmetry and capital structure (Model I)

To analyze the influence of asymmetric information on firms’ capital structure, we use as dependent variables: the ratio between short-term debt and assets (Dst/A); the ratio between long-term debt and assets (Dlt/A); and the ratio between total debt and assets (TD/A).

Total debt is composed of short-term loans, short-term bonds, long-term loans and long-term bonds.

As explanatory variables of the level of indebtedness, we use a proxy for information asymmetry and five control variables. International works have basically used four different categories of proxies for information asymmetry. As can be seen in the paper by Clarke and Shastri (2001), these metrics are based on analysts’ forecasts (percentage of error and dispersion of predictions), the firm’s set of investment opportunities (market-to-book ratio), the stock return (volatility of the stock price) and market microstructure measures (such as probability of information-based trading - PIN).

In this work, we use the percentage error of analysts’ forecasts of earnings per share as a proxy for information asymmetry. According to Clarke and Shastri (2001, p. 6), “the appropriateness of these measures is based on the findings of Blackwell and Dubins (1962) who demonstrate that opinions tend to converge as the amount of information available about an unknown quantity increases.” In other words, the more information is available, the lower will be information asymmetry, leading to a consensus among analysts and a reduction in the prediction error. This measure is constructed as follows:

$$\text{Pred. Err} = \frac{|\text{earnings per share}_{\text{real}} - \text{earnings per share}_{\text{pred}}|}{|\text{earnings per share}_{\text{real}}|}$$

We use the average EPS value predicted and the real figure at the end of the period, both obtained from Thomson One Analytics. We expect that the higher the prediction error, the greater will be the information asymmetry and thus the higher the debt of the companies analyzed, because if they issued shares to finance their needs, they could face underpricing.
We use five control variables indicated in the literature as important determinants of firms’ capital structure:

a) Size
For the variable representing the Size attribute, we use the natural logarithm of gross sales revenue. Harris and Raviv (1991) argued that the larger a company’s size, the longer its credit history and the better its reputation, the more its cost of obtaining financial resources will be reduced. For Rajan and Zingales (1995), larger companies tend to be more diversified and less prone to go bankrupt, leading to a positive relation between size and indebtedness.

b) Tangibility
For the Tangibility attribute we use the ratio between property, plant and equipment (less revaluation reserve) and total assets. According to Rajan and Zingales (1995), companies with large a proportion of tangible assets can use them as collateral for financial transactions, reducing the risk creditor’s face from agency costs, besides increasing their capacity to retain more value in case of liquidation. Therefore, the greater the tangibility, the greater will be the firm’s debt capacity, leading to a positive relationship between these variables.

c) Intangibility (or growth opportunities)
For the Intangibility attribute we use the ratio between the market and book value per share (market-to-book), obtained from the Economática database. Fama and French (2002) stated that in the tradeoff model, firms with large investment opportunities are less leveraged because they have higher incentives to avoid inefficiencies from under-investment and substitution of assets that occur due to agency problems between shareholders and creditors, and because these firms have less need of the disciplinary role of debt to control problems generated by excess free cash flow. Therefore, the expected sign according to tradeoff theory for this variable is negative. In pecking order theory, the reason for this negative relation is different: companies with large investment expectations reserve low-risk debt financing capacity for future investments, so they are less leveraged.

d) Profitability
For the Profitability attribute we use the ratio between earnings before interest (EBI) and total assets. According to the tradeoff theory, there should be a positive relation between profitability and indebtedness. Since more profitable firms have more taxable income to protect, they will be more likely to use debt as a financing source due to the tax deductibility of this form of financing. Besides this, the use of debt mitigates the agency problems between managers and shareholders generated by excess free cash flow. However, the pecking order theory predicts a negative relation between profitability and debt, since more profitable firms have more internal resources available to make investments, and the use of these resources avoids problems generated by asymmetric information, such as adverse selection, besides avoiding transaction costs. Therefore, it is possible to expect both a positive and negative relation between these variables.

e) Risk
For the Risk attribute we use the unleveraged beta, calculated as follows:

\[
\text{Risk} = \text{Unleveraged beta} = \frac{\text{Beta}}{1 + (1 - 0.34) \times \frac{\text{SE}}{\text{TD}}}
\]

where:

TD: total debt; SE: shareholders’ equity; 0.34: combined rate of income tax and social contribution on profit\(^1\). We obtained the beta for the firms from the Economática database.

We expect a negative relation between risk and indebtedness. According to Myers (1984), riskier firms tend to be less indebted because the higher the risk, the greater the chance of default, and since the costs of financial distress
are caused by threatened or actual default, firms with higher risk tend to have lower financing capacity. Halov and Heider (2003) also argued that risk reduces the capacity for debt and increases its cost. Hence it is reasonable to expect a negative relation between these variables.

Finally, the model formulated with the mentioned variables to analyze the relationship between information asymmetry and capital structure can be represented by the following equation:

\[(TD_t) = f(\text{control variables}, Pred\_Err_t)\]

(Model I)

where:
\(TD_t\) is the level of total debt on date \(t\)
and \(Pred\_Err_t\) is the variable representing information asymmetry on date \(t\).

The results for the \(Pred\_Err\) variable do not warrant a claim that information asymmetry is one of the determinants of the capital structure and cost of equity capital of Brazilian public companies

3.2.2 Relation between information asymmetry and cost of equity capital (Model II)

To analyze the relation between information asymmetry and cost of capital, we use the cost of capital obtained by the OJ model (Ohlson and Juettner-Nauroth, 2005) as the dependent variable. According to Ohlson and Lopes (2007), the cost of capital by the OJ model can be obtained as follows:

\[Ke = A + \sqrt{\left\{\frac{\Delta \text{eps}_t}{P_0} \times \left(\frac{\text{eps}_t}{\text{eps}_{t+1}} - (g - 1)\right)\right\}}\]

where: \(A = \frac{1}{2}\left(g - 1 + \frac{dps_t}{P_0}\right)\)

and \(Ke\) = the cost of equity capital; \(P_0\) is the price per share on date \(t\); \(\text{eps}_t\) is the earnings per share expected on date \(t+1\); \(\text{eps}_{t+1}\) is the earnings per share expected on date \(t+2\); \(dps_t\) is the dividend per share expected on date \(t+1\); and \(g\) is the growth rate (we use 6% for the Brazilian).

As can be seen, in the OJ model the cost of capital depends on the current share price, expected dividends, earnings per share and their growth. We relied on data relative to analysts’ projections, obtained from the Thomson One Analytics database. Due to the assumptions of the OJ model, it cannot be applied to firms with negative cost of capital.

As explanatory variables, we use the proxy for information asymmetry mentioned in the previous topic (percentage of analysts’ forecasting error or earnings per share – \(Pred\_Err\)), along with five control variables that can influence the cost of capital, as employed by Alencar and Lopes (2005).

We expect that the greater the forecasting error, the greater will be the degree of information asymmetry, increasing the risk attributed to a firm and thus increasing its cost of capital. We thus expect a positive relation between these variables.

The control variables used by Alencar and Lopes (2005) are:

a) Size
We use the same Size variable as in Model I: the natural logarithm of gross sales revenue. According to the authors, there should be a negative relation between this size and the cost of equity capital, because larger firms tend to be considered less risky and thus can obtain capital more cheaply.

b) Indebtedness
Alencar and Lopes (2005) used the natural logarithm of the ratio between total liabilities and shareholders’ equity to represent this attribute. In this study, we
use the ratio between total debts and total assets (TD/A). We expect a positive relation between indebtedness and cost of equity capital, since the more debt a firm carries, the greater its risk and consequently the higher the cost of capital.

c) Ratio between market price and book price per share (Intangibility)
According to Alencar (2007), the market-to-book ratio indicates the degree of conservatism of accounting numbers in relation to the market valuation, and can also indicate more growth opportunities and smaller associated risks. Hence, there should be a negative relation between this variable and the cost of capital. In this work, we use this variable to represent Intangibility, as in Model I.

d) Corporate governance (DCG)
We use a dummy variable to indicate the adhesion of firms to Levels 1 and 2 and the Novo Mercado trading segments of the Bovespa (São Paulo Stock Exchange). Alencar and Lopes (2005) used this variable because companies with enhanced corporate governance gain more credibility in their financials, leveraging the disclosure effect. Albanez and Valle (2009) also use this variable in their work, to represent less information asymmetry between firms and investors. Therefore, we expect a negative relation between this variable and the cost of capital.

e) Internationalization (DNYSE)
This is a dummy variable indicating whether or not a firm had ADRs traded on the New York Stock Exchange during the study period. As discussed by Iquíapaza, Lamounier and Amaral (2007), access to the American market requires firms to disclose more information, which reduces the information asymmetry between the firm and investors. Therefore, we believe these firms should be considered less risky, so a negative relation can be expected between this variable and the cost of capital.

The model formulated to analyze the relation between information asymmetry and cost of equity capital can be represented by the following equation:

\[ (K_{e_t}) = f(\text{control variables}, \ Pred\_Err_t), \]

where:

\[ (\text{Model II}) \]

\[ K_{e_t} \] is the cost of equity capital on date \( t \) and \( \text{Pred\_Err}_t \) represents information asymmetry on date \( t \).

3.3 Treatment of the data

Because of the characteristics and size of the sample (multiple firms analyzed over a period of time), we believe that panel data (time-series cross-sectional) analysis is best, by permitting analysis of dynamic relations in time and space (Wooldridge, 2006). Two common methods to estimate panel data models with unobserved effects are the fixed effects and random effects models. According to Wooldridge (2006), the fixed effects model can be directly applied to unbalanced panels (data sets in which there are missing values) if the reasons why some values are missing for some time periods are not systematically related to idiosyncratic errors \( (u_i) \). In the random effects model, it is assumed that the unobserved effect \( (a_i) \) is not correlated with any of the explanatory variables \( (x_{it}) \).

The fixed effects model allows the intercept to vary for each observation, taking into consideration the specific nature of the company, but considering that the angular coefficients are constant for all the observations. The fixed effects estimator considers an arbitrary correlation between a (unobserved characteristics of each firm) and the explanatory variables in each time period. The equation can be written as follows:

\[ y_{it} = a_i + x_{it}^T \beta + \ldots + x_{kit}^T \beta_k + u_{it}, \quad t = 1,2,\ldots,T \]

The random effects model is useful when \( a_i \) is not correlated with \( x_{it} \) over time. Hence, \( a_i \) can be left in the compound error term \( (v_i) \), and the equation can be written as:
The Relationship of Asymmetric Information in Brazilian Public Companies

\[ y_{it} = \beta_0 + \beta_1 x_{1it} + \ldots + \beta_k x_{kit} + v_{it}, \text{ where:} \]

\[ v_{it} = \alpha_0 + u_{it}, \]  
\( \beta_0 \) is the intercept and \( \beta_k \) is the angular coefficient of the regression line.

A way to decide between these models is to apply the Hausman test, which can be performed by several econometric programs, such as STATA, the software we used here.

To satisfy the assumptions of regression analysis, we consider that the residuals are normally distributed, because of the size of the sample analyzed. We evaluated the presence of multicollinearity of the explanatory variables by means of Pearson’s correlation coefficient \((r)\), and to check the robustness of the analysis, we used White’s correction, which eliminates problems of heteroskedasticity of the residuals.

4. ANALYSIS OF THE RESULTS

Exhibit 3 presents the descriptive statistics of the dependent and explanatory variables utilized in our analysis.

It can be seen that the average debt level (TD/A) of the sample firms in the 2004-2007 period was 28.36%, and that they used more long-term resources (Dlt/A) than short-term funding (Dst/A), with respective averages of 21.04% and 7.31%. It can also be noted that the average percentage error in analysts’ earnings per share forecasts (Pred_Err) is 22.03% and the average cost of capital (ke) was 14.56%.

We also performed correlation analyses to investigate the possible existence of multicollinearity of the explanatory variables, using the SPSS software, which supplies the result of the t-test for significance of the coefficients. The results showed no significantly high correlation between the explanatory variables, meaning the probability is low of multicollinearity of these variables.


<table>
<thead>
<tr>
<th>Variable</th>
<th>N° observations</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dst/A</td>
<td>135</td>
<td>0.0000</td>
<td>0.2900</td>
<td>0.0731</td>
<td>0.0528</td>
</tr>
<tr>
<td>Dlt/A</td>
<td>135</td>
<td>0.0000</td>
<td>0.6210</td>
<td>0.2104</td>
<td>0.1218</td>
</tr>
<tr>
<td>TD/A</td>
<td>135</td>
<td>0.0000</td>
<td>0.6770</td>
<td>0.2836</td>
<td>0.1367</td>
</tr>
<tr>
<td>Tangibility</td>
<td>135</td>
<td>0.0110</td>
<td>0.7870</td>
<td>0.4361</td>
<td>0.1818</td>
</tr>
<tr>
<td>Intangibility</td>
<td>135</td>
<td>0.2950</td>
<td>39.1370</td>
<td>3.2633</td>
<td>4.5081</td>
</tr>
<tr>
<td>Profitability</td>
<td>133</td>
<td>0.0120</td>
<td>0.3120</td>
<td>0.1162</td>
<td>0.0591</td>
</tr>
<tr>
<td>Risk</td>
<td>134</td>
<td>0.0090</td>
<td>1.4510</td>
<td>0.5628</td>
<td>0.2985</td>
</tr>
</tbody>
</table>

Notes: TD: total debt; Dst: short-term debt; Dlt: long-term debt; A: assets; Pred_Err: percentage prediction error of earnings per share; Ke: cost of equity capital.
After these initial analyses, we performed the panel data tests. Exhibit 4 contains the results of the analysis of the relation between information asymmetry and capital structure (Model I), broken down by short-term debt (Dst/A), long-term debt (Dlt/A) and total debt (TD/A). For this model, the Hausman test indicated the adequacy of the random effects model in all the analyses (short-term, long-term and total), with p-values greater than 0.05, thus not rejecting the null hypothesis.

The results of Model I for the firms’ level of debt show that the statistic from the regressions is significant and the explanatory power is significant in all the analyses: around 11% for the short-term analysis, 23% for the long-term analysis and 31% for the analysis of total indebtedness.

In the short-term analysis, among the control variables utilized, only Tangibility, Intangibility and Risk are statistically significant. The Tangibility variable has a negative coefficient of around 0.08, in contrast to the expected relation, according to which the higher the proportion of tangible assets, the greater will be the financing capacity, and hence the greater the level of indebtedness. The sign supports an alternative relation. According to Rajan and Zingales (1995) and Frank and Goyal (2003), by the pecking order theory, firms with few tangible assets face greater information asymmetry problems and will tend to accumulate more debt over time, making them more leveraged. Therefore, the expected relation between tangibility and assets should be negative, because firms with greater proportions of tangible assets can obtain funding by issuing shares. The Intangibility variable is positively related to the short-term debt level. Valle (2008, p. 63) argued that “given that issuing short-term debt does not limit managers’ discretionary power over investment decisions, thus minimizing the risks of under-investment, a direct relation is

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>0.004</td>
<td>0.004</td>
<td>0.305</td>
<td>-0.005</td>
<td>0.017</td>
<td>0.763</td>
<td>0.002</td>
<td>0.016</td>
<td>0.900</td>
</tr>
<tr>
<td>Tangibility</td>
<td>-0.084</td>
<td>0.032</td>
<td>0.009</td>
<td>0.202</td>
<td>0.093</td>
<td>0.029</td>
<td>0.148</td>
<td>0.097</td>
<td>0.125</td>
</tr>
<tr>
<td>Intangibility</td>
<td>0.003</td>
<td>0.001</td>
<td>0.111</td>
<td>0.000</td>
<td>0.001</td>
<td>0.921</td>
<td>0.003</td>
<td>0.001</td>
<td>0.078</td>
</tr>
<tr>
<td>Profitability</td>
<td>-0.055</td>
<td>0.090</td>
<td>0.544</td>
<td>-0.674</td>
<td>0.220</td>
<td>0.002</td>
<td>-0.669</td>
<td>0.231</td>
<td>0.004</td>
</tr>
<tr>
<td>Risk</td>
<td>-0.072</td>
<td>0.017</td>
<td>0.000</td>
<td>-0.177</td>
<td>0.049</td>
<td>0.000</td>
<td>-0.255</td>
<td>0.048</td>
<td>0.000</td>
</tr>
<tr>
<td>Pred_Err</td>
<td>0.006</td>
<td>0.007</td>
<td>0.375</td>
<td>-0.019</td>
<td>0.018</td>
<td>0.282</td>
<td>-0.013</td>
<td>0.020</td>
<td>0.528</td>
</tr>
<tr>
<td>Constant</td>
<td>0.082</td>
<td>0.064</td>
<td>0.202</td>
<td>0.386</td>
<td>0.262</td>
<td>0.141</td>
<td>-0.402</td>
<td>0.277</td>
<td>0.147</td>
</tr>
</tbody>
</table>

Observations: 132

Prob>chi2: 0.000

R²: 0.1055
expected between this variable and short-term debt.” Nevertheless, although the relation found here is statistically significant, it cannot be considered economically significant, due to the low coefficient (near 0). The Risk variable has a negative coefficient of 0.07. The sign is as expected, since companies considered riskier have a harder time obtaining financing and at higher cost, leading to a negative relation between risk and leverage. Finally, the variable Pred_Err, the most important among the explanatory variables in this study because it represents the information asymmetry attribute, is not statistically significant.

...the more information is available, the lower will be information asymmetry, leading to a consensus among analysts and a reduction in the prediction error.

In the long-term analysis, among the control variables only Tangibility, Profitability and Risk are statistically significant. The Tangibility variable has a positive coefficient of 0.20, a substantially higher economic significance than in the short-term analysis. The sign is as expected, since firms with larger proportions of tangible assets have more collateral to secure debts and thus tend to be more leveraged. The Profitability variable has a negative coefficient of 0.67. The sign is as expected by the pecking order theory, whereby more profitable companies are less leveraged than others because they can finance themselves with internal resources, a preferable source because it avoids problems generated by asymmetric information, such as adverse selection, besides transaction costs. The Risk variable continues having a negative sign as in the short-term analysis, ratifying the negative relation between risk and leverage. It is also more economically significant, with a coefficient of 0.18. The variable Pred_Err, representing the information asymmetry attribute, continues being statistically significant.

In the analysis of total debt, the control variables Profitability and Risk continue being statistically significant, both with negative signs. The coefficient of Profitability is negative 0.67, ratifying the relation found in the long-term analysis, whereby more profitable firms take on less debt as a source of financing. The statistical significance of Risk is higher and its coefficient is negative 0.26, also ratifying the previous analyses, where the higher the risk, the lower the use of debt financing. And the variable representing information asymmetry, Pred_Err, continues not being statistically significant.

Exhibit 5 shows the results of the relation between information asymmetry and cost of equity capital (Model II). For this model, the Hausman test indicated the fixed effects model as adequate, with a p-value less than 0.05, rejecting the null hypothesis.

### Exhibit 5. Output for the regression with fixed effects – Model II

<table>
<thead>
<tr>
<th>Information asymmetry and cost of equity capital (Model II)</th>
<th>Dependent variable: Ke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanatory variables</td>
<td>Coef.</td>
</tr>
<tr>
<td>Size</td>
<td>-0.115</td>
</tr>
<tr>
<td>Indebtedness</td>
<td>0.010</td>
</tr>
<tr>
<td>Intangibility</td>
<td>-0.004</td>
</tr>
<tr>
<td>DGC</td>
<td>-0.044</td>
</tr>
<tr>
<td>DNYSE (dropped)</td>
<td></td>
</tr>
<tr>
<td>Pred_Err</td>
<td>0.071</td>
</tr>
<tr>
<td>Constant</td>
<td>1.995</td>
</tr>
<tr>
<td>n° Observations</td>
<td>125</td>
</tr>
<tr>
<td>Prob&gt;F</td>
<td>0.0314</td>
</tr>
<tr>
<td>R²</td>
<td>0.2448</td>
</tr>
</tbody>
</table>

Notes: Coef.: coefficients; Std. Err. (robust): robust standard error by the White method; p-value (FE): significance of the coefficient for the regression with fixed effects; Pred_Err: percentage error of analysts’ forecast of earnings per share; Prob>F: level of significance of the model; R²: explanatory coefficient of the model.
Model II is also statistically significant, with an explanatory power of around 24%. In this model, only the Size variable is statistically significant to explain variations in the cost of equity capital of the sample companies, with a negative coefficient of 0.12. The negative sign is as expected, indicating that the higher a firm's debt, the lower its cost of equity capital, due to the fact that these firms are considered less risky by investors and also have less information asymmetry. Halov and Heider (2003) stated that larger companies have a “higher reputation” and are considered more secure, i.e., less likely to go bankrupt, so they have more access to outside financing. Harris and Raviv (1991) expressed the same view: the larger the firm, the better its reputation and the lower its cost of raising financial resources.

Rajan and Zingales (1995) also argued that size can serve as a proxy for the information possessed by outside investors (the information about larger firms tends to be less asymmetric), which increases the preference for issuing shares. In this respect, Agarwal and O’Hara (2007) affirmed that information risk is lower for companies about which there is more information (larger firms), which reduces the information asymmetry between insiders and outsiders and can favor the issuance of shares due to the low probability they will be undervalued by the market.

In summary, our findings indicate that information asymmetry, when represented by the percentage of analysts’ errors in forecasting earnings per share, was not statistically significant in the analyses carried out and does not explain the variations in either the level of indebtedness (capital structure) or the cost of equity capital of the firms in the sample. We also performed tests with the explanatory variables lagged by one period, which are not shown because they did not substantially change the coefficients obtained or their statistical significance.

Because Pred_Err, the most important of the explanatory variables in this study because it represents the information asymmetry attribute, was not statistically significant in either of the models (of structure and cost of capital), we conducted analyses using an alternative approach to information asymmetry.

According to Clarke and Shastri (2001), proxies for asymmetric information are based on analysts’ forecasts (percentage of error and dispersion among the predictions) on earnings per share, the set of growth opportunities (market-to-book ratio), stock return (stock price volatility) and market microstructure metrics (probability of information-based trading - PIN). Among these approaches, it is impossible to use dispersion of analysts’ forecasts and PIN in this work because of the lack of data to construct these variables. We used market-to-book ratio to represent the Intangibility attribute, and to further examine the relation between information asymmetry and capital structure, we performed tests with the stock price volatility variable.

In this respect, Clarke and Shastri (2001, p. 8) state, “to the extent that residual volatility reflects uncertainty about firm value, the magnitude of the asymmetric information problem increases with the residual volatility of the security ... Thus, residual volatility likely overstates the level of asymmetric information about a firm.” Therefore, we expect that greater volatility will imply more asymmetric information, leading to more reliance on debt because of the high cost of equity capital in this situation.

The Volatility variable was obtained from figures in the Economática database. The Volatility variable was obtained from figures in the Economática database. In this base, volatility for n days is calculated using a series of closing prices from n+1 days: d_0, d_1, d_2, d_3, ..., d_n, hence:
The Relationship of Asymmetric Information in Brazilian Public Companies

\[ \text{Volat} = \sqrt{\frac{\sum (S_i - S_m^2)}{n \times \text{PPA}}} \]

where: Volat: Volatility; \( S_i \): natural logarithm of \( \frac{d_i}{d_{i-1}} \); \( i: 1...n \); \( S_m \): mean of \( S_1, S_2, S_3, \ldots S_n \); PPA: periods per year (PPA=252 for daily closing prices; PPA=52 for weekly closing prices; PPA=12 for monthly closing prices; PPA=4 for quarterly closing prices; and PPA=1 for annual closing price).

We performed correlation tests to investigate the possible existence of multicollinearity among the explanatory variables, and the volatility variable was not highly correlated with the other variables. The exhibit below presents the descriptive statistics of the volatility variable.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No observations</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatility</td>
<td>132</td>
<td>18.5140</td>
<td>64.1030</td>
<td>37.040</td>
<td>7.0667</td>
</tr>
</tbody>
</table>

Nevertheless...it is not possible to affirm that information asymmetry does not influence the financing decisions and cost of capital of Brazilian firms.

The exhibit below shows the results of analyzing the relationship between information asymmetry, now represented by the Volatility variable, and the short-term, long-term and total debt levels (Model I).

<table>
<thead>
<tr>
<th>Information asymmetry and capital structure (Model I - Volatility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: Dst/A</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>Explanatory variables</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Tangibility</td>
</tr>
<tr>
<td>Intangibility</td>
</tr>
<tr>
<td>Profitability</td>
</tr>
<tr>
<td>Risk</td>
</tr>
<tr>
<td>Volatility</td>
</tr>
<tr>
<td>Constant</td>
</tr>
</tbody>
</table>

Notes: Coef.: coefficients; Std. Err. (robust): robust standard error by the White method; p-value (RE): significance of the coefficient for the regression with random effects; Prob>chi2: level of significance of the model; R²: explanatory coefficient of the model.
The results of this model show that the volatility variable is also not significant in any of the analyses (short-term, long-term and total debt), but the other explanatory variables continue having the same signs and statistical significance found in the previous analysis, where analysts’ forecasting error was used as a proxy for information asymmetry.

The exhibit below shows the results of analyzing the relationship between information asymmetry, again represented by the Volatility variable, and the cost of equity (Model II).

<table>
<thead>
<tr>
<th>Exhibits 8. Output for the regression with fixed effects – Model II (Volatility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information asymmetry and cost of equity capital Model II (Volatility)</td>
</tr>
<tr>
<td>Dependent variable: Ke</td>
</tr>
<tr>
<td>Explanatory variables</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Indebtedness</td>
</tr>
<tr>
<td>Intangibility</td>
</tr>
<tr>
<td>DGC</td>
</tr>
<tr>
<td>DNYSE (dropped)</td>
</tr>
<tr>
<td>Volatility</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>n° Observations</td>
</tr>
<tr>
<td>Prob&gt;F</td>
</tr>
<tr>
<td>R²</td>
</tr>
</tbody>
</table>

Notes: Coef.: coefficients; Std. Err. (robust): robust standard error by the White method; p-value (FE): significance of the coefficient for the regression with fixed effects; Prob>F: level of significance of the model; R²: explanatory coefficient of the model

In this model the volatility variable also is not significant, and as in the preceding analysis, size is the only significant variable, with the same sign as before.

We also tested both variables representing information asymmetry (Pred_Err and Volatility) in a single model (I and II), but in all cases both variables continued not being statistically significant. Finally, we tested the explanatory variables lagged by one period in these models. There was no substantial change in the coefficients or their significance.

Again according to Clarke and Shastri (2001, p. 6), “one criticism of the use of forecast errors as a measure of information asymmetry is that they might be correlated with the riskiness of the firm. Specifically, some firms may have higher forecast errors because they have more volatile earnings and not because of higher levels of information asymmetry.” This also suggests that measures of volatility and prediction errors are related, which may have led to the lack of significance of the stock volatility variable in models analyzed.

In Brazil, Saito, Villalobos and Benetti (2008, p. 357) investigated the quality of analysts’ projections in the Brazilian market and found that “the capacity of analysts to add value in relation to statistical
projection models is very small, due to lack of the analysts’ ability; macroeconomic instability is so great that its influence on firms’ earnings dominates all other factors that can influence the projection error.” In turn, Martinez and Salim (2004) investigated the determinants of the accuracy of analysts’ forecasts for Brazilian firms and found that analysts were optimistic on average and their performance was weak in terms of precision and accuracy. These results can indicate a certain deficiency of these predictions to reflect the amount of information available, perhaps leading to the inability of the \textit{Pred\_Err} variable to represent information asymmetry, explaining the results found in this study.

5. FINAL CONSIDERATIONS

The main objective of this paper was to analyze the influence of asymmetric information on the financing decisions and cost of equity capital of Brazilian public companies, based on the pecking order theory. In response to the question investigated and the objective proposed, the results for the \textit{Pred\_Err} variable do not warrant a claim that information asymmetry is one of the determinants of the capital structure and cost of equity capital of Brazilian public companies, leading to the rejection of the research hypotheses. Nevertheless, even with these results it is not possible to affirm that information asymmetry does not influence the financing decisions and cost of capital of Brazilian firms, only that information asymmetry, when represented by the percentage of analysts’ earnings per share forecasting errors, is not statistically significant in explaining the variations in debt levels and cost of equity capital of the firms analyzed. This indicates the importance of the proxies used to represent information asymmetry. This result can also indicate the need to study the quality of analysts’ projections for Brazilian firms, i.e., how much of the percentage error is due to information asymmetry and how much is due to the accuracy and/or bias of these projections. Saito, Villalobos and Benetti (2008) analyzed the quality of analysts’ projections in the Brazilian market and found that factors related to firms’ characteristics and their information environment significantly influence the size of the forecasting error (accuracy), and that there is bias in the projections.

References


Valle, M. R. 2008. Estrutura de capital de empresas brasileiras num ambiente de altas taxas de juros e na presença de fontes diferenciadas de financiamento. Thesis (Teaching Credential) – Department of Accounting, School of Economics, Administration and Accounting of Ribeirão Preto, University of São Paulo.


**Endnotes**

1 Social contributions in Brazil are taxes by another name, the difference being that the revenue is earmarked for specific purposes instead of going into the general fund.

2 Levels 1 and 2 and the Novo Mercado (“New Market”) trading segments require firms to have enhanced levels of information disclosure, shareholder dispersion and corporate governance (including guarantees to minority shareholders).
Case Study “Tomsel Corp.”
First-Time Adoption of International Financial Reporting Standards by U.S. Company

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Executive Summary

Recent developments in global financial reporting have increased the likelihood of U.S. public companies being allowed or even required to adopt International Financial Reporting Standards (IFRS) in the not-too-distant future. In preparing for the transition from U.S. Generally Accepted Accounting Principles (U.S. GAAP) to IFRS, it is useful for firms, auditors, educators and students to consider an example of a company going through the U.S. GAAP-to-IFRS transition exercise. Although a growing number of U.S. companies have been affected by IFRS, especially as subsidiaries or investees of international companies using IFRS, real-life examples of IFRS adoption for primary reporting purposes are rare and limited to foreign entities in IFRS jurisdictions using previously U.S. GAAP instead of their national GAAP for financial reporting purposes.

We undertook an educational case study designed to highlight issues related to the adoption of IFRS by U.S. issuers. The purpose of the case study is to illustrate the U.S. GAAP-to-IFRS transition using a fictitious company, Tomsel Corporation, which is loosely based on a large European conglomerate that changed its basis of accounting from U.S. GAAP to IFRS in 2007. This paper showcases an example of the transition from one accounting system to another with respect to accounting for leases. This example has been selected because it highlights differences between rule-based U.S. GAAP and principles-based IFRS.

Background

On November 19, 2008, the U.S. Securities and Exchange Commission (SEC) issued for public comment a proposed ‘roadmap’ that could lead to the use of International Financial Reporting Standards (IFRS) by U.S. public companies beginning in 2014 (SEC, 2008). In the roadmap the SEC proposed a phased-in approach depending on company size. Mandatory IFRS adoption, however, would not be automatic. In 2011, the Commission would evaluate the progress of IFRS against certain defined milestones and make a decision on whether to go ahead with adoption starting in 2014, after 2014, or not at all. The comment period on the proposed roadmap ended on April 20, 2009. Although the roadmap was put on a back
burner for a while due to the financial and economic crisis, the SEC has turned its attention once again to the question of adopting IFRS now that the financial crisis has shown signs of abatement. In February 2010 the Commission unanimously approved a Statement, which provides an overview of the SEC’s IFRS activities to date and directs staff to carry out a work plan (SEC, 2010). The document does not provide any details of potential transition date or approach, but confirms that the Commission will make a decision about incorporating IFRS into the U.S. financial system in 2011. Because commenters on the proposed roadmap stated that a switch to IFRS would take them approximately four to five years to accomplish, the SEC does not expect first-time issuers to report under IFRS before 2015. The exact timeline for IFRS adoption, if the SEC decides to incorporate IFRS in the U.S. reporting system, is still under evaluation.

The SEC’s roadmap comes at a time when over 100 countries require or allow the use of IFRS for the preparation of financial statements by listed companies, including the Member States of the European Union, Australia and New Zealand, which transitioned to IFRS in 2005. Countries that require or allow the use of IFRS by listed companies may also allow or require the use of IFRS for local regulatory/statutory financial reporting or disclosure purposes by non-listed companies. Recently, several more countries have adopted IFRS or announced their commitment to ‘joining the IFRS club’ soon. For example, Israel has required IFRS for public companies, except banks, since 2008, while Canada and South Korea are among the countries with plans to adopt or converge with IFRS by 2011. Mexican and the first Indian companies listed are required to comply with IFRS by 2012, while Japan’s Financial Services Agency has decided to let some domestic companies use IFRS beginning in March 2010, leaving the U.S. as the only major economy not using the global reporting rules in some form.

As the SEC is contemplating its next step, company leaders and educators should prepare in time for the transition to IFRS. The SEC roadmap pertains to the system of ‘full IFRS’ issued by the International Accounting Standards Board (IASB, 2009a). In July 2009, the IASB issued a stand-alone, simplified IFRS version called IFRS for Small and Medium-sized Entities (IFRS for SMEs, which is IASB, 2009b). This IFRS for SMEs can already be used by private U.S. companies since the American Institute of Certified Public Accountants (AICPA) recognized the IASB as an official standard setter in 2008 (AICPA, 2008). Under these circumstances the AICPA’s Board of Examiners decided to include IFRS questions on the Uniform Certified Public Accountant Examination (Uniform CPA Exam) beginning in 2011 (AICPA, 2009).

The potential adoption of IFRS by U.S. public companies is likely to constitute a change in financial reporting equal to or greater than that resulting from enactment of the Securities Act of 1933 and the Securities Exchange Act of 1934. It is also expected to cost more than the implementation of the Sarbanes-Oxley Act of 2002.

First-Time Adoption of IFRS

While conversion to IFRS is not mandated for another few years, it is important for companies to realize that IFRS implementation is a complex and time-consuming process because of the comparative financial statements that will be required upon adoption, and because of the retrospective nature (with few exceptions) of implementation. Like all first-time adopters of IFRS around the world, U.S. companies will have to follow IFRS 1, First-Time Adoption of International Financial Reporting Standards (IASB, 2008a), which provides the framework applicable to entities adopting IFRS for the first time as their basis of accounting. According to IFRS 1, transition to IFRS involves the following steps:
1. Selection of accounting policies that comply with IFRS. A first-time adopter must use the same accounting policies in its opening IFRS statement of financial position and throughout all periods presented in its first set of IFRS financial statements. Those accounting policies must comply with each IFRS effective at the end of the first IFRS reporting period, with certain exceptions discussed below.

2. Preparation of an opening IFRS statement of financial position (balance sheet) at the date of transition to IFRS as the starting point for subsequent accounting under IFRS. 

3. Presentation and disclosure of the first set of IFRS financial statements and interim financial reports, including explanation of transition to IFRS.

In terms of accounting policies, IFRS 1 requires, in principle, retrospective application of each IFRS regulation effective at the reporting date to an entity’s first set of IFRS-compliant financial statements, with certain limited mandatory exceptions and optional exemptions. In particular, paragraph 10 of IFRS 1 requires an entity to do the following in the opening IFRS statement of financial position that it prepares as a starting point for its accounting under IFRS:

1. Recognize all assets and liabilities whose recognition is required by IFRS.
2. Derecognize items as assets or liabilities where IFRS do not permit recognition.
3. Remeasure all recognized assets and liabilities according to IFRS rules.
4. Reclassify items recognized under previous GAAP as one type of asset, liability or equity component, but that are a different type of asset, liability or component of equity under IFRS.

Management should select initial IFRS accounting policies based on relevance and reliability, as these choices will affect the company’s financial reporting for years to come. While many accounting policy choices will simply reflect relevant circumstances (e.g., method of depreciation or foreign currency translation), other choices will not depend on circumstances but will result from IFRS flexibility (e.g., options for recognizing actuarial gains and losses related to post-employment benefits, or the option to designate non-trading financial instruments as available for sale).

The accounting policies a U.S. firm uses under IFRS are likely to differ from those that it used for the same date using U.S. GAAP. Adjustment entries eliminate the differences between the two accounting systems. These arise from events and transactions before the date of transition to IFRS. They are therefore recognized directly in retained earnings (or, if appropriate, another category of equity) at the date of transition to IFRS.

IFRS 1 prohibits retrospective application of IFRS in some areas to prevent earnings from being managed, particularly where retrospective application would require judgments by management about past conditions after the outcome of a particular transaction has already become known. Firms are prohibited from retrospective application on issues related to:

- Estimates
- Derecognition of non-derivative financial assets and non-derivate financial liabilities
- Hedge accounting
- Non-controlling interests

Besides these mandatory exceptions, IFRS 1 also grants limited optional exemptions from
Exhibit 1 presents an exemplar timeline of the opening IFRS statements of financial position vis-à-vis reporting dates for three categories of filers as if affected by the 2008 version of the SEC roadmap.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Large Accelerated Filers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Year under U.S. GAAP</td>
<td>Date of Transition</td>
<td>First Year under IFRS</td>
<td>Reporting Date</td>
<td></td>
</tr>
<tr>
<td>1/1/2013</td>
<td>12/31/2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Accelerated Filers</td>
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<tr>
<td>Last Year under U.S. GAAP</td>
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<td>First Year under IFRS</td>
<td>Reporting Date</td>
<td></td>
</tr>
<tr>
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<tr>
<td>Last Year under U.S. GAAP</td>
<td>Date of Transition</td>
<td>First Year under IFRS</td>
<td>Reporting Date</td>
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</tr>
<tr>
<td>1/1/2015</td>
<td>12/31/2016</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Reconciliations of its equity reported in accordance with previous GAAP to its equity in accordance with IFRS for both of the following dates

(i) the date of transition to IFRS, and

(ii) the end of the latest period presented in the entity’s most recent annual financial statements in accordance with previous GAAP.

(b) A reconciliation to its total comprehensive income in accordance with IFRS for the latest period in the entity’s most recent set of annual financial statements. The starting point for that reconciliation shall be total comprehensive income in accordance with previous GAAP for the same period or, if an entity did not report such a total, profit or loss under previous GAAP.

(c) If the entity recognized or reversed any impairment losses for the first time in preparing its opening IFRS statement of financial position, the disclosures that International Accounting Standard 36, Impairment of Assets (IAS 36), would have required if the entity had recognized those impairment losses or reversals in the period beginning with the date of transition to IFRS.
As presented above, an entity’s first set of IFRS financial statements should include at least one year of comparative information under the standard, but the SEC and the stock exchanges may require two years of comparatives. Consequently, the date of transition to IFRS depends on two factors: first, the year of adoption of IFRS, and second, the number of years of comparative financial statements that the entity decides (or is required) to present along with the financial statements for the first IFRS reporting period.

To comply with the revised IAS 1, Presentation of Financial Statements (IASB, 2007), which became mandatorily effective in 2009, an entity’s first set of IFRS financial statements shall include at least three statements of financial position, two statements of comprehensive income, two separate income statements (if presented), two statements of cash flows and two statements of changes in equity and related notes, including comparative information.

In the following section, we present the rudiments of an educational case study designed to highlight issues related to the adoption of IFRS by U.S. issuers.

**Tomsel Corporation – Case Study**

**Company background**

Tomsel Corporation is an American multinational conglomerate headquartered in Chicago and listed on the New York Stock Exchange (NYSE). The corporation is the parent of a consolidated group comprising about 750 companies worldwide, employing over 300,000 people, and realizing sales of more than $97 billion in the fiscal year 2009. Tomsel is one of the world’s largest technology groups. It operates worldwide in three operating segments: steel, capital goods, and services.

The steel segment concentrates on carbon steel and stainless steel. Tomsel concentrates on flat steel products with strong growth potential and high value added. The corporation is a major global player in carbon flat steel. It also holds leading positions on the markets for high-performance materials, i.e., nickel alloys and titanium. Tomsel supports customers in the manufacture of top-quality end products in the automotive, appliance, electronics and aerospace industries.

The capital goods segment consists of three sub-segments: elevators, automotive (parts, sub-assemblies and modules) and technologies. The elevator unit is one of the leading elevator companies in the world and is represented at almost 1,000 locations in more than 70 countries. Tomsel is the only elevator producer that can offer the full range of passenger transportation systems. The services segment provides tailor-made materials, environmental services, mechanical engineering and scaffolding services. The services segment rigorously focuses on providing materials and industrial services as well as commodities for the producing and manufacturing sectors.

**Tomsel and the Proposed SEC Roadmap**

Because of its multinational character, the company intends to voluntarily adopt IFRS in 2011. According to the 2008 version of the SEC roadmap, U.S. issuers that meet both of the following criteria would have been eligible to use IFRS in their financial statements filed with the SEC for fiscal years ending on or after December 15, 2009:

1. The U.S. issuer is globally among the 20 largest (in terms of market capitalization) companies in its industry.
2. IFRS as issued by the IASB are used as the basis for financial reporting more often than any other basis of accounting by the 20 largest (in terms of market capitalization) public companies in that industry on a global basis.
Tomsel Corporation meets both criteria, having a market capitalization of $90,500 million and a majority of its competitors located in IFRS jurisdictions. Although the Commission in its February 2010 Statement withdrew the early-use proposal from the original 2008 version of the roadmap, it did not rule out the ability to adopt IFRS early once a mandate is decided.

Tomsel's financial reporting requirements under IFRS 1 are explained next, under the assumption that the SEC requires IFRS adopters to follow IFRS 1 literally and to present comparative information for one year only.4 The end of Tomsel's first IFRS reporting period is December 31, 2011. The last reporting period under U.S. GAAP ends on December 31, 2010. Exhibit 2 illustrates reporting requirements under IFRS 1 applicable to Tomsel Corp.

<table>
<thead>
<tr>
<th>Date Of Transition</th>
<th>Reporting Date</th>
</tr>
</thead>
<tbody>
<tr>
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<td>12/31/10</td>
</tr>
<tr>
<td></td>
<td>12/31/11</td>
</tr>
</tbody>
</table>

- Tomsel Corporation must prepare and present at the reporting date an opening IFRS statement of financial position for the date of transition to IFRS, that is the beginning of business on January 1, 2010 (or, equivalently, close of business on December 31, 2009)
- Tomsel Corporation will produce its first set of IFRS financial statements for the annual period ending December 31, 2011 — its first IFRS reporting period is 2011
- Tomsel Corporation will prepare and present its statement of financial position (balance sheet) for December 31, 2011, a statement of comprehensive income, a statement of changes in equity and a statement of cash flows for the year ending December 31, 2011, and disclosures, as well as comparative amounts for 2010 for all those statements
- Tomsel Corporation has quarterly reporting requirements; the entity will comply with IAS 34, Interim Financial Reporting, and present the first IFRS-compliant interim report — the March 31, 2011, quarterly report.

**Accounting Issues at Tomsel Corporation**

Tomsel Corporation presently prepares its financial statements in accordance with U.S. GAAP. During the assessment phase of the conversion project, Tomsel’s CFO has selected Stainless Inc., a recently purchased unit within Tomsel’s steel segment, as a “laboratory” for assessing the potential implications of IFRS adoption. In your role as Stainless Inc.’s Controller, you and your team determined that IFRS adoption might significantly affect several accounting policies.

You have determined that one of the accounting policies that may produce significantly different results under U.S. GAAP versus IFRS is lease accounting. Statement of Financial Accounting Standards No. 13 (SFAS 13, now captured in topic 840 (ASC 840) of the FASB Accounting Standards Codification™), the primary standard for lease accounting in U.S. GAAP, is an example of a rules-based standard (FASB, 2008). The standard requires that firms distinguish between operating and capital leases using four specific criteria, whose purpose is to ensure that leases that are essentially purchases are treated as such. Two of the criteria include the so-called bright-line tests. If a contract satisfies any of the four criteria, it must be recognized as a capital lease in the financial statements. The FASB developed this standard hoping that by providing explicit rules, individual judgment would be eliminated and the standards would be consistently applied. In many respects, this strategy backfired. Because precise rules were established, companies carefully structured lease contracts to qualify as operating leases. As a result, the explicit rule allows off-balance-sheet financing to continue, and provides justification for the treatment.
Studying these issues further, you have realized that the rules-based approach to lease accounting under U.S. GAAP contrasts sharply with the principles-based approach under IFRS, where accounting for leases is primarily addressed in IAS 17, Leases (IASB, 2008b). This standard provides broad guidance on classifying lease contracts as capital or operating. The principles-based IAS 17 states simply that a lease “is classified as a finance (i.e., capital) lease if it transfers substantially all of the risks and rewards incidental to ownership” to the lessee. Thereby IAS 17 does not provide an opportunity to write contracts that avoid minimum requirements. The example shows that principles-based standards are more difficult to circumvent than rules-based standards. If a lease is, in substance, a debt-financed purchase (capital lease), the leased asset must be recorded on the lessee’s books along with a corresponding liability. In essence, under IAS 17, it is difficult for companies to write lease contracts that allow off-balance-sheet financing (Shortridge and Myring, 2004).

**Learning Goals and Requirements**

The requirements of the case study are intended to achieve the following learning goals:

1. To make students familiar with the IFRS recognition, measurement, presentation, and disclosure requirements listed in this case, which have been chosen to be representative of the financial reporting topics most prevalent in U.S. industrial companies.

2. To introduce students to the requirements of IFRS 1, especially the principle of retrospective application of IFRS.

In order to achieve these objectives, students are given a set of transactions and events, and are required:

1. To prepare the U.S. GAAP journal entries necessary to account for the given transactions and events.

2. To identify significant differences between U.S. GAAP and IFRS related to the given transactions and events.

3. To study the requirements of IFRS 1 with respect to retrospective application of IFRS.

4. To prepare the IFRS journal entries as well as the adjusting entries required to translate the financial statements from U.S. GAAP to IFRS.

The lease accounting example provided below represents one such set of transactions and events and is used to illustrate the approach of the larger case study.

**Lease Accounting Example**

On January 1, 2008, Stainless Inc., which is involved in supply chain management (SCM), leased a specialized SCM computer system used for value-adding processing and logistics. The lease is non-cancelable, and Stainless Inc. will not receive title to the leased system during or at the end of the lease term. The terms of the lease contract are as follows:

- Annual rentals, due at the beginning of the year: $36,000.
- Estimated executory costs paid by the lessor: $1,000.
- Lease term: 3 years.
- Estimated economic life: 4.2 years and no residual value, as a new and superior system is expected on the market in March 2012.
- Purchase option for a price of $30,000, which approximates fair market value, at the end of three years.
• Renewal option: for 1 year at $15,000, which is substantially below the market rent; no penalty for non-renewal; standard renewal clause.
• Fair market value at inception of the lease: $111,000.
• Lessee’s incremental borrowing rate: 8%
• Stainless Inc. knows that the lessor sets the annual rental to earn a rate of return on its investment of 6% per year.
• Stainless Inc. depreciates, on a straight-line basis, other computer systems that it owns.
• The SCM computer system is designed strictly for supply chain management and modified for the operating purposes at Stainless Inc.; it cannot be used for other purposes.

Stainless, Inc. is a company with December 31 fiscal year end.

Solution

U.S. GAAP accounting treatment: (SFAS 13, now captured in ASC 840; especially applicable in this case are Paragraph 840-10-25-1; Subtopic 840-20 and Subtopic 840-30):

Leases are classified as either capital or operating leases. Classification depends on whether substantially all of the risks and rewards incidental to ownership have been transferred. Four specific criteria (including two with ‘bright lines’) are used to make this distinction. In order for the lessee to “expense payments,” the following criteria must be met:

1. The lease does not automatically transfer ownership of the asset to the lessee at the end of the lease term.
2. The lease does not provide a minimal or “bargain purchase option” at the conclusion of the lease term.
3. The term of the lease is less than 75% of the estimated economic life of the leased asset.
4. The present value of the lease payments cannot exceed 90% of the fair market value (purchase price) of the equipment.

If one or more of the criteria are not met, the lease is classified as a capital lease. Under the capital lease accounting treatment, the lessor recognizes a lease receivable, and the lessee recognizes the asset and a liability for future lease payments. Under an operating lease, the asset remains on the lessor’s balance sheet and the lessee expenses the lease payments over the lease term.

The accounting policies a U.S. firm uses under IFRS are likely to differ from those that it used for the same date using U.S. GAAP.

Classification of the lease under U.S. GAAP:

Criteria
1. Transfer of title: No.
2. Bargain purchase option: No, the option to purchase at the end of three years at approximately the fair market value is not a bargain.
3. Economic life test (75%): The lease term is three years and a bargain renewal period exists; 3/4.2 = 71.4%; test not met
4. Recovery of investment test (90%): fair market value = 111,000 x 90% = 99,900
   Rental payments $36,000 less executory costs 1,000 = 35,000
   • Present value of annuity due factor for 3 years at 8%: 2.78326;
     present value of minimum lease payments using incremental borrowing rate = 35,000 x 2.78326 = 97,414.
   • Present value of minimum lease payments using implicit rate of 6%: 35,000 x 2.83339 = 99,169.
   • Implicit rate is lower, so it should be used in the test: 99,169/111,000 = 89.3% < 90%.

Conclusion
Classify the transaction as an operating lease.
U.S. GAAP Journal Entries

<table>
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<tbody>
<tr>
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<tr>
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<tr>
<td></td>
<td>36,000</td>
<td>36,000</td>
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</tr>
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</tr>
<tr>
<td>Rent</td>
<td></td>
<td>36,000</td>
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<td>36,000</td>
</tr>
</tbody>
</table>

**IFRS accounting treatment (IAS 17):**

Under IAS 17, leases are classified as either operating or finance leases. The classification of a lease does not depend on specific criteria, but rather on the substance of the lease. That means it is dependent on who bears the essential risks and rewards related to the leased asset. If the lease is classified as a finance lease, the lessee recognizes the asset. Under an operating lease the lessor recognizes the asset. Judgment is used in applying the following criteria:

**Determinative factors (meeting any one determines finance lease) (IAS 17.10):**

- The lease transfers ownership of asset to the lessee at the expiration of the lease.
- The lessee has an option to purchase the asset at below fair value; the option will be exercised with reasonable certainty.
- The lease term is for a major part of the economic life of the asset.
- The present value of minimum lease payments approximates fair value of the leased asset (use implicit rate).
- The leased asset is of a specialized nature and only suitable for the lessee.

**Suggestive factors (IAS 17.11):**

- The lessee will bear cancellation losses;
- Gains or losses resulting from the fluctuations in the fair value of the residual accrue to the lessee.
- The lease for a secondary period is possible at substantially lower-than-market rent.

In a finance lease the lessee recognizes the finance lease as an asset and liability in the statement of financial position. The asset and the liability are recognized at the fair value of the leased property or, if lower, at the present value of the minimum lease payments. The minimum lease payments are the payments of the lessee excluding contingent rent, costs for services, and taxes. The present value of the minimum lease payments is calculated with the interest rate implicit in the lease.

**The date of transition to IFRS depends on two factors:** first, the year of adoption of IFRS, and second, the number of years of comparative financial statements that the entity decides (or is required) to present along with the financial statements for the first IFRS reporting period.
**Classification of the lease under IFRS:**

**Criteria**

Take into consideration all the criteria listed above. It could be argued that the lease term is for a major part of the economic life; at the implicit rate the present value of minimum lease payments approximates fair value of the leased assets; the leased asset is of a specialized nature; and the lease for a secondary period is possible at substantially lower-than-market rate.

**Stainless Inc.**

**SCM Computer System – Lease Amortization Schedule**

<table>
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<tr>
<th>Date</th>
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<th>Executory Costs</th>
<th>Interest on Obligation (6%)</th>
<th>Reduction of Lease Obligation</th>
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</thead>
<tbody>
<tr>
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<td>5,831</td>
<td>99,169</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

Based on the economic substance of the lease transaction rather than the form of the contract, the lease should be classified as a finance (capital) lease.

**IFRS journal entries:**

Present value of minimum lease payments using implicit rate of 6% = 35,000 x 2.83339 = 99,169.
Concluding Remarks

U.S. companies face major challenges in the context of changing their financial reporting from U.S. GAAP to IFRS. Although substantial efforts have been made to converge the two systems, significant differences still remain. The most relevant differences are addressed by the case study “Tomsel Corporation,” which is loosely based on a large European conglomerate that changed its basis of accounting from U.S. GAAP to IFRS in 2007. The objective is to prepare firms, auditors, educators and students for the impact of transitioning from U.S. GAAP to IFRS by providing much-needed exposure to and hands-on experience with IFRS.

This paper concludes the first phase of our project. In the next phase, we intend to develop more sets of transactions and events for accounting issues on which IFRS and U.S. GAAP differ, as well as scenarios for the application of selected optional exemptions from retrospective application in specified areas under IFRS 1. Furthermore, on first-time adoption of IFRS, companies must choose which accounting policies to adopt. We intend to structure the case around selected accounting policy choices under IFRS to provide students with an opportunity to consider the long-term impact of these choices on the company’s future financial situation.

References


Endnotes

1 For details, refer to www.iasplus.com/country/useias.htm.

2 The date of transition to IFRS is the beginning of the earliest comparative period presented in an entity's first set of IFRS financial statements.

3 The early adoption timeline was unrealistic to begin with; it would not come true due to the SEC's decision to extend the comment period on the IFRS roadmap to April 20, 2009, and to postpone any major IFRS related decisions in 2009.

4 In its proposed 2008 roadmap, the SEC required the IFRS financial statements to include two years of comparative period in the first year of IFRS reporting for SEC filing purposes. In the case we assume that this requirement will be lifted based on the following facts: (1) in 2004 the SEC amended Form 20-F to provide a one-time accommodation relating to financial statements prepared under IFRS for foreign private issuers registered with the SEC. The accommodation permitted eligible foreign private issuers for their first year of reporting under IFRS to file two years rather than three years of statements of income, changes in shareholders' equity and cash flows prepared in accordance with IFRS, and (2) most of the respondents to the proposed Roadmap expressed their concern about two comparative periods required, and argued that the SEC should follow strictly IFRS 1 (the comment letters are available at http://edgar.sec.gov/comments/s7-27-08/s72708.shtml).

5 For example, the FASB and IASB have been conducting a joint project on leases with an objective to create a common standard on lease accounting to ensure that the assets and liabilities arising from lease contracts are recognized in the statement of financial position. On August 17, 2010 the Boards published an Exposure Draft, Leases which is open for public comment until December 15, 2010. The final standard is expected in June 2011. (The exposure draft is available at http://www.ifrs.org/CurrentProjects/IASBProjects/Leases/ed10/Ed.htm)
Executive Summary

In this article, we illustrate that the estimation procedure applied in Chan et al. (1992) — hereafter referred to as CKLS (1992) — for estimating short-term interest rate models suffers from significant estimation bias. We show by Monte Carlo simulations that the application of the jackknife estimation of Quenouille (1956) provides substantial bias reduction. We provide empirical distributions for parameter tests depending on the elasticity of conditional variance of changes in the short-term interest rate. Using daily, weekly and monthly observations of the three-month U.S. Treasury bill yield and the federal funds rate, we demonstrate that the estimation results can depend on both the sampling frequency and the proxy that is used for the short-term interest rate.

1. Introduction

Many asset pricing models use one-factor stochastic differential equations — hereafter referred to as SDE — to capture the dynamics of the short-term interest rate. Since different drift and diffusion functions generate significantly different prices for interest rate sensitive assets, the choice of the corresponding specification is of great importance.

In CKLS (1992) the empirical validity of several continuous-time models is analyzed by means of the generalized method of moments — hereafter GMM — estimation of Hansen (1982). We show that this procedure suffers from significant estimation bias that arises from the estimation of autoregressive models. This bias is likely to have a large impact on pricing interest rate sensitive assets. We show, by Monte Carlo simulations, that the jackknife estimation of Quenouille (1956), first suggested by Phillips and Yu (2005) within the framework of maximum likelihood estimation of continuous-time models, achieves substantial bias reduction.

Furthermore, to examine the importance of mean-reversion, we determine empirical distributions of the associated t-statistics under the null hypothesis that the drift function is zero. Our findings indicate that the distributions depend on the elasticity of the conditional variance of changes in the short-term interest rate. In addition, we consider the empirical distribution of the likelihood ratio — hereafter LR — statistics under the corresponding null models. We find that the distributions do not strictly and exclusively depend on the number of restrictions, but also on the given model that is considered.

Using observations of the three-month U.S. Treasury bill yield and the federal funds rate from January 4, 1954 through March 2, 2006, we demonstrate that the estimation results can depend on both the sampling frequency and the proxy that is used for the short-term interest rate. As indicated by the results, the three-month U.S. Treasury bill yields seem to be non-stationary, such that the role of mean-reversion appears to be negligible. As in CKLS (1992), we find that the conditional variance of changes in the three-month U.S. Treasury bill yield is highly sensitive to the yield level, whereas an exact specification of the elasticity seems to be more important for daily observations, since the null models are rejected more often. In contrary to that...
result, daily observations of the federal funds rate exhibit significant mean-reversion and a lower sensitivity of the conditional variance of changes in the rate level.

The remainder of this work is organized as follows. Section 2 discusses the stochastic properties of several continuous-time models. Section 3 presents an analysis of the estimation procedure. In Section 4, the results of the Monte Carlo experiments are presented. Section 5 reports the corresponding empirical results. Section 6 concludes.

2. Continuous-Time Models of the Short-Term Interest Rate

CKLS (1992) assume that the short-term interest rate follows a continuous-time stochastic process \( \{ R_t \mid t \geq 0 \} \) which solves a time-homogenous, one-factor, diffusion-type SDE, of the form

\[
dR_t = (\alpha + \beta \cdot R_t) \, dt + \sigma \cdot R_t^\gamma \, dW_t,
\]

where \( \{ W_t \mid t \geq 0 \} \) is a standard Brownian motion and the parameter vector is \( \theta = (\alpha, \beta, \sigma, \gamma) \). This specification allows both the conditional mean and variance of changes in the short-term interest rate to depend on \( R_t \). It follows from (1) that the conditional variance of changes in the short-term interest rate increases with \( R_t \) if \( \beta > 0 \). Using the properties of stochastic integrals, it can be shown that the unconditional mean \( E(R_t) \) of \( R_t \) satisfies

\[
\lim_{t \to \infty} E(R_t) = -\frac{\alpha}{\beta} \quad \text{for} \quad \beta < 0.
\]

This illustrates that in the case of \( \beta < 0 \) the process is mean-reverting, which means that there is an adjustment to the unconditional long-run mean \( -\alpha / \beta \) measured by \( b \). The specifications that are examined in this work and their corresponding parameter restrictions are summarized in Exhibit 1.

The process in Merton (1973) implies that both the variance and the mean of the short-term interest rate increase by time, such \( R_t \) is non-stationary. In Vašícek (1977), the process is asymptotic stationary if and only if \( \beta < 0 \). Both models imply that the conditional variance of changes in \( R_t \) is constant. Since \( R_t \) is Gaussian, it can be negative.

**Exhibit 1. Summary of Alternative Models of the Short-Term Interest Rate**

<table>
<thead>
<tr>
<th>Model</th>
<th>SDE</th>
<th>( \alpha )</th>
<th>( \beta )</th>
<th>( \gamma )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted</td>
<td>( dR_t = (a + b \cdot R_t) , dt + s \cdot R_t^\gamma , dW_t )</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Merton (1973)</td>
<td>( dR_t = a , dt + s , dW_t )</td>
<td>-0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vašícek (1977)</td>
<td>( dR_t = (a + b \cdot R_t) , dt + s , dW_t )</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Dothan (1978)</td>
<td>( dR_t = s \cdot R_t , dW_t )</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CIR (1980)</td>
<td>( dR_t = s \cdot R_t^{0.5} , dW_t )</td>
<td>0</td>
<td>0</td>
<td>1.5</td>
</tr>
<tr>
<td>BS (1982)</td>
<td>( dR_t = (a + b \cdot R_t) , dt + s \cdot R_t , dW_t )</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CIR (1985)</td>
<td>( dR_t = (a + b \cdot R_t) , dt + s \cdot R_t^{0.5} , dW_t )</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>GBM</td>
<td>( dR_t = b \cdot R_t , dt + s \cdot R_t , dW_t )</td>
<td>0</td>
<td>-1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Explanation:** Exhibit 1 summarizes the specifications of alternative models of the short-term interest rate with their corresponding parameter restrictions that are imposed on the parameter vector.

The process suggested by Dothan (1978) is non-stationary since its variance increases by time. Assuming \( R_0 = -\alpha / \beta \) it can be shown that asymptotic stationary requires \( \beta < 0 \) and \( 2 \cdot \beta + \sigma^2 < 0 \) within the model of Brennan and Schwartz (1982) – hereafter BS (1982). Due to \( g = 1 \), the models of Dothan (1978) and BS (1982) assume that the conditional volatility of changes in the short-term interest rate is proportional to the rate level.

It can be shown that \( \beta < 0 \) is necessary for asymptotic stationarity in CIR (1985), where the conditional distribution of \( R_t \) is non-central chi-square. If \( R_t \) follows a geometric Brownian motion — hereafter GBM — then asymptotic
stationarity requires $\beta < 0$ and $2 \cdot \beta + \sigma^2 < 0$. In this case the mean and the variance of $R_t$ converge to zero as $t \to \infty$.

3. Analysis of the Estimation Techniques

Let $t_i$ denote a point of time, where $\Delta t := t_{i+1} - t_i > 0$ and $t_0 := 0$. For estimation, it is assumed that the solution of (1) can be approximated by a discrete-time stochastic process $\{ r(t_i) \}$ that satisfies

$$r(t_{i+1}) - r(t_i) = (\alpha_0 + \beta_0 \cdot r(t_i)) \cdot \Delta t + \varepsilon(t_{i+1})$$

where $\theta_0 = (\alpha_0, \beta_0, \sigma_0, \gamma_0)'$ denotes the parameter vector that is to be estimated. The unobservable error term $\varepsilon(t_i)$ is allowed to be conditionally heteroskedastic such that

$$E(\varepsilon(t_{i+1}) | r(t_i)) = 0$$

And

$$E(\varepsilon(t_{i+1})^2 | r(t_i)) = \sigma_0^2 \cdot \gamma_0 \cdot \Delta t$$

for all $i$. For estimation, the following vector function is suggested

$$f(r(t), \theta) = \left[ \begin{array}{c} \varepsilon(t_{i+1}) \\ \varepsilon(t_{i+1}) - \sigma_0 \cdot \gamma_0 \cdot \Delta t \end{array} \right] \otimes \left[ \begin{array}{c} 0 \\ r(t_i) \end{array} \right]$$

where $\otimes$ denotes the Kronecker product.

Using the law of iterated expectations it can be shown that $E(f(r(t), \theta_0)) = 0$. Given a finite observed sample of (2) with size $n$, the sample moments of $f$ are denoted as

$$g_n(\theta) = \frac{1}{n} \sum_{i=0}^{n-1} f(r(t_i), \theta)$$

The GMM procedure consists of choosing an estimator $\hat{\theta}_n$ for $\theta_0$ such that the criterion function $Q_n(\theta)$ given below is minimized with respect to $q$, that is

$$\hat{\theta}_n = \text{argmin}_q \{ Q_n(\theta) \}$$

where $Q_n(\theta) := g_n(\theta)' \cdot V_n \cdot g_n(\theta)$, and $V_n$ is a positive definite weighting matrix. This is equivalent to solving $G_n(\theta)' \cdot V_n \cdot g_n(\theta) = 0$, where $G_n(\theta)$ denotes the Jacobian of $g_n(\theta)$ with respect to $\theta$.

Since the number of equations equals the number of parameters in the unrestricted case, the estimator of the unrestricted parameter vector — denoted as $\hat{\theta}_n(0)$ — can be obtained by solving $G_n(\theta) = 0$ numerically by the Newton-Raphson method. The sample moments of the vector function are assumed to satisfy the central limit theorem, that is

$$\Sigma^{0.5} \cdot \sqrt{n} \cdot g_n(\theta_0) \xrightarrow{d} N(0, I_n) \text{ as } n \to \infty,$$

where $\xrightarrow{d}$ denotes the convergence in distribution and $\Sigma$ is a positive definite matrix given by

$$\Sigma = \Gamma_0 + \lim_{n \to \infty} \sum_{j=1}^{n} \left( 1 - \frac{j}{n^2} \right) \left( \Gamma_j + \Gamma_j' \right) = \Gamma_0 + \sum_{j=1}^{n} \left( \Gamma_j + \Gamma_j' \right)$$

and $\Gamma_{i-j} := E(f(r(t), \theta_0) \cdot f(r(t), \theta_0'))$. Using the Taylor expansion it follows that

$$\Lambda_n^{0.5} \cdot \sqrt{n} \cdot (\hat{\theta}_n - \theta_0) \xrightarrow{d} N(0, I_n), \text{ where}$$

$$\Lambda_n^{0.5} = \left( G_n(\theta_0)' \cdot V_0 \cdot G_n(\theta_0) \right)^{-1} \cdot G_n(\theta_0)' \cdot V_0 \cdot \Sigma \cdot V_0 \cdot G_n(\theta_0)^{0.5}$$

It can be shown that $\Lambda_n - (G_n(\theta_0)' \cdot \Sigma^{-1} \cdot G_n(\theta_0))^{-1}$ is positive semi-definite for all choices of $V_0$, and hence we get

$$\Lambda_n = (G_n(\theta_0)' \cdot \Sigma^{-1} \cdot G_n(\theta_0))^{-1} \text{ if } V_0 = \Sigma^{-1}.$$
to ensure consistency, that is
\[ \tilde{\Sigma} = \hat{\Gamma}_0 + \sum_{j=1}^{b(n)} k(j,b(n)) \left( \hat{\Gamma}_j + \hat{\Gamma}_j' \right) \]
where \( k(\cdot) \) is known as the kernel and \( b(n) \) known as the bandwidth depending on the sample size. The Bartlett kernel introduced by Newey and West (1987a) is
\[ k(j,b(n)) = 1 - \frac{j}{b(n)+1}. \]
Andrews (1991) shows that the asymptotic mean square error of \( \tilde{\Sigma} \) is minimized by setting \( b(n) \) to \( O(n^{1/3}) \), such that we use the integer part of \( n^{1/3} \) for the Bartlett kernel. The estimation of a restricted model requires a two-step GMM estimation; estimating the optimal weighting matrix in the first step using \( q^{(s)} \), followed by estimating the parameters of the corresponding restricted model.

To test the validity of the models, we apply the methodology proposed by Newey and West (1987b) which can be viewed as an extension to the GMM framework of the classical parameter tests from maximum likelihood theory. Newey and West (1987b) show that the test-statistic
\[ D = n \cdot (Q_n(\hat{q}^{(s)}_n) - Q_n(\hat{q}^{(0)}_n)) \]
is asymptotically distributed chi-square with \( s \) degrees of freedom, where \( s \) is the number of restrictions, and \( \hat{q}^{(s)}_n \) is the corresponding estimate. The weighting matrix from the unrestricted model is used to calculate both \( Q_n(\hat{q}^{(s)}_n) \) and \( Q_n(\hat{q}^{(0)}_n) \).

It is commonly known that standard maximum likelihood procedures can lead to biased coefficient estimators while estimating autoregressive models. Since (2) can be regarded as an autoregressive model of order one with conditional heteroskedastic errors, the question of a bias reduction method arises. We apply the jackknife estimation of Quenouille (1956) as follows. An observed sample with \( n \) observations is decomposed into \( l \geq 2 \) consecutive sub-samples, each with \( t \) observations, such that \( n = l \cdot t \). Then the jackknife estimator \( \hat{q}^{\text{jack}}_l \) of the parameter vector \( q \) is given by
\[ \hat{q}^{\text{jack}}_l = \frac{1}{l-1} \left( 1 - \frac{1}{l(l-1)} \sum_{j=1}^{l} \hat{q}_{-j} \right) \text{ for } l \geq 2, \]
where \( \hat{q}_{-j} \) symbolizes a corresponding GMM estimate of \( q_0 \) obtained from the \( j \)-th sub-sample with \( j = 1, \ldots, l \).

4. Monte Carlo Results
Within all Monte Carlo experiments, the realisations of standard normal pseudo-random variables are generated using Marsaglia and Tsang (1984). The bias of the estimation is tested using
\[ \sqrt{m \cdot \frac{\hat{\sigma} - a}{\hat{s}_d}} \xrightarrow{d} N(0,1) \text{ as } m \to \infty, \]
under \( H_0 : E(\hat{q}_n) = q_0 \)
where \( m \) denotes the number of replications, \( \hat{\sigma} \) symbolizes the sample mean of the estimates of \( a \), \( \hat{s}_d \) represents an estimate for standard deviation, i.e.
\[ \hat{s}_d = \sqrt{\frac{1}{m-1} \sum_{j=1}^{m}(\hat{a}(j) - \bar{a})^2}, \]
and \( \hat{a}(j) \) denotes an estimate of \( a \) computed at the replication \( j \) with \( j = 1, \ldots, m \). For the remaining parameters, the bias is tested analogously.
We construct simulated sample paths of (2) consisting of 12,500, 25,000, 50,000 and observations using \(a_0 = 0.04\), \(b_0 = -1\), \(\hat{b}_0 = -1\), \(s_0 = 0.2\), \(g_0 = 1.5\), \(\Delta t = 0.01\) and \(r(t_* ) = 0.035\), from which the unrestricted model is estimated respectively. We also compute the corresponding jackknife estimates using \(l = 2\). The experiment is based on \(m = 5000\) replications.

We generate simulated samples, each with \(n = 10000\), under \(H_0 : a_0 = b_0 = 0\) using \(s_0 = 0.5\), \(\Delta t = 0.01\), and four different values for \(g\) respectively. The experiment is based on \(m = 30,000\) replications and is repeated for the jackknife estimates with \(l = 2\). The distribution of the LR-statistics is examined analogously for all models. The results are presented in Exhibit 3 and Exhibit 4.

The biases of the jackknife estimators do not differ from zero for \(a\), \(b\), and \(g\) at the 5% level. However, the null hypothesis that the bias is zero is rejected at the 1% level for the jackknife estimates for \(s\) obtained from samples with 12,500, 25,000 and 50,000 observations, but it is not rejected at the 5% level for estimates of \(s\) obtained from samples with 100,000 observations.

For all types of sampling frequencies only the model of CIR (1980) is not rejected at the 5% level, so that this model best describes the dynamics of the three-month U.S. Treasury bill yield.

We analyze the distribution of the \(t\)-statistics for \(\hat{b}\) under \(H_0 : a_0 = b_0 = 0\). The alternative is \(H_1 : a_0 > 0 \land b_0 < 0\). The \(t\)-statistics of the estimates for \(\hat{b}\) are calculated by

\[
t_{\hat{b}} = \sqrt{n} \cdot \frac{\hat{b}}{\sqrt{\hat{\Lambda}^{(2,2)}_n}},
\]

where \(\hat{b}\) is an estimate of \(b\) and \(\hat{\Lambda}^{(2,2)}_n\) denotes the second component of the main diagonal of \(\hat{\Lambda}_n := (G_n (\hat{g}_n))^{\frac{1}{2}} \cdot \hat{\Sigma}^{-1} \cdot G_n (\hat{g}_n)^{-1}\).

Exhibit 2 summarizes the results for the estimates obtained from simulated samples with size \(n\). The number of the sub-samples for the jackknife estimation is denoted by \(l\), and \(s\) and \(\alpha\) observations using \(\hat{b}\) is an estimate of \(b\), and \(\hat{\Lambda}^{(2,2)}_n\) is the second component of the main diagonal of \(\hat{\Lambda}_n \). The test-statistics of the non-jackknife estimates. The marking * (**) means that the null hypothesis that the bias is zero can be rejected at the 5% (1%) level.

We construct simulated sample paths of (2) consisting of 12,500, 25,000, 50,000 and observations using \(a_0 = 0.04\), \(b_0 = -1\) \(s_0 = 0.2\), \(g_0 = 1.5\), \(\Delta t = 0.01\) and \(r(t_* ) = 0.035\), from which the unrestricted model is estimated respectively. We also compute the corresponding jackknife estimates using \(l = 2\). The experiment is based on \(m = 5000\) replications.

The results, presented in Exhibit 2, indicate that the standard deviations of the estimates decrease for all parameters as the sample size increases. This feature is necessary to assume convergence in probability. The null hypothesis that bias is zero is rejected at the 1% level for the estimates of \(a\), \(b\), and \(s\). The bias seems to be larger for fewer observations.

\[\text{Exhibit 2. Estimation Bias – Monte Carlo Results}\]

<table>
<thead>
<tr>
<th>(n)</th>
<th>(l)</th>
<th>(\alpha)</th>
<th>(\beta)</th>
<th>(\sigma)</th>
<th>(\gamma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 500</td>
<td>1</td>
<td>0.04118**</td>
<td>-1.0297**</td>
<td>0.2480**</td>
<td>1.4933*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.1314]</td>
<td>[17.1222]</td>
<td>[18.1850]</td>
<td>[-2.1878]</td>
</tr>
<tr>
<td>50 000</td>
<td>2</td>
<td>0.039960</td>
<td>-0.9999</td>
<td>0.2042**</td>
<td>1.4966</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.5565]</td>
<td>[0.5429]</td>
<td>[6.7649]</td>
<td>[-1.9358]</td>
</tr>
<tr>
<td>100 000</td>
<td>1</td>
<td>0.040009</td>
<td>-1.0002</td>
<td>0.2006</td>
<td>1.5007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.0400]</td>
<td>[-0.9995]</td>
<td>[0.2026**]</td>
<td>[1.5002]</td>
</tr>
<tr>
<td>25 000</td>
<td>1</td>
<td>0.04060**</td>
<td>-1.0149**</td>
<td>0.2237**</td>
<td>1.4964</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.0406]</td>
<td>[-0.9999]</td>
<td>[0.2026**]</td>
<td>[1.5002]</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.039997</td>
<td>-0.9999</td>
<td>0.2062**</td>
<td>1.5002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.0399]</td>
<td>[-0.9999]</td>
<td>[0.2062**]</td>
<td>[1.5002]</td>
</tr>
</tbody>
</table>

**Explanation:** Exhibit 2 summarizes the results for estimates obtained from simulated samples with size \(n\). The number of the sub-samples for the jackknife estimation is denoted by \(l\), where \(l = 1\) represents the non-jackknife estimates. The test-statistics of the estimation bias are in brackets. The marking * (**) means that the null hypothesis that the bias is zero can be rejected at the 5% (1%) level.

\[\text{In case of } a_0 = b_0 = 0 \text{ the short-term interest rate process has a unit root. As shown in Rodrigues and Rubia (2004), the resulting } t\text{-statistics do not depend on the level of } \gamma .\]

\[\text{Note that } a_0 \leq 0 \land b_0 < 0 \text{ would imply that the short-term interest rate follows a stationary process with non-positive long-run mean.}\]
As the results show, the empirical distribution of the \( t \) -statistics seems to depend on the value of \( g \) that is used to generate simulated sample paths. However, we cannot identify any kinds of patterns for the percentiles concerning the dependence of the distribution on \( g \).

### Exhibit 3. Empirical Percentiles of the \( t \)-Statistics Depending on \( \gamma \) – Monte Carlo Results

<table>
<thead>
<tr>
<th>( \gamma )</th>
<th>( \lambda )</th>
<th>0.5%</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>50%</th>
<th>90%</th>
<th>95%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1</td>
<td>5.4445</td>
<td>5.0488</td>
<td>4.0131</td>
<td>3.5361</td>
<td>2.1717</td>
<td>0.8655</td>
<td>0.4257</td>
<td>0.4201</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>0.5</td>
<td>1</td>
<td>5.0691</td>
<td>4.6604</td>
<td>3.5231</td>
<td>3.0179</td>
<td>1.5972</td>
<td>0.6037</td>
<td>0.0765</td>
<td>1.0833</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>6.3508</td>
<td>6.1211</td>
<td>5.4167</td>
<td>5.0250</td>
<td>3.5730</td>
<td>2.2367</td>
<td>1.6158</td>
<td>0.9939</td>
</tr>
<tr>
<td>1.0</td>
<td>1</td>
<td>4.0611</td>
<td>3.7818</td>
<td>3.0130</td>
<td>2.6424</td>
<td>1.4912</td>
<td>0.6857</td>
<td>0.4740</td>
<td>0.4626</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>6.3984</td>
<td>6.1363</td>
<td>5.1873</td>
<td>4.6648</td>
<td>3.1080</td>
<td>2.0637</td>
<td>1.8379</td>
<td>-1.4249</td>
</tr>
<tr>
<td>1.5</td>
<td>1</td>
<td>3.8603</td>
<td>3.5938</td>
<td>2.8894</td>
<td>2.5481</td>
<td>1.4568</td>
<td>0.3016</td>
<td>0.0003</td>
<td>0.6735</td>
</tr>
</tbody>
</table>

**Explanation:** Exhibit 3 contains the empirical percentiles of the distributions of the \( t \)-statistics of \( \beta \) under \( H_0: \alpha_0 = \beta_0 = 0 \) obtained from simulated samples. The number of the sub-samples that is used for the jackknife estimation is denoted by \( \lambda \), where \( \lambda = 1 \) represents the non-jackknife estimates.

As the results show, the empirical distribution of the \( t \)-statistics seems to depend on the value of \( g \) that is used to generate simulated sample paths. However, we cannot identify any kinds of patterns for the percentiles concerning the dependence of the distribution on \( g \).

### Exhibit 4. Empirical Percentiles of the LR-Statistics – Monte Carlo Results

<table>
<thead>
<tr>
<th>Model</th>
<th>( s )</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>50%</th>
<th>90%</th>
<th>95%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERTON (1973)</td>
<td>2</td>
<td>0.0224</td>
<td>0.1132</td>
<td>0.2264</td>
<td>1.4550</td>
<td>4.8592</td>
<td>6.3411</td>
<td>9.8118</td>
</tr>
<tr>
<td>VAŠICEK (1977)</td>
<td>1</td>
<td>0.0003</td>
<td>0.0072</td>
<td>0.0295</td>
<td>0.8293</td>
<td>4.8179</td>
<td>6.8982</td>
<td>12.2344</td>
</tr>
<tr>
<td>DOTHAN (1978)</td>
<td>3</td>
<td>0.6319</td>
<td>1.1431</td>
<td>1.5804</td>
<td>4.5747</td>
<td>10.6623</td>
<td>13.2419</td>
<td>19.6428</td>
</tr>
<tr>
<td>BS (1982)</td>
<td>1</td>
<td>0.0004</td>
<td>0.0076</td>
<td>0.0302</td>
<td>0.8567</td>
<td>5.6433</td>
<td>8.4467</td>
<td>17.2100</td>
</tr>
<tr>
<td>CIR (1985)</td>
<td>1</td>
<td>0.0004</td>
<td>0.0103</td>
<td>0.0412</td>
<td>1.0029</td>
<td>4.9780</td>
<td>7.0076</td>
<td>12.5912</td>
</tr>
<tr>
<td>GBM</td>
<td>2</td>
<td>0.0243</td>
<td>0.1268</td>
<td>0.2671</td>
<td>1.8278</td>
<td>6.3591</td>
<td>8.3170</td>
<td>13.1324</td>
</tr>
</tbody>
</table>

**Explanation:** Exhibit 4 contains the empirical percentiles of the distributions of the LR-statistics obtained from simulated samples under the given null models, where \( s \) denotes the number of restrictions.
The distribution of the LR-statistics seems to depend on both the number of restrictions and the underlying null models. The empirical percentiles that result from the models of Dothan (1978) and CIR (1980) do not considerably differ from each other. Only the LR-statistics that are obtained from the model of Merton (1973) tend to be well approximated by the chi-square distribution.

5. Empirical Results

The concept of the short-term interest rate is not unambiguous from the practical point of view, such that the choice for an appropriate proxy has to be made. Since, as shown in Duffee (1996), one-month Treasury bill yields are assumed to be affected by idiosyncratic variation, we use samples of daily, weekly and monthly observations of the three-month U.S. Treasury bill yield from January 4, 1954 through March 2, 2006 which are provided by the Federal Reserve. We also use daily, weekly, and monthly observations of the federal funds rate.

We report descriptive statistics and the results from the application of the unit root test of Said and Dickey (1984). We use Akaike (1973) to determine the number of lagged differences for the test for which a constant is also included. We also test the normality of the observations using Jarque and Bera (1987). The results are presented in Exhibit 5. The results of the tests suggest that neither the Treasury bill yield nor the federal funds rate can be assumed to follow a stationary process and the normal distribution at the 5% level.

<table>
<thead>
<tr>
<th>Exhibit 5. Summary Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Treasury bill yield</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Federal funds rate</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Explanation: Exhibit 5 contains descriptive statistics of three-month U.S. Treasury bill yields and Federal funds rates. The number of observations is denoted by \( n \), \( JB \) denotes the Jarque-Berra test-statistic, \( ADF \) denotes the t-statistic obtained from the unit root test with the number of lagged differences that are chosen. The critical values that we use are -2.8865 and -3.4752 for the 5% and the 1% level. The marking * (**) means that the corresponding null hypothesis is rejected at the 5% (1%) level.
### Exhibit 6. Estimation Results of the Unrestricted Model

<table>
<thead>
<tr>
<th>Data</th>
<th>Frequency</th>
<th>1</th>
<th>a</th>
<th>b</th>
<th>Critical Values</th>
<th>s</th>
<th>g</th>
<th>–a / b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treasury bill yield</td>
<td>Daily</td>
<td>1</td>
<td>0.0087</td>
<td>-0.1571</td>
<td>-2.89 (5%)</td>
<td>0.8782</td>
<td>1.4978</td>
<td>0.0556</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0111</td>
<td>-0.1214</td>
<td>-2.61 (5%)</td>
<td>0.8882</td>
<td>1.5696**</td>
<td>0.0510</td>
</tr>
<tr>
<td></td>
<td>Weekly</td>
<td>1</td>
<td>0.0083</td>
<td>-0.1492</td>
<td>-2.89 (5%)</td>
<td>0.9441</td>
<td>1.5410**</td>
<td>0.0559</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0110</td>
<td>-0.2177</td>
<td>-2.61 (5%)</td>
<td>0.9158</td>
<td>1.6474**</td>
<td>0.0506</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
<td>1</td>
<td>0.0095</td>
<td>-0.1728</td>
<td>-2.89 (5%)</td>
<td>1.3499</td>
<td>1.6595**</td>
<td>0.0552</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0126</td>
<td>-0.2538</td>
<td>-2.61 (5%)</td>
<td>1.5718</td>
<td>2.0026**</td>
<td>0.0498</td>
</tr>
<tr>
<td>Federal Funds Rate</td>
<td>Daily</td>
<td>1</td>
<td>0.0828</td>
<td>-1.4407**</td>
<td>-3.52 (5%)</td>
<td>0.2909</td>
<td>0.5713**</td>
<td>0.0574</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0780</td>
<td>-1.2880*</td>
<td>-4.66 (1%)</td>
<td>0.0685</td>
<td>0.4128</td>
<td>0.0606</td>
</tr>
<tr>
<td></td>
<td>Weekly</td>
<td>1</td>
<td>0.0155</td>
<td>-0.2602</td>
<td>-3.01 (5%)</td>
<td>0.2321</td>
<td>0.8283**</td>
<td>0.0597</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0200</td>
<td>-0.3646</td>
<td>-5.19 (5%)</td>
<td>0.1878</td>
<td>0.8758**</td>
<td>0.0548</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
<td>1</td>
<td>0.0110</td>
<td>-0.1808</td>
<td>-2.89 (5%)</td>
<td>1.6553</td>
<td>1.7666**</td>
<td>0.0609</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0143</td>
<td>-0.2699</td>
<td>-5.67 (5%)</td>
<td>1.7200</td>
<td>1.9869**</td>
<td>0.0530</td>
</tr>
</tbody>
</table>

**Explanation:** Exhibit 6 contains the estimation results for the three-month U.S. Treasury bill yield and Federal funds rates. The number of the sub-samples for the jackknife estimation is denoted by $\lambda$ where $\lambda = 1$ represents the non-jackknife estimates. The term $-a / \beta$ represents the long-run mean. The t-statistics are in brackets. The critical values are taken from Exhibit 3. The marking * (**) means that the null hypothesis that the estimated parameter is zero is rejected at the 5% (1%) level.
We estimate the unrestricted models using $\Delta t = 1/250$ for daily, $\Delta t = 1/52$ for weekly, and $\Delta t = 1/12$ for monthly observations. We also compute the corresponding jackknife estimates using $l = 2$. We test $H_0 : a_g = b_g = 0$ using the empirical distributions given in Exhibit 3 depending on $g$. We assume that the estimates of $g$ are asymptotically normal under $H_0 : g = 0$. The results are presented in Exhibit 6.

The null hypothesis $H_0 : a_g = b_g = 0$ cannot be rejected at the 5% level for the three-month U.S. Treasury bill yields, so that there appears to be no empirical evidence for mean-reversion. In contrast to that result, we find that mean-reversion plays an important role for the specification of the federal funds rate dynamics, but only for daily observations. Our results also indicate that the conditional variance of changes in the three-month U.S. Treasury bill yield is highly sensitive to the yield level. However, for the federal funds rates, the estimated value of $g$ increases from daily to monthly observations.

We estimate the restricted models using the percentiles given in Exhibit 4 as critical values for the corresponding LR-statistics. To test the empirical validity of Merton (1973), we use the percentiles of the chi-square distribution with 2 degrees of freedom. The results are presented in Exhibit 7.

For daily and weekly observations of the three-month U.S. Treasury bill yield, all models except CIR (1980) are rejected at the 5% level. This result indicates that the conditional variance of changes in daily and weekly observations is highly sensitive to the yield level, while the mean reversion seems to be negligible. Monthly observations allow a lower elasticity of the conditional variance of yield changes, because only Merton (1973), Vaší ek (1977), and CIR (1985) can be rejected at the 5% level. For all types of sampling frequencies only the model of CIR (1980) is not rejected at the 5% level, so that this model best describes the dynamics of the three-month U.S. Treasury bill yield.

### Exhibit 7. Estimation Results of the Restricted Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Data</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERTON (1973)</td>
<td>Treasury bill yield</td>
<td>109.8111**</td>
<td>42.9676**</td>
<td>10.33**</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>59.8113**</td>
<td>22.0294**</td>
<td>7.5315*</td>
</tr>
<tr>
<td>VAŠÍCEK (1977)</td>
<td>Treasury bill yield</td>
<td>108.0119**</td>
<td>42.3872**</td>
<td>9.8946*</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>34.9138**</td>
<td>20.3528**</td>
<td>5.9502</td>
</tr>
<tr>
<td>DOTTHAN (1978)</td>
<td>Treasury bill yield</td>
<td>32.9966**</td>
<td>17.2741*</td>
<td>5.8133</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>83.7127**</td>
<td>7.1675</td>
<td>5.1990</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>117.4089**</td>
<td>26.1764**</td>
<td>3.6026</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>72.0333**</td>
<td>1.4664</td>
<td>2.5947</td>
</tr>
<tr>
<td>CIR (1985)</td>
<td>Treasury bill yield</td>
<td>74.5311**</td>
<td>30.9254**</td>
<td>7.5155*</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>0.9317</td>
<td>4.5476</td>
<td>4.5119</td>
</tr>
<tr>
<td>GBM</td>
<td>Treasury bill yield</td>
<td>32.2474**</td>
<td>16.4096**</td>
<td>5.5239</td>
</tr>
<tr>
<td></td>
<td>Federal funds rate</td>
<td>77.3434**</td>
<td>3.8977</td>
<td>4.9823</td>
</tr>
</tbody>
</table>

**Explanation:** Exhibit 7 contains the LR-statistics of the restricted models for observations of the three-month U.S. Treasury bill yield and Federal funds rate. Except for Merton (1973), the critical values for the LR-statistics from Exhibit 4 are used. The marking * (**) means that the corresponding null model is rejected at the 5% (1%) level.
The results obtained from the Federal funds rates are highly sensitive to the chosen sampling frequency. While, for daily observations, mean-reversion appears to be important (only CIR (1985) is not rejected at the 5% level for daily observations) this feature is negligible for weekly and monthly observations. For weekly observations — since the model of BS (1982) is not rejected at the 5% level — the sensitivity of the variance of changes in the Federal funds rate seems to be higher than for daily observations in general. As for the three-month U.S. Treasury bill yield, an exact specification of the elasticity of conditional variance is more important for daily observations, since the null models are rejected more often. Only the specification of Merton (1973) can be rejected at the 5% level for monthly observations of the Federal funds rate. Since the model of CIR (1985) is not rejected at the 5% level for all types of sampling frequencies, we find that this model best describes the dynamics of the Federal funds rate.

Since the model of CIR (1985) is not rejected at the 5% level for all types of sampling frequencies, we find that this model best describes the dynamics of the Federal funds rate.

6. Conclusion

We have illustrated that the GMM estimation applied in CKLS (1992) for estimating continuous-time models of the short-term interest rate suffers from significant estimation bias, which could be reduced by means of the jackknife estimation under the assumption that the short-term interest rate can be approximated by a discrete-time process.

We have provided critical values for parameter tests obtained from empirical distributions of the associated test-statistics. We have shown that the t-statistics of the drift parameters depend on the elasticity of the conditional variance of changes in the short-term interest rate. We find that the distributions of the LR-statistics of the corresponding null models do not strictly and exclusively depend on the number of restrictions imposed by the underlying null models but also on the given model that is considered.

Our estimation results have shown that the models that are chosen can depend on both the sampling frequency and the proxy that is used. While daily observations of the federal funds rate seem to exhibit significant mean-reversion, the specification of the drift function seems to be of secondary importance for the dynamics of the three-month U.S. Treasury bill yield.

We have also demonstrated that the jackknife estimation can result in higher values for the elasticity of conditional variance for the three-month U.S. Treasury bill yield. This sensitivity appears to be lower for daily observations of the federal funds rate. An exact specification of the elasticity of conditional variance seemed to be more important for daily observations in general. We find that the model of CIR (1980) best describes the dynamics of the three-month U.S. Treasury bill yield, whereas, for the federal funds rate, the corresponding model is CIR (1985).

References


The Impact of Leader Tenure on Proactiveness in Religious Organizations

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Executive Summary

This study empirically assesses the impact that a religious leader’s tenure has on his or her use of a proactive strategy. Proactiveness is one component of an entrepreneurial strategy that relies primarily on first mover advantages and typically exploits new markets and services. Proactiveness as a strategic choice is gaining increased attention; however, little is known as to the leader characteristics that drive its implementation in a religious context. The impact of tenure on proactiveness as a strategic choice in a religious context is particularly enlightening given the increased role that legitimacy arguments play in a not-for-profit context. In addition, the importance of trust, and of building relationships that are critical in ethical leadership are also indicated through this study. Therefore this study sets out to evaluate whether a longer tenure with a given organization leads to an increase or decrease in proactive behaviors in a religious organization.

Using a sample of 250 religious organizations in five major metropolitan areas, it was found that low tenure leaders employ a significantly less proactive strategy in leading their organizations than those leaders with moderate or high tenure. These findings support the proposition that in ethics-based organizations such as religious organizations, there may be significant resistance to untested leadership. Although those organizations with high tenure leaders used a slightly more proactive strategy than those with mid-tenure leaders, this difference was not found to be statistically significant. The empirical results are presented and the practical and theoretical implications of these findings are developed. It is proposed that developing a wider base of power and an increased level of trust promotes the ability to act proactively. Several recommendations are offered to increase the proactiveness of leaders in the earlier years of their tenure with an organization.

Introduction

In the literature of strategic management entrepreneurship and organization theory, scholars have long examined and debated the role of managers in assessing and reacting to the environment in order to achieve desirable organizational outcomes. Traditionally, writers have argued that, for various reasons, organizations should require employees to concentrate on those particular aspects of their work necessary for effective performance. Managers and employees are expected to accept the current external environment and adjust to the constraints it puts on their behavior (e.g., Katz and Kahn, 1978). However, in recent years we have witnessed the entry of the concept of proactive behavior into the management lexicon in a vigorous way. Proactive behavior is composed of those actions taken to create new markets and services, rather than merely adjusting existing practices and improving the efficiency of serving the current market and customer base. Proactive behavior encourages the utilization
of behaviors that can assist in enacting a new environment rather than merely adjusting to the current one.

Today’s organizations are emphasizing autonomy, flexibility and decentralization. A highly competitive and unpredictable environment has compelled managers to place increasingly complex demands on themselves and their employees. They are requiring their members to act beyond their immediate operational tasks by assuming a broad perspective and adopting a proactive role orientation. Increasingly organizations are recognizing the need for proactive individuals — those who:

• Are highly involved in the task environment;
• Are flexible in reacting to circumstances;
• Have a well-developed sense of responsibility; and
• Are willing to show initiative that extends well beyond customary job requirements.

Proactive people identify and seize opportunities and act on them rather than simply constraining their focus to immediate demands.

Managers and employees are expected to anticipate problems and opportunities and make appropriate decisions based on the information they have (Frese, Fay, Hilburger, Leng and Tag, 1997). These expectations underlie a determination to influence one’s environment, rather than simply adapting to circumstances (e.g., Buss, 1987; Larsen, Diener and Emmons, 1986). Bateman and Crant (1993) argue that proactive people identify and seize opportunities and act on them rather than simply constraining their focus to immediate demands. Proactive individuals become deeply involved in creating progress and persist in creating meaningful change.

Proactive behavior has been defined as “taking initiative in improving current circumstances or creating new ones; it involves challenging the status quo rather than passively adapting to present conditions” (Crant, 2000, p. 436). It has to do with the propensity to engage in action toward influencing one’s environment (Bateman and Crant, 1993). Such conduct can be a high-leverage concept and a critical determinant of organizational success (Bateman and Crant, 1999). Clearly, the impact and benefits of moving into new markets is widely accepted in for-profit organizations. However, entering new markets might be viewed as threatening, or even an abandonment of the central mission in a religious organization. Therefore, although religious leaders may feel that proactive behaviors will lead to stronger performance, proactive strategies might still meet with significant resistance from the members and other stakeholders in a religious organization.

Religious organizations stand to benefit from a wide range of proactive behaviors. Such behavior “is an important determinant of individual, organizational and team outcomes, and plays an important role particularly when the environment is challenging or unfavorable” (Gupta and Bhawe, 2007, p. 80). For example, proactive individuals actively create environmental change, while less proactive people take a more reactive approach toward their jobs (Bateman and Crant, 1993). The salience and importance of proactive behavior in a traditional religious context is heightened by the increased pressures that have emerged in the context of declining membership in many mainline traditional churches. Scholars have begun to develop models and empirical results to test the leadership strategies that lead to successful religious organizations. Specifically, Nygren and his colleagues (1994) developed a theoretical model showing a number of important leadership competencies that are needed in religious organizations. The model maintains that proactiveness is a
major competency that differentiates effective leaders from ineffective leaders of faith communities. A more rigorous approach was taken by Butler and Herman (1999) in their study of effective ministerial leadership. In their empirical study of the leadership skills of 49 Evangelical ministers who are especially effective pastoral leaders, they found that those with longer tenures and who score significantly higher on the “change agent” scale are more effective ministers. In a recent large scale study of 250 Protestant churches, an entrepreneurial strategy that included a variety of behaviors including proactiveness was found to be correlated with increases in attendance and dollars given to the church (Pearce, Fritz and Davis, 2010).

Over the past two decades, proactive personalities and behavior have received considerable scholarly research attention. Researchers have adopted a number of different approaches toward identifying the antecedents and consequences of proactive behavior. The literature has focused primarily on the impact of proactivity on various outcomes with diverse samples and a variety of occupations and settings. Overall, these investigations show that the possession of a proactive personality is an important element of employee, team and firm effectiveness. The proactive disposition appears to be related to many desirable individual behaviors and organizational outcomes. For example, researchers have demonstrated that proactive employees earn higher salaries, display greater productivity and receive more awards and promotions (e.g., Seibert, Kraimer and Crant, 2001; Thompson, 2005; Van Dyne and LePine, 1998; Van Scotter, Motowidlo and Cross, 2000). A longitudinal study of real estate agents found a close relationship between their proactivity scores and their job performance (Crant, 1995). Successful agents focused on the high-end market and actively solicited new clients. Other studies have investigated the relationship between proactive personality and entrepreneurship. Among undergraduate and M.B.A. students, Crant (1996) found a positive correlation between proactive personality and intentions to own one’s own business. Finally, a study of presidents of small businesses reported that proactive personality scores were positively associated with an aggressive entrepreneurial posture, where the firm scans for opportunities and takes a bold market position and entrepreneurial behaviors (Becherer and Maurer, 1999).

Although the relationship between CEO job tenure and organizational performance has interested scholars for many years, one area that has received little attention is the relationship between executive tenure and proactivity. A number of writers have expressed the need to study upper echelon characteristics in order to understand an organization’s strategic processes (Leontiades, 1982). Upper Echelon theory asserts that strategic decisions reflect the background of the organization’s most powerful managers and what the organization does could be explained, at least in part, by the profile of its top management. Thus the top executive is considered to be a proxy for the organization. In their seminal paper on Upper Echelon theory, Hambrick and Mason (1984) articulated an ambitious research agenda by proposing a number of hypotheses for testing the relationship between organizational outcomes and certain demographic characteristics of top executives. Finkelstein and Hambrick (1996) noted that from 1984 to 1996, more than two hundred studies pertaining to Upper Echelon theory were published. More studies have been published during the last decade.

A number of these studies have shown that leaders’ demographic characteristics represent a major antecedent of organizational performance. By virtue of their position, organizational leaders are more capable of perceiving and understanding relevant environmental trends and communicating
them to the rest of the organization. They are uniquely positioned to formulate an exciting vision of the future which emphasizes opportunity recognition and exploitation (Yukl, 1998). Although, consistent with Upper Echelon perspective, there has been progress in examining the relationship between leaders’ demographic characteristics and various outcomes, one area which has received little attention concerns the linkage between tenure and proactivity. Executive tenure “is usually taken to mean time of continuous service with a single organization” (Lovett and Cole, 2003, p. 4). It is interesting to note that, although it is consistently treated as a demographic variable in the literature, it is different from other variables such as age, race, or gender because it is based on personal choices. One can choose to remain in an organization or leave it.

The role of tenure is particularly appropriate to relate to strategic behaviors in a religious context. Relatively new Church leaders (pastors, priests, etc.) still have “low tenure.” If they are interested in progressing to a larger, more affluent congregation (Zech, 2001), they are likely to refrain from implementing challenging and unpopular proactive strategies at the current organization, since new ideas might threaten traditional members of the congregation.

One study on the relationship between tenure and organizational performance was conducted by Cardinal and her colleagues (2002). They report that, in the pharmaceutical industry, top management tenure is positively associated with a number of organizational outcomes. They include product line breadth, the frequency of new product market entry, in-house research and development efforts, as well as strategic alliances (Cardinal, Hatfield, Korn, 2002). In another study, Kessler and Chakrabarti (1999) found a relationship between longer tenure and the speed of new product development among large firms in several industries. The researchers, however, did not focus on top management tenure; rather, they examined the tenure of research and development team members.

The considerable attention to proactive behavior is an ongoing testament to the importance placed on its impact on various individual and organizational outcomes. Yet significant gaps in the literature remain. One area that has been largely overlooked and, therefore, warrants further investigation is the relationship between executive tenure and proactivity, particularly within the context of a religious organization. This study begins a careful examination of this important question. Its purpose is to investigate the role that the executive’s tenure plays in the development of proactive strategies in a religious organization. The results have clear implications for the growing number of religious organizations and for many nonprofits in general. Further, this research opens windows of insight into the management of the growing number of social enterprises where the dominant resource is human capital and the organization’s success is largely influenced by relationship management.

This study specifically addresses the utilization of a proactive strategy by religious organizations where organizational qualities such as stability and lack of change are often viewed as strengths (Miller, 2002).

Methodology

Setting and Data

The study involved a sample of 250 religious organizations concentrated in five different urban areas. All organizations were Lutheran churches concentrated in five major metropolitan areas (Charlotte, Pittsburgh, Philadelphia, Lincoln, Minneapolis). By controlling for the religious denomination (Lutheran), an enhanced control was added. By limiting the variation of mission and structure of the surveyed organizations, the study design provided direct access to the
research question of the leader’s impact on strategy selection. Within the five targeted metropolitan areas, 512 potential organizations were identified. The five geographical areas were selected due to the large number of the subject organizations in the same general economic area of opportunity. Organizations that did not have a current leader in place were eliminated from the population prior to mailing the survey. This provided 493 potential organizations in the sample pool. A survey and follow-up post card was mailed directly to the named leader of each of the organizations. A total of 277 surveys were returned; of those, 250 of the surveys were complete and usable (50.7 percent). A comparison of the early and late responders indicated that the sample did not bear a response bias. A brief summary of the sample population demographics follows.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>195</td>
</tr>
<tr>
<td>Female</td>
<td>55</td>
</tr>
<tr>
<td>Age: Under 35</td>
<td>19</td>
</tr>
<tr>
<td>36 – 45</td>
<td>37</td>
</tr>
<tr>
<td>46 – 55</td>
<td>89</td>
</tr>
<tr>
<td>56 – 65</td>
<td>96</td>
</tr>
<tr>
<td>Over 65</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Attendance</td>
<td>197 (Mean) 182 (s.d.)</td>
</tr>
<tr>
<td>Tenure</td>
<td>9.9 (Mean) 8.6 (s.d.)</td>
</tr>
<tr>
<td>Proactiveness</td>
<td>11.2 (Mean) 4.13 (s.d.)</td>
</tr>
</tbody>
</table>

Tenure. Tenure was a self-reported measure where the leader indicated the actual years that he or she had been leading the current organization.

Proactiveness. Proactiveness was assessed using three survey items that were adapted from Colvin and Selvin’s (1987) measures of entrepreneurial orientation. The three items were intended to measure the proactiveness construct and the wording was modified and tested for validity and usefulness in this context.

All organizations, but in particular religious organizations, develop routines and norms that are not easily changed.

Results

First, the proactiveness measure was evaluated for validity. Utilizing Lisrel 8.51 a confirmatory factor analysis was performed. All proactiveness questions loaded on the correct factor and the loadings were all above .50, indicating adequate convergent validity (Fornell and Larcker, 1981). In addition, the Cronbach alpha for the three items was examined (alpha = .92). A Cronbach alpha above .70 is desired as an indication of convergent validity (Nunally, 1978). After assessing the construct validity of survey items, the three proactiveness measures were summed to give a composite proactiveness score for each organization. The composite proactiveness scores ranged from a low of three to a high of 21. The mean proactiveness score for the sample population was 11.21 with a standard deviation of 4.13. This indicates that the leaders utilized a wide spectrum of strategies, ranging from avoidance of proactive strategies to highly proactive strategies. The mean score of 11.21 is very close to the neutral proactiveness score of 12.

Second, the tenure data was consolidated to form three groups. The three group methodology was utilized to be consistent with common practice of identifying high, low, and medium levels of the variable of interest. Those leaders whose tenure at the current organization was less than five years were classified as “low.” Those leaders who had been at the current organization for more than 15 years were classified as “high.” The remaining leaders whose tenure with the current organization ranged between five and 15 years were coded as “medium.” This classification resulted in three major
The primary research question was tested using analysis of variance (ANOVA) to assess the differences in proactive strategies across the three groups. The cell values for the ANOVA analysis are presented in Exhibit 2. The overall $F$ of the ANOVA was significant, $F(2, 247) = 13.66, p < .001$, which indicated that there were significant differences in the use of proactive strategies based on the leader’s tenure at the organization. An examination of the mean proactiveness scores that are shown in Exhibit 2 indicates increasing levels of proactiveness as the tenure of the leader increases.

### Exhibit 2: Descriptive Statistics of Proactiveness Across Tenure Groups

<table>
<thead>
<tr>
<th>Tenure Group</th>
<th>M</th>
<th>(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Tenure (0 to 5 years)</td>
<td>9.52</td>
<td>(3.99)</td>
</tr>
<tr>
<td>Medium Tenure (5 to 15 years)</td>
<td>11.67</td>
<td>(3.94)</td>
</tr>
<tr>
<td>High Tenure (Over 15 years)</td>
<td>12.81</td>
<td>(3.86)</td>
</tr>
<tr>
<td>N</td>
<td>86</td>
<td>102</td>
</tr>
</tbody>
</table>

$F= 13.66, p < .001$

As shown in Exhibit 3, a post hoc analysis using the Tukey multiple comparison procedure confirmed that there were statistically significant differences between the low tenure group and both the medium and high tenure groups. The use of proactive strategies was slightly higher for those high-tenure leaders than those who were in the mid-tenure group. However, a post hoc statistical analysis did not indicate that the organizations with high tenure leaders and those with mid tenure leaders differed significantly in their use of proactive strategies.

### Exhibit 3. Tukey’s Studentized Range Test for Proactiveness across Tenure Levels

<table>
<thead>
<tr>
<th>Tenure Group</th>
<th>Difference Between Means</th>
<th>Simultaneous 95% Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>High to Mid</td>
<td>1.14</td>
<td>-0.356 2.635</td>
</tr>
<tr>
<td>Mid to Low</td>
<td>2.14</td>
<td>0.784 3.503 ***</td>
</tr>
<tr>
<td>High to Low</td>
<td>3.28</td>
<td>1.736 4.830 ***</td>
</tr>
</tbody>
</table>

*** Comparisons significant at 0.05 level

Low–tenure leaders may need time to develop their power base. In a religious organization, and nonprofits in general, the leader serves multiple constituents. The amount of power that is available to a new leader is often limited at first, and increases over time. Further, the initial power that is conferred on the leader is directed towards the existing markets and services that the leader was hired to manage. Early on, leaders...
may be constrained to use organizational sources of power. These would include power that is directly related to their formal role. Leadership research would identify these sources as legitimate power as well as coercive and reward power (French and Raven, 1959). Proactive strategies such as expanding the markets served, or the services offered, would arguably require the development of expert power or even referent power. These two forms of power would rely on accumulating experience and repeated positive exchanges with the church members in order for the members to build up the trust and awareness of the positive attributes of the leader.

To address this concern, institutional leaders in ethics-based organizations (like the religious organizations in this study) could take extra efforts to ensure that newer leaders have proper authority and control. New leaders could also take additional steps early in their tenure to communicate their competence and expertise. To increase the possibility of proactive change, new leaders should be encouraged to use transformation types of leadership that build referent power and challenge the organization to view problems in a new light. Arguably, ethics based organizations such as many religious organizations, and by extension not-for-profits in general, will find more utility in transformational leadership than their more secular counterparts.

Proactive change requires a deeper knowledge of the broader environment. Low-tenure leaders may not have developed the knowledge of the local community and the skills and assets present in the organization. Over time as leaders become more aware of the external environment and the local organization’s skills, they become more proactive in utilizing these strengths to exploit and expand into new markets. Specific steps to increase the leader’s initial knowledge of the local environment should be taken to address this limitation for low-tenure leaders. Joining local organizations and meeting with neighborhood groups could be helpful in improving the leader’s awareness of the local environment. Meeting with the existing organizational members early in one’s tenure should also be encouraged in order for the new leader to specifically assess the strengths of the organization. Many organizations perform a detailed assessment of the organization prior to selecting a new leader. Perhaps a similar but abbreviated process should be undertaken early in the tenure of a new leader.

Leaders must plan for unusually strong resistance in the early stages of their tenure in a new organization.

Finally, the leader should be aware that proactive change can be viewed as a threat to many of the existing organizational members. All organizations, but in particular religious organizations, develop routines and norms that are not easily changed. Even leaders who have a strong preference for proactive behavior may be reluctant to challenge the existing organization and the existing order. Leaders must plan for unusually strong resistance in the early stages of their tenure in a new organization. Further, low-tenure leaders may lack the level of trust required to implement changes that may threaten the existing organization. In order to build trust, leaders should be vigilant in demonstrating those behaviors that are strongly linked to high levels of trust such as integrity, competence and altruistic behavior (Mayer, Davis and Shoorman. 1995).
References


Testing the Trade-off Theory of Capital Structure

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Executive Summary

We test the trade-off theory of capital structure in a setting in which a crisis suddenly changes the probability of bankruptcy. In this setting, the trade-off theory of capital structure predicts that the optimum level of capital structure would shift to a lower level of debt, and thus would lead to a negative market reaction for a firm at its optimum level of debt. Because the optimum level of debt is unobservable, we predict that the level of debt affects the market reaction. In other words, we predict that firms with higher level of debt will experience greater negative stock returns.

We also predict greater negative stock returns for firms with lower capacity to service debt. We use stock price declines after the terrorist attacks of 2001 to test this prediction. Our sample consists of 2,137 U.S. manufacturing firms. For our analysis, we use both portfolio and individual cumulative abnormal returns for three days after the terrorist attacks. Findings of the study support our predictions: firms with high level of debt (especially long-term debt) and a lower capacity to service debt experienced greater negative abnormal returns in the three days after the terrorist attacks.

1. Introduction

There are two main sources of financing for a business: debt and equity. The choice of debt and equity (the capital structure decision) is one of the most important financial policy decisions, and one of the most researched topics in finance. Because owners of a business need to contribute some equity, the decision narrows down to the amount of debt.

The prevalent range of debt in business is between zero and (nearly) one hundred percent. The range varies with industries, but also varies within an industry, indicating that there is no universal rule for determining the right level of debt. The choice of capital structure is important because it has an impact on the value of the firm. While it is evident that the level of debt affects the value of the firm, it is not clear at what level of debt the value of the firm is highest.

Modigliani and Miller (1963) theorize the relation between financial leverage and stock returns. Their proposition (referred to as the MM II proposition) states that an increase in financial leverage (debt) will lead to an increase in the value of the firm because of debt advantages such as tax shield. A popular graphical presentation of this theory follows:
In Exhibit 1, $V_L$ is the value of a levered firm (firm with debt), $V_U$ is the value of an unlevered firm (firm with no debt), and TD is tax shield because of debt.

The MM II proposition suggests a linear relation between leverage and firm value, but we do not observe many (nearly) 100 percent debt-financed businesses. This disagreement of prediction and real experience led to the evolution of the trade-off theory. The trade-off theory argues for an optimal level of debt where marginal benefit of adding debt is equal to the marginal cost of bankruptcy risk. Restated, an increase of debt until this optimum level increases the value, but any increase after that is value destroying. A popular graphical presentation of this theory is:

Exhibit 2: Trade-off theory of capital structure

In Exhibit 2, the value of the firm rises and then falls as the level of debt is increased. The point at which the value is maximized is the optimum level of debt.

The bankruptcy-related cost depends on two things: the probability of bankruptcy, and the bankruptcy-related costs. A higher probability of bankruptcy should lower the level of debt [Harris and Raviv (1991), Frank and Goyal (2003)]. Our study tests this prediction of the trade-off theory in a setting in which a crisis suddenly changes the probability of bankruptcy. A sudden increase in bankruptcy cost will shift the optimum level downward [Bradley, Jarrell and Kim (1984)], and thus would lead to a negative market reaction for a firm at an optimum level of debt. Because the optimum level is unobservable (Zhao and Susmel, 2008), we predict that the level of debt affects the market reaction. Thus, our primary empirical prediction is that high-debt firms should suffer a more negative market reaction to the crisis than low-debt firms.

This study adopts an event study design to test this prediction of the trade-off theory. First, we calculate the abnormal returns of manufacturing firms after the September 11, 2001 terrorist attacks. Second, we compare the returns of low-debt firms and high-debt firms. Finally, we compare returns of firms with low times-interest-earned ratio with firms with high times-interest-earned ratios. Times-interest-earned is a measure of the capacity of a firm to meet its debt obligations.

The 2001 terrorist attacks were tragic events that led to a significant decline in the stock market. The event changed risk levels from every possible perspective: social, economic, and geo-political. It is reasonable to assume that this event led to an increase in the probability of financial distress for our sample firms. In case of an increase in distress probability, the trade-off theory predicts that the optimum level of debt will shift to a lower
level of debt. We predict that high-debt firms and firms with lower capacity to service debt suffered a bigger decline in stock prices in reaction to the terrorist attacks.

Our findings support this prediction. We find that high-debt firms (especially those with high levels of long-term debt) have a greater negative abnormal stock returns after the terrorist attacks. We also find that firms with higher times-interest-earned ratios (indicating higher debt servicing capacity) suffered lower stock price declines than firms with lower times-interest-earned ratio.

This study contributes to the body of knowledge by providing a new test of a widely held theory on a very important topic in finance. The research setting allows for a clean test of predictions of the trade-off theory and provides strong results favoring its predictions. The findings of this study are important for managers as they determine capital structure, especially in times where there is higher uncertainty and distress probabilities. Thus, we believe our findings are particularly important in this period of great financial instability.

The rest of paper is organized as follows: Section 2 presents a literature review; Section 3 develops our hypotheses; Section 4 describes data and methodology; Section 5 provides a discussion of results, and Section 6 presents the conclusion.

2. Literature Review

The seminal article on capital structure is Modigliani and Miller (1958, hereafter MM). They argue that in absence of a few (but strong) assumptions, capital structure does not affect the firm value. Numerous studies followed this paper, and many theories have evolved as an outcome of relaxing one or more of MM assumptions. While there are several theories on the topic, finance textbooks highlight two theories: the trade-off theory and the pecking order theory. In a horse race, the trade-off theory has more supportive empirical evidence. In this section, we present a brief review of literature focusing on trade-off theory, and a brief description of the other main theory.

The trade-off theory evolved as a result of relaxing the ‘no tax’ and ‘no bankruptcy costs’ assumption in MM. Debt provides a tax shield, but increases the risk of bankruptcy. Tax shield and bankruptcy risk both increase with the level of debt. Bankruptcy costs depend on two sources: probability of bankruptcy and costs related to actual bankruptcy. The trade-off theory predicts that the value of a levered firm is equal to the value of an unlevered firm plus the net of leverage cost and benefits. In addition, firm value is maximum at the point at which marginal benefit of leverage is equal to the marginal cost of leverage; the optimal level of debt.

An incomplete list of studies that contributed to the development of this theory include DeAngelo and Masulis (1980), Bradley, Jarrell and Kim (1984), and Myers (2003). For a survey of this literature, refer to Harris and Raviv (1991) and Hart (1995). Graham and Harvey (2001) in a survey of CFO’s find evidence of a target debt ratio for most firms. However, there are empirical studies that challenge predictions of the trade-off theory. For example, Graham (2000) argue that tax savings are much bigger than bankruptcy costs, and Fama and French (2002) find evidence contrary to the prediction that more profitable firms are more levered.

While it is evident that the level of debt affects the value of the firm, it is not clear at what level of debt the value of the firm is highest.

The dynamic trade-off theory is an important spin-off of the trade-off theory. It predicts that firms will actively make changes to remain close to the target debt ratio predicted by the trade-
Testing the Trade-off Theory of Capital Structure

off theory. Hovakimian, Opler and Titman (2001) argue that leverage deficit can be used to predict capital raising, Flannery and Rangan (2006) find evidence that firms tend to return to target debt ratio when shocked away, and Kayhan and Titman (2007) find that stock price changes and financial deficits explain capital structure changes.

The pecking order theory is the other dominant theory on capital structure. Myers (1984) and Myers and Majluf (1984) contradict the trade-off theory by arguing that information asymmetry between managers and outside investors produces a “pecking-order” of capital financing. Managers, who know more, use internal funds first, followed by debt, and use equity only as the last resort. Findings in support of the pecking-order theory include Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), and studies arguing against the theory include Chirinko and Singha (2000).

3. Hypotheses

Our primary objective is to study the effect of a sudden increase in the probability of bankruptcy on stock returns of firms with different levels of debt. A crisis that increases the bankruptcy probability should hurt high-debt firms more than low-debt firms. Restated, firms with higher debt would experience higher negative stock returns in a crisis. Thus, our first hypothesis is:

\[ \text{H}_0 \ (1): \text{The stock market reaction to the September 11, 2001 terrorist attacks is more pronounced (negative) for high-debt firms than for low-debt firms.} \]

Acceptance of \( \text{H}_0 \ (1) \) supports the prediction that an increase in the probability of bankruptcy leads to a lower optimum level of debt and value declines for firms with high levels of debt. We use three different debt ratios to test this relation:

- Table 2 uses two portfolios of firms sorted based on total debt/total assets ratio. Total debt is the sum of short-term debt (compustat # 34) and long-term debt (compustat # 9) less cash and cash equivalents (compustat # 1).
- Table 3 uses two portfolios of firms sorted based on short-term debt/total assets ratio. Short-term debt is short-term debt (compustat # 34) less cash and cash equivalents (compustat # 1).
- Table 4 uses two portfolios of firms sorted based on long-term debt/total assets ratio. Long-term debt is long-term debt (compustat # 9) less cash and cash equivalents (compustat # 1).

If high-debt firms suffer more in a crisis, the relation should also manifest itself in a firm’s capacity to service debt. Thus, our second hypothesis is:

\[ \text{H}_0 \ (2): \text{The stock market reaction to the September 11, 2001 terrorist attacks is more pronounced (negative) for low times-interest-earned ratio firms than for high times-interest-earned ratio firms.} \]

Acceptance of \( \text{H}_0 \ (2) \) implies that a higher debt servicing capacity leads to a lower negative stock market reaction when a crisis suddenly increases the probability of bankruptcy. To examine this relation, Table 5 uses two portfolios sorted based on the times-interest-ratio. We define the times-interest-earned ratio as operating income before depreciation (compustat # 13) divided by interest expense (compustat # 15).

4. Data and Methodology

a. Data

We use a sample of U.S. manufacturing firms (SIC code 2000 – 3999). We obtain accounting information from Compustat database and stock returns from the Center for Research in Securities Prices (CRSP) database. We exclude
firms that have an asset size of less than $10 million and firms that did not have required variables for the financial year 2000.

Table 1 reports descriptive statistics for our 2137 sample firms. The mean (median) asset size is $3068.74 ($251.49) million. The mean (median) market-to-book ratio is 2.92 (1.72) times. The mean (median) total debt / total assets ratio is 0.08 (0.15). The mean (median) short-term debt / total assets ratio is -0.11 (-0.02). The negative numbers are a result of deducting cash holdings from debt levels in calculating all ratios. The mean (median) long-term debt / total assets ratio is 0.01 (0.05). The mean (median) times-interest-earned ratio is -10.47 (4.86). A negative number for the times-interest-earned ratio indicates a loss-making firm. The mean (median) three-day cumulative abnormal return (CAR) is -2.57% (-3.02%). This indicates a strong negative market reaction to the event.

The findings of this study are important for managers as they determine capital structure, especially in times where there is higher uncertainty and distress probabilities. [They] are particularly important in this period of great financial instability.

b. Methodology

In a research design where the event date is common for all sample firms, the standard market model is not suitable for the calculation of abnormal returns. The market model assumes independence of errors, but a common event date can lead to cross-correlation in errors. Since Schipper and Thompson (1983), it has been common practice to use a multivariate regression model to calculate the abnormal returns around important dates in this setting.

We follow the extant literature [for example, Johnson, Kasznik, and Nelson (2000) and Howe and Jain (2004)] and employ a multivariate regression method using portfolio returns to calculate abnormal returns. The regression equation is:

$$ R_{pt} = \alpha_p + \beta_{R_{mt}} + \gamma_{D_t} + \epsilon_{pt} $$  (1)

where $R_{pt}$ is the daily return from January 2, 2001 to Dec 31, 2001 on a portfolio of US manufacturing firms. $R_{mt}$ is the CRSP value-weighted index, and $D_t$ is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, $\gamma_p$ represents the cumulative abnormal return (CAR) for the three-day window.

Panel A in Table 2 – Table 5 reports results using portfolios created using equal weights (hereafter, referred as equally weighted portfolios) for each firm.

Panel B in Table 2 – Table 5 reports results using portfolios created using weights calculated in two steps.

First, we run Equation (1) for each firm and obtain residuals. Second, we use the inverse of the variance of these residuals as weights to create the portfolio. This weighting process asymptotically controls for cross-sectional heteroscedasticity (Thompson, 1985). We refer to these as “variance-weighted” portfolios. We use heteroscedasticity and autocorrelation consistent standard errors (Newey-West, 1987) in testing for statistical significance.

As a robustness check, we also calculate individual cumulative-abnormal-returns (CARs) and perform a multivariate analysis. The regression equation to calculate individual (not portfolio) CARs is:

$$ R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + \epsilon_{it} $$  (2)
where $R_{it}$ is the daily return from January 2, 2001 to Dec 31, 2001 of an individual firm. $R_{mt}$ is the CRSP value-weighted index, and $D_t$ is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, $\gamma_i$ represents the cumulative abnormal return (CAR) for the three-day window for an individual firm.

We use individual CARs (%) as the dependent variable and debt-related variables (three measures for the level of debt and one measure of capacity to service the debt) as explanatory variables in four separate models. We include two firm-level control variables, firm size and market-to-book ratio. Table 6 reports results of this multivariate analysis.

We use robust standard errors in testing for statistical significance.

5. Discussion of Results

We present our empirical results in five tables. Table 2 – table 5 report results using portfolio returns, and Table 6 reports results of a multivariate analysis. In Table 2 – Table 5, we divide our sample firms in two parts: firms with the lower subject ratio and firms with higher subject ratio. Panel A reports results of an equally weighted portfolio, and panel B reports results of variance-weighted portfolios. We report the number of days used in the regression, the coefficient on the market index, and the coefficient on the event dummy. The coefficient on the event dummy captures the abnormal stock market return for the three-day window after the terrorist attacks.

Table 2 reports results using the total debt/total assets ratio:

- For equally-weighted portfolios, the coefficient on event dummy for low-debt firms is -0.014 and the coefficient on event dummy for high-debt firms is -0.042. The low-debt firm coefficient is not significant at the 10 percent level, and the high-debt firm is statistically significant at the one percent level.
- For variance-weighted portfolios, the coefficient on the event dummy for low-debt firms is -0.023 and the coefficient on the event dummy for high-debt firms is -0.024. Both are significant at the one percent level.
- The equally weighted portfolio results show a clear higher negative market reaction for high-debt firms; in the case of the variance-weighted portfolios, results are not as clear.
- Overall, these results indicate a discriminating market reaction based on debt level. Because debt maturity can have an effect, in the next two tables we look at the level of short-term debt and long-term debt separately.

Table 3 reports results using the short-term debt/total assets ratio:

- For equally-weighted portfolios, the coefficient on the event dummy for low-debt firms is -0.015 and the coefficient on the event dummy for high-debt firms is -0.041. The low-debt firm coefficient is significant at the ten percent level, and the high-debt firm is statistically significant at the one percent level.
- For variance-weighted portfolios, the coefficient on the event dummy for low-debt firms is -0.022 and the coefficient on the event dummy for high-debt firms is -0.024. Both are significant at the one percent level.
- Again, equally weighted portfolio returns indicate a greater negative market reaction for firms with high level of short-term debt. Returns for variance-weighted portfolios are not different for the two groups of firms.

Table 4 reports results using the long-term debt/total assets ratio:

- For equally-weighted portfolios, the coefficient on event dummy for low-debt firms is -0.012 and the coefficient on event dummy for high-debt firms is -0.045. The
low-debt firm coefficient is not statistically significant, and the high-debt firm coefficient is statistically significant at the one percent level.

- For variance-weighted portfolios, the coefficient on the event dummy for low-debt firms is -0.020 and the coefficient on event dummy for high-debt firms is -0.025. Both are significant at the one percent level. These results suggest a much clearer discrimination on the part of the market based on long-term debt level.

Results reported in Table 2 to Table 4 indicate that market reaction was more negative for high-debt firms, and that the effect is accentuated for high levels of long-term debt. These results support the first hypothesis.

We report results of the test of our second hypothesis in Table 5, i.e., the effect of the capacity to service debt on the market reaction. Table 5 uses two portfolios of firms sorted on times-interest-earned ratio. The ratio is operating income before depreciation divided by interest expense. A lower ratio indicates a lower capacity to service debt. In a crisis, firms with a lower capacity to service debt should suffer more. The results support this prediction and thus support our second hypothesis that the ability to service debt does affect stock market reaction.

For equally-weighted portfolios, the coefficient on the event dummy for low times-interest-earned firms is -0.032 and the coefficient on event dummy for high times-interest-earned firms is -0.024. Both coefficients are significant at the one percent level. For variance-weighted portfolios, the coefficient on event dummy for low times-interest-earned firms is -0.034 and the coefficient on event dummy for high times-interest-earned firms is -0.020. Both are significant at the one percent level. These results clearly indicate a greater negative market reaction for low times-interest-earned firms, thus supporting the second hypothesis.

Finally, Table 6 reports results of a multivariate analysis using individual CARs (%) as the dependent variable and debt level (or capacity to service debt) as the explanatory variable. Firm-level control variables are firm size and the market-to-book ratio.

Model 1 uses the total debt / total assets ratio, and the coefficient is -2.376, significant at the one percent level. This result indicates a strong negative relation between market reaction and the total debt level. Restated, a higher debt level is associated with a lower (or more negative) CAR.

Model 2 uses short-term debt / total assets ratio, and the coefficient is -1.819. The coefficient is not significant at the 10 percent level. This result indicates that there is no relation between market reaction and the short-term debt level.

Model 3 uses long-term debt / total assets ratio, and the coefficient is -2.801. The coefficient is significant at the one percent level. This result indicates a negative relation between market reaction and the long-term debt level. Overall, the results indicate a stronger negative market reaction for high long-term debt level firms, and are supportive of our first hypothesis.

Model 4 uses times-interest-earned ratio, and the coefficient is 0.001. The coefficient is significant at the five percent level. This result indicates that there is a positive relation between market reaction and the capacity to service debt. In other words, a higher times-interest-earned ratio (or capacity to serve debt) means a more positive (or less negative) market reaction. This result is supportive of our second hypothesis.

To conclude, these empirical results indicate that firms with higher long-term debt and a lower capacity to service debt suffered a more negative stock market reaction after the terrorist attacks.
6. Conclusion

The 2001 terrorist attacks had a significant effect, especially an adverse economic effect that led to a steep decline in the stock prices. Thus, the probability of financial distress increased for businesses. We use this setting to test prediction of an important theory related to an important financial decision: the trade-off theory of capital structure. This theory predicts that the value of the firm is highest at the level of debt where the marginal benefit of tax shield equals the marginal cost of bankruptcy. An increase in bankruptcy risk will shift this optimum point to a lower level of debt. Thus, firms with higher level of debt will suffer a greater decline in their values.

We find that high-debt (especially high long-term debt) firms and firms with a lower capacity to service debt experienced higher negative abnormal returns in the days after terrorist attacks. This finding supports the trade-off theory and contributes to our understanding of an important financial decision, especially when there is higher distress risk.

Table 1
Descriptive Statistics

This table reports descriptive statistics for variables used in our analysis. A total of 2137 firms are included in the sample. Total debt is the sum of short-term debt (compustat # 34) and long-term debt (compustat # 9) less cash and cash equivalents (compustat # 1). Short-term debt is calculated as short-term debt (compustat # 34) less cash and cash equivalents (compustat # 1). Long-term debt is calculated as long-term debt (compustat # 9) less cash and cash equivalents (compustat # 1). The times-interest-earned ratio is operating income before depreciation (compustat # 13) divided by interest expense (compustat # 15). The three-day Cumulative Abnormal return is calculated for a three-day window after the terrorist attacks of September 11, 2001. The abnormal returns are calculated using the following regression:

\[
R_{it} = \alpha + \beta R_{mt} + \gamma D_t + \epsilon_{it} \quad (2)
\]

where \(R_i\) is the daily return from January 2, 2001 to Dec 31, 2001 for an individual firm. \(R_{mt}\) is the CRSP value-weighted index, and \(D_t\) is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, \(\gamma_i\) represents the cumulative abnormal return (CAR) for the three-day window.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>25th percentile</th>
<th>Median</th>
<th>75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Size ($ million)</td>
<td>2137</td>
<td>3068.74</td>
<td>67.77</td>
<td>251.49</td>
<td>1161.35</td>
</tr>
<tr>
<td>MB ratio</td>
<td>2137</td>
<td>2.92</td>
<td>0.83</td>
<td>1.72</td>
<td>3.47</td>
</tr>
<tr>
<td>Total debt /Total assets</td>
<td>2137</td>
<td>0.08</td>
<td>-0.13</td>
<td>0.15</td>
<td>0.33</td>
</tr>
<tr>
<td>Short-term debt/Total assets</td>
<td>2137</td>
<td>-0.11</td>
<td>-0.21</td>
<td>-0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>Long-term debt /Total Assets</td>
<td>2137</td>
<td>0.01</td>
<td>-0.16</td>
<td>0.05</td>
<td>0.24</td>
</tr>
<tr>
<td>Times-Interest-Earned ratio</td>
<td>2137</td>
<td>-10.47</td>
<td>1.21</td>
<td>4.86</td>
<td>12.53</td>
</tr>
<tr>
<td>Three-day Cumulative Abnormal Return (%)</td>
<td>2137</td>
<td>-2.57</td>
<td>-8.41</td>
<td>-3.02</td>
<td>1.29</td>
</tr>
</tbody>
</table>
This table reports abnormal return for a three-day window after the terrorist attacks of September 11, 2001. The abnormal returns are calculated using the following regression:

\[ R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_p D_t + \varepsilon_{pt} \]  

where \( R_{pt} \) is the daily return from January 2, 2001 to Dec 31, 2001 on a portfolio of manufacturing firms in the bottom half and top half based on total debt/total assets ratio. \( R_{mt} \) is the CRSP value-weighted index, and \( D_t \) is equal to \( 1/3 \) for each day in the three-day window and zero otherwise. Thus, \( \gamma_p \) represents the cumulative abnormal return (CAR) for the three-day window. Panel A reports results of an equally weighted portfolio. Panel B reports results of a portfolio with weights calculated in two steps. First, Equation (1) is run for each firm and residuals are obtained. Second, the inverse of the variance of these residuals is used as the weight to create the portfolio. P-values reported in the parenthesis are based on heteroscedasticity and autocorrelation consistent standard errors (Newey-West, 1987). *, ** and *** denote significantly different from zero at 10%, 5% and 1%.

### Panel A: Equally weighted portfolios

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50%</td>
<td>Highest 50%</td>
</tr>
<tr>
<td></td>
<td>Total Debt/Total Assets</td>
<td>Total Debt/Total Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>1.050*** (0.000)</td>
<td>0.555*** (0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.014 (0.122)</td>
<td>-0.042*** (0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>401.07*** (0.000)</td>
<td>280.32*** (0.000)</td>
</tr>
</tbody>
</table>

### Panel B: Variance-weighted portfolios

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50%</td>
<td>Highest 50%</td>
</tr>
<tr>
<td></td>
<td>Total Debt/Total Assets</td>
<td>Total Debt/Total Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>0.537*** (0.000)</td>
<td>0.298*** (0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.023*** (0.000)</td>
<td>-0.024*** (0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>610.08*** (0.000)</td>
<td>277.64*** (0.000)</td>
</tr>
</tbody>
</table>
Testing the Trade-off Theory of Capital Structure

Table 3
Stock Returns and Short-term Debt

This table reports abnormal return for a three-day window after the terrorist attacks of September 11, 2001. The abnormal returns are calculated using the following regression:

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_p D_t + \epsilon_{pt}$$

where $R_{pt}$ is the daily return from January 2, 2001 to Dec 31, 2001 on a portfolio of manufacturing firms in the bottom half and top half based on short-term debt/total assets ratio. $R_{mt}$ is the CRSP value-weighted index, and $D_t$ is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, $\gamma_p$ represents the cumulative abnormal return (CAR) for the three-day window. Panel A reports results of an equally weighted portfolio. Panel B reports results of a portfolio with weights calculated in two steps. First, Equation (1) is run for each firm and residuals are obtained. Second, the inverse of the variance of these residuals is used as the weight to create the portfolio. P-values reported in the parenthesis are based on heteroscedasticity and autocorrelation consistent standard errors (Newey-West, 1987). *, ** and *** denote significantly different from zero at 10%, 5% and 1%.

### Panel A: Equally weighted portfolios

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50%</td>
<td>Highest 50%</td>
</tr>
<tr>
<td></td>
<td>Total Debt/Total Assets</td>
<td>Total Debt/Total Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>1.068***</td>
<td>0.538***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.015*</td>
<td>-0.041***</td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>423.26***</td>
<td>284.67***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

### Panel B: Variance-weighted portfolios

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50%</td>
<td>Highest 50%</td>
</tr>
<tr>
<td></td>
<td>ST Debt/Total</td>
<td>ST Debt/Total</td>
</tr>
<tr>
<td></td>
<td>Assets</td>
<td>Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>0.546***</td>
<td>0.291***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.022***</td>
<td>-0.024***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>497.55***</td>
<td>249.39***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>
This table reports abnormal return for a three-day window after the terrorist attacks of September 11, 2001. The abnormal returns are calculated using the following regression:

\[ R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_p D_t + \varepsilon_{pt} \quad (1) \]

where \( R_{pt} \) is the daily return from January 2, 2001 to Dec 31, 2001 on a portfolio of manufacturing firms in the bottom half and top half based on long-term debt/total assets ratio. \( R_{mt} \) is the CRSP value-weighted index, and \( D_t \) is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, \( \gamma_p \) represents the cumulative abnormal return (CAR) for the three-day window. Panel A reports results of an equally weighted portfolio. Panel B reports results of a portfolio with weights calculated in two steps. First, Equation (1) is run for each firm and residuals are obtained. Second, the inverse of the variance of these residuals is used as the weight to create the portfolio. P-values reported in the parenthesis are based on heteroscedasticity and autocorrelation consistent standard errors (Newey-West, 1987). *, ** and *** denote significantly different from zero at 10%, 5% and 1%.

**Panel A: Equally weighted portfolios**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50%</td>
<td>Highest 50%</td>
</tr>
<tr>
<td></td>
<td>Total Debt/Total</td>
<td>Total Debt/Total</td>
</tr>
<tr>
<td></td>
<td>Assets</td>
<td>Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>1.035*** (0.000)</td>
<td>0.537*** (0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.012 (0.235)</td>
<td>-0.045*** (0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>345.58*** (0.000)</td>
<td>487.21*** (0.000)</td>
</tr>
</tbody>
</table>

**Panel B: Variance-weighted portfolios**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50%</td>
<td>Highest 50%</td>
</tr>
<tr>
<td></td>
<td>LT Debt/Total</td>
<td>LT Debt/Total</td>
</tr>
<tr>
<td></td>
<td>Assets</td>
<td>Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>0.532*** (0.000)</td>
<td>0.306*** (0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.020*** (0.000)</td>
<td>-0.025*** (0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>629.52*** (0.000)</td>
<td>322.16*** (0.000)</td>
</tr>
</tbody>
</table>
Testing the Trade-off Theory of Capital Structure

Table 5
Stock Returns and Times-Interest-Earned

This table reports abnormal return for a three-day window after the terrorist attacks of September 11, 2001. The abnormal returns are calculated using the following regression:

\[ R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_p D_t + \epsilon_{pt} \]  \hspace{1cm} (1)

where \( R_{pt} \) is the daily return from January 2, 2001 to Dec 31, 2001 on a portfolio of manufacturing firms in the bottom half and top half based on times-interest-earned ratio. \( R_{mt} \) is the CRSP value-weighted index, and \( D_t \) is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, \( \gamma_p \) represents the cumulative abnormal return (CAR) for the three-day window. Panel A reports results of an equally weighted portfolio. Panel B reports results of a portfolio with weights calculated in two steps. First, Equation (1) is run for each firm and residuals are obtained. Second, the inverse of the variance of these residuals is used as the weight to create the portfolio. P-values reported in the parenthesis are based on heteroscedasticity and autocorrelation consistent standard errors (Newey-West, 1987). *, ** and *** denote significantly different from zero at 10%, 5% and 1%.

Panel A: Equally weighted portfolios

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50% Total Debt/Total Assets</td>
<td>Highest 50% Total Debt/Total Assets</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>0.786*** (0.000)</td>
<td>0.823*** (0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.032 (0.000)</td>
<td>-0.024*** (0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>185.39*** (0.000)</td>
<td>580.08*** (0.000)</td>
</tr>
</tbody>
</table>

Panel B: Variance-weighted portfolios

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Three-day CAR (%)</th>
<th>Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest 50% Times-Interest-Earned</td>
<td>Highest 50% Times-Interest-Earned</td>
</tr>
<tr>
<td>No. of days</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>CRSP Value-Weighted Index</td>
<td>0.535*** (0.000)</td>
<td>0.334*** (0.000)</td>
</tr>
<tr>
<td>Event (9/17/2001 to 9/19/2001)</td>
<td>-0.034*** (0.000)</td>
<td>-0.020*** (0.000)</td>
</tr>
<tr>
<td>F-statistic</td>
<td>1195.12*** (0.000)</td>
<td>979.72*** (0.000)</td>
</tr>
</tbody>
</table>
Table 6
Multivariate Analysis

This table reports results of multivariate analysis using three-day cumulative abnormal returns (CAR) for a three-day window after the terrorist attacks of September 11, 2001, as the dependent variable. The explanatory variables include log of total assets, market-to-book ratio, and a measure of debt level. We use four models (Model 1 to Model 4) with four different measures to capture the effect of debt level: total debt/total assets, short-term debt/total assets, long-term debt/total assets, and times-interest-earned ratio. The three-day cumulative abnormal return for each firm is calculated using the following regression:

$$ R_{it} = \alpha_j + \beta_j R_{mt} + \gamma_i D_t + \epsilon_{it} $$  \hspace{1cm} (2)

where $R_{it}$ is the daily return from January 2, 2001 to Dec 31, 2001 on an individual firm. $R_{mt}$ is the CRSP value-weighted index, and $D_t$ is equal to 1/3 for each day in the three-day window and zero otherwise. Thus, $\gamma_i$ represents the cumulative abnormal return (CAR) for the three-day window. P-values reported in the parenthesis are based on robust standard errors. *, ** and *** denote significantly different from zero at 10%, 5% and 1%.

<table>
<thead>
<tr>
<th>Model</th>
<th>Dependent variable = Three-day CAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td></td>
</tr>
<tr>
<td>Total debt / Total assets</td>
<td>-2.376*** (0.005)</td>
</tr>
<tr>
<td>ST debt / Total assets</td>
<td></td>
</tr>
<tr>
<td>LT debt / Total assets</td>
<td></td>
</tr>
<tr>
<td>Times-Interest-Earned Ratio</td>
<td></td>
</tr>
<tr>
<td>Log of Total assets</td>
<td>-0.199 (0.171)</td>
</tr>
<tr>
<td>MB Ratio</td>
<td>0.008** (0.025)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-1.271 (0.201)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0045</td>
</tr>
<tr>
<td>F-Statistics</td>
<td>5.80*** (0.0006)</td>
</tr>
</tbody>
</table>
Testing the Trade-off Theory of Capital Structure

References


A Perspective on 2000’s Illiquidity and Capital Crisis: Past Banking Crises and their Relevance to Today’s Credit Crisis

Serge L. Wind, New York University – SCPS and Keller Graduate School of Business at DeVry Institute of New York
swind2@nyc.rr.com.

Executive Summary

The current financial crisis is marked by the simultaneous occurrence of several severe economic and financial conditions. These circumstances reinforce the need to provide expectations for investors and consumers in an environment marked by risk and uncertainty.

This author strongly believes the current financial crisis shares a key characteristic of prior banking crises. Sharp credit contractions were preceded by inflationary asset bubbles and credit expansion. It was therefore felt useful to obtain a perspective on today’s crisis by viewing it in the context of 15 prior systemic banking crises. This setting enables an assessment of the possible course of today’s financial crisis.

If today’s crisis turns out to be similar to the benchmark, a recovery period of 10.6 years is expected for real equity prices to regain their peak. Then, equity prices could return to their inflation-adjusted peaks by mid-2018, from the prior peak of October 9, 2007. Real total equity returns of about 10 percent annually for nine years would be implied, if March 9, 2009 were adopted as the date of the true trough in equity prices.

The unemployment rate is likely to peak at about 11.5 percent if today’s crisis turns out to be similar to past credit crunches. And real Gross Domestic Product is expected to decline by four percent between 2008 and 2009.

Introduction

In the second half of 2009, concern is being voiced of floundering in uncharted waters, with no clear indication of the depth and length of the economic recession and its accompanying state of illiquidity, especially for small business. Moreover, housing prices continue to decline, with foreclosures increasing markedly (Norris, 2009). The unemployment rate continues to rise, with foreclosures increasing markedly (Norris, 2009). The unemployment rate continues to rise, with foreclosures increasing markedly (Norris, 2009). The unemployment rate continues to rise, with foreclosures increasing markedly (Norris, 2009). The unemployment rate continues to rise, with foreclosures increasing markedly (Norris, 2009). The unemployment rate continues to rise, with foreclosures increasing markedly (Norris, 2009). The unemployment rate continues to rise, with foreclosures increasing markedly (Norris, 2009). 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NYU Professor Nuriel Roubini presciently stated in March 2007, if the economy slips into a recession, “then you have a systemic banking crisis like we haven’t had since the 1930s” (Roubini, 2008).

I believe the current financial crisis can properly be viewed as a systemic banking crisis due to its sharp credit contraction, preceded by a housing market price bubble and credit expansion. I maintain we are not merely experiencing another cyclical economic crisis characterized by a deep recessionary period or just a bear market phase of the stock market. It was therefore felt useful to view the current liquidity and capital crisis in the context of prior systemic banking episodes.

The objective of this paper is to provide an assessment of the current position and possible course of the 2000’s financial crisis for investors and consumers in an environment marked by risk and uncertainty. An analysis of previous banking crises is undertaken to provide a comparison with the current crisis. By determining the most appropriate benchmarks based on 15 prior systemic banking contractions, we can discern the risk of further consequences on the ongoing economic/financial crisis. For example, the duration of the equity price downturn and the peak unemployment rate may not yet have been realized.

Five specific issues of interest and general concern will be addressed in the Findings section, based on past protracted economic crises of the type we are currently experiencing:

1. The duration and magnitude of the downturn in stock market prices.
2. The number of years for equity prices to regain their inflation-adjusted peaks.
3. The real annual total returns required for regaining those peaks.
4. The peak unemployment rate.
5. The real decline in the nation’s output from peak to trough. (“Real” refers to inflation-adjusted dollars, rather than current dollars).

Uncertainty may surely be with us, but current conditions resemble past credit episodes. Those shared common characteristics will serve as bearings to our current circumstance, and guideposts to investors, consumers, economists and regulators.

As Abraham Lincoln said in 1858, “If we could first know where we are and whither we are tending, we could better judge what to do and how to do it.”

Basic Approach and Data Description

Today’s credit, illiquidity and capital crisis bears strong resemblances to prior systemic banking crises. This article adds to the literature sharing this perspective, specifically the work of economists Carmen M. Reinhart of the University of Maryland and Kenneth S. Rogoff of Harvard (Reinhart, 2009) and (Reinhart and Rogoff, 2008, 2009, 2009a), and chartered financial analysts Jon Ruff and Vincent L. Childers (Ruff and Childers, 2009). This author has extended the work of Ruff and Childers to derive new, more robust benchmarks to serve as more appropriate bases of comparison to the current credit crisis.

In characterizing banking crises, Reinhart and Rogoff state: “We find that systemic banking crises are typically preceded by asset price bubbles, large capital inflows and credit booms, in rich and poor countries alike.” (Reinhart and Rogoff, 2008). “Financial crises are protracted affairs. Asset market collapses are deep and prolonged. Real housing prices declines average 35% stretched out over six years.” (Reinhart, 2009).

Ruff and Childers view a large credit contraction as the defining element, noting: “It is this characteristic — a severe shock to a
By determining the most appropriate benchmarks based on 15 prior systemic banking contractions, we can discern the risk of further consequences on the ongoing economic/financial crisis.

country’s financial system — that differentiates the current crisis from more typical business cycle-related recessions and bear markets.” (Ruff and Childers, 2009, p. 1).

Reinhart and Rogoff present average changes in real housing prices, equity prices, the unemployment rate, national output, and government debt for 14 banking episodes over the past three decades (Reinhart and Rogoff, 2009a). Ruff and Childers exhibit eight crisis characteristics, as listed and defined in Exhibit 1, for each of 15 systemic banking crises. Changes in equity prices, real national output and the unemployment rate are displayed by both studies. The decline in real earnings per share (EPS) and changes in real loan growth and contraction, as defined in Exhibit 1, are included only by Ruff and Childers for each of their episodes. Nine credit events are common to both samples, with a full listing available in Appendix II.

I eschewed studying the ten official, post-1947 recessions as inappropriate bases of comparison from which to view the severe crisis that occurred in the U.S. beginning in December of 2007 (National Bureau of Economic Research, 2009). Rather, further analysis utilizing the Ruff-Childers sample set of 15 banking crises has been undertaken, because this author fully supports their choice of severe credit contractions — rather than typical business cycle-related recessions — as apt comparisons to the current crisis.

Ruff and Childers compared characteristics of the current crisis against their benchmark of prior credit contractions and found that “If today’s crisis turns out to be “average,” … prices could return to their inflation-adjusted peaks by the year 2016.” And “a recovery by then would imply eight years of real double-digit stock returns.” (Ruff and Childers, 2009, p. 3).

Two shortcomings of their work were identified. Their benchmarks were determined by taking simple averages of the banking episodes contained in several universes of the 15 banking crises. This is cause for concern, because some of the “average” results presented in the Ruff-Childers paper might be skewed by assigning the same weight, or influence factor, to each crisis. Also, by publishing in January 2009, before the S&P 500 nadir of March 9, 2009, was realized, Ruff and Childers identified the trough in equity prices to have occurred on November 20, 2008.

My contributions are generating new, more sharply-honed and robust benchmarks by:

1. Determining the weighted average, rather than the simple average, of the banking crises, accompanied by 95 percent confidence intervals to summarize the risk associated with the weighted mean.

2. Selecting new universes or subsets of the fifteen prior episodes to serve as more appropriate bases of comparison to the current credit crisis.

This author suggests in the Methodology section:

• Based on observations of current conditions compared to those of the 1930s, the unemployment rate and the decline in real Gross Domestic Product (GDP) associated with the Great Depression are extremely unlikely to recur

• New, adjusted benchmarks for just these two indicators were created, omitting that banking crisis

• In addition, estimation of the year in which the prior peak of real equity prices could be attained was updated by tentatively adopting March 9, 2009, as the possible trough in stock prices
### Exhibit 1: Definitions of the Crisis Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real Economy</strong></td>
<td></td>
</tr>
<tr>
<td>EPS – Peak to Trough</td>
<td>Percentage change in one-year operating earnings per share from peak to trough, at end of month, adjusted for inflation. Like all other crisis characteristics, EPS is derived for “host” country affected by banking crisis. EPS, sometimes called earnings (E), is derived using country price index P and country price/earnings (P/E) ratio history. For U.S. episodes, Price P is defined as S&amp;P 500 Stock Price Index, and EPS as as earnings accruing to this Index.</td>
</tr>
<tr>
<td>GDP (per Capita, Annualized)</td>
<td>Percentage change in real Gross Domestic Product (GDP) (annualized) from peak to trough calendar year, adjusted for inflation and seasonal fluctuations; also known as real economic growth or national output.</td>
</tr>
<tr>
<td>Unemployment: % Pt. Incr. – Trough to Peak</td>
<td>Percentage point increase in the unemployment rate from its trough to its peak; seasonally-adjusted unemployment rate of civilians does not include those who have stopped looking for work.</td>
</tr>
<tr>
<td><strong>Real Equity Price</strong></td>
<td></td>
</tr>
<tr>
<td>Peak-to-Trough Drop (%)</td>
<td>Percentage change in equity price (stock market index), adjusted for inflation, from peak to trough end-of-month; price or S&amp;P 500 Index excludes cash dividends.</td>
</tr>
<tr>
<td>Peak-to-Trough Years</td>
<td>Number of years of real equity price decline from prior pre-crisis peak to trough of crisis.</td>
</tr>
<tr>
<td>Years to Regain Peak</td>
<td>Number of years for real equity prices to regain prior inflation-adjusted peak from prior peak.</td>
</tr>
<tr>
<td><strong>Real Loan Growth</strong></td>
<td></td>
</tr>
<tr>
<td>Three-Years-Prior to Peak</td>
<td>Percentage change in domestic credit market, adjusted for inflation, from three-years-prior to peak (un-annualized).</td>
</tr>
<tr>
<td>Peak to Trough</td>
<td>Percentage change in domestic credit market, adjusted for inflation, from peak to trough (un-annualized),</td>
</tr>
</tbody>
</table>
Application of the *weighted mean* to data consisting of characteristics associated with systemic banking crises is highly appropriate to represent the relative importance or magnitude of the credit crunches in the sample. This application is original, as neither set of co-authors, Ruff-Childers or Reinhart-Rogoff, utilized this statistical measure of centrality.

The *weights* selected to represent the relative influences of the crises were Relative Wealth of the crisis-impacted countries — roughly, the affected country’s GDP relative to the United States’ GDP. [Relative Wealth is more precisely defined in the ensuing Methodology section.] Ruff and Childers, by calculating simple averages of their constituent banking episodes, assigned the same weight, or influence factor, to, say, the systemic banking crises of Colombia in the late 1990s and the U.S. in the late 1980s. The weight I assigned to the latter episode was nearly five times Colombia’s.

The differences between the more robust and representative weighted average and the simple average benchmarks are delineated in the Comparison of Results section. For example, based on differently-calculated benchmarks based on the same 15 banking contractions, I expect real equity prices to reach their peak in 2018, two years later than the Ruff-Childers result cited above.

Results are also presented in terms of annual real total returns to recovery from the assumed equity price trough of March 9, 2009 to the (prior) inflation-adjusted peak in real equity. Total return is defined as price-plus-gross-cash-dividend return (Standard & Poors, 2009). These findings provide a practical measure of attainability of the peak in real equity to which investors and consumers can relate.

The three groups of five banking crises each and the universe of all 15 crises which Ruff and Childers specified, and which I adopted, are listed with further details in Appendix I (Ruff and Childers, 2009, p. 2). The eight characteristics of a crisis, also based on the Ruff-Childers paper, as previously noted, are listed and defined in Exhibit 1.

**Methodology**

To derive the *weighted-average* benchmark, the readily-available Relative Wealth data was utilized, with values for each banking crisis contained in Appendix I of the Ruff-Childers (2009, p. 8) paper. Relative Wealth was defined as “real GDP per capita of [the affected] country divided by the greater of U.S. or UK real GDP per capita.” (Ruff and Childers, 2009, p. 8) Normalizing the Relative Wealth factors for each crisis to form an index of weights that sum to 100 percent for each universe, each factor was then divided by the sum of Relative Wealth figures for each banking crisis for a given universe.

The largest *weights* of 9.63 percent were associated with U.S. banking crises #1, 11, 12 and 13, as identified in Appendix I; the smallest weight of 2.02 percent was assigned to crisis # 10 (Colombia). The more robust and representative results obtained by the weighted-average benchmark are mainly attributable to not applying the implied same fixed weight of 6.67 percent to each of the 15 crises, as associated with the “average” figures derived in the Ruff-Childers paper.

The results associated with the new benchmark based on all fifteen prior crises are presented in Exhibit 2, accompanied by their 95 percent confidence intervals. For each of the benchmark’s characteristics, say, the percentage change in real equity price from peak to trough end-of-month, the expected (or mean) figure of -50 percent, is shown, along with a lower bound of -61 percent and an upper bound of -38 percent. (Exceptions for displaying the expected figure based on all fifteen crises for two characteristics are noted below.)
To generate a wider set of results, supplementing those associated with the universe of all 15 banking crises, two other event sets are introduced: (1) a second benchmark generated by taking a weighted average of banking crises for Group I, consisting of five major credit contractions associated with developed countries after World War II; and (2) the Great Depression of the 1930s. These two event sets were both included in the total universe of 15 banking crises, but with diminished influence. The decreases in real equity price from peak to trough are -51% and -81% for the Group I benchmark and the Great Depression, respectively. (One additional universe is presented for two characteristics — the unemployment rate increase and the change in real GDP – as noted below.)

Thus, five figures for each of eight crisis characteristics are presented as benchmarks for the current credit crisis of the 2000s, with the Great Depression set of numbers emanating directly from Ruff and Childers (2009, p. 8).

The likelihood of the Great Depression with all of its manifestations making a return appearance is probably very small, for the following reasons:

1. Bank depositors are now insured for $250,000 per account by the Federal Deposit Insurance Corporation, which was established in 1933, after the Great Crash and after the beginning of the Great Depression. (The FDIC raised the standard maximum deposit insurance amount per account for member banks from $100 thousand to $250 thousand during the current crisis in 2008.)

2. The magnitude of the 25 percent decline in the consumer price index, or deflation, in the Great Depression was attributable to continued adherence to the gold standard, since discontinued. Under the gold standard, governments had little influence on the money supply. (Ruff and Childers, 2009, p. 5)

3. “Today’s fiscal and monetary policies are certainly a lot better than what the world saw in the Great Depression of the 1930s.” (Reinhart and Rogoff, 2009)

Thus, the magnitude of the real per capita Gross Domestic Product decline of 30.8 %, associated with the banking crisis of the 1930s, is extremely unlikely to recur.

The Great Depression figures for the decline in real GDP and the increase in the unemployment rate [for similar reasons, as explained in the Findings section] were treated as influential outliers in the universe of all fifteen banking crises, which, in my judgment, are highly unlikely to be experienced again, due to changed external conditions. Therefore, I created, just for those two characteristics of the eight considered, an “adjusted benchmark” consisting of all banking crises but excluding the U.S. 1930s episode.

“If we could first know where we are and whither we are tending, we could better judge what to do and how to do it.”

Abraham Lincoln, 1858

However, other characteristics associated with the Great Depression might very well merit attention, perhaps even as attainable observations, as noted below.

- The "housing price decline experienced by the United States to date during the current episode (almost 28% according to the Case–Shiller index) is already more than twice that registered in the U.S. during the Great Depression.” (Reinhart, 2009)
- Today’s financial crisis is also far more global than its 1930’s counterpart, with downturns and recoveries more “interconnected” to those of other countries.
Moreover, Simon Johnson, former chief economist of the IMF, has recently written: “What we face now could, in fact, be worse than the Great Depression — because the world is now so much more interconnected and because the banking sector is now so big. We face a synchronized downturn in almost all countries, a weakening of confidence among individuals and firms and major problems for government finances.” (Johnson, 2009).

The S&P 500 Index and its total return, (TR), were selected as representing equity prices and total equity return in the U.S. stock market for the current crisis (Standard & Poors, 2009). A decline in actual real total equity return of 56.0 percent was determined by the following steps. First, the nominal total return percentage, TR(%), for a period was derived by calculating the percentage change in the broad-gauged S&P 500 Index of total returns, from its peak value on October 9, 2007, to its “assumed” trough on March 9, 2009, using the formula:

$$TR(\%) = \frac{(\text{Index of new date} – \text{Index of old date})}{(\text{Index of old date})}$$

Then the real total return was calculated by the formula:

$$\text{Real total return} = \frac{(1 + \text{Nominal TR}(\%))}{(1 + \text{Inflation rate})} – 1$$

The current year’s lowest total return, with twelve months of actual 2009 data available, was attained by the S&P 500 Index on March 9, 2009, with the S&P 500 at 676.53 and its TR of 1095.04. The decline in real total returns was 56.0 percent from the recent peak S&P 500 TR of 2447.03 on October 9, 2007. Similarly calculated, the decrease in real equity prices was 57.5 percent from the S&P 500 peak of 1565.15. The 17-month inflation rate was 1.81 percent (InflationData, 2009).

The nominal declines of 55.3 percent for total return and 56.8 percent for equity prices were calculated in a similar manner with the inflation rate set to 0.0 percent in Equation 2.

The four annual returns required for equity market recovery — total returns and price returns, with both returns stated on a real and nominal basis — are determined as explained below, and introduced and discussed in the Findings section. The following three equations were utilized:

$$\text{Real index peak} = \left(\frac{\text{Real decline to trough}}{(\text{Inflation rate} + 1)}\right).$$

$$\text{Percent to real recovery} = \left(\frac{\text{Real index peak}}{\text{Index trough}}\right) – 1.$$  

$$\text{Annual return to recovery} = \left(\frac{\text{Real index peak}}{\text{Index trough}}\right)^{\left(\frac{1}{\text{Time to recovery}}\right)} – 1$$

where the notation “$$b^c$$” represents base $$b$$ being taken to the power $$c$$.

Findings

Observations associated with the benchmark for 15 banking crises and other benchmarks, as summarized in Exhibit 2, include the following findings for the five specific issues identified in the Introduction:

1. Duration and Magnitude of the Downturn in Stock Market Prices
   - Real equity prices are expected to decline for 3.0 years from peak to trough years. This observation suggests, since the S&P 500 Index peaked in October 2007, stock prices may continue to decline until October 2010, if the 2000’s credit crisis turns out to be similar to its fifteen predecessors. Through early March 2009 — before the stock market rally of the last several months — the current bear market had been declining for 1.4 years.
   - In an acknowledgment that real equity prices could further decline beyond the 2009 low value attained on March 9, 2009,
### Exhibit 2: Benchmarks for Banking Crisis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Benchmark: 15 Crises</th>
<th>95% Confidence Interval: 15 Crises</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td><strong>Real Economy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPS – Peak to Trough</td>
<td>-102%</td>
<td>-151%</td>
</tr>
<tr>
<td>GDP (per Capita, Annualized)</td>
<td>-6.7%**#</td>
<td>-9.8%*</td>
</tr>
<tr>
<td>Unemployment: % Pt. Incr.</td>
<td>6.6%*</td>
<td>3.9%*</td>
</tr>
<tr>
<td><strong>Real Equity Price</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak-to-Trough Drop (%)</td>
<td>-50%</td>
<td>-61%</td>
</tr>
<tr>
<td>Peak-to-Trough Years</td>
<td>3.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Years to Regain Peak:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Peak to Peak</td>
<td>10.6</td>
<td>6.0</td>
</tr>
<tr>
<td><strong>Real Loan Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-Years-Prior to Peak</td>
<td>21%</td>
<td>14%</td>
</tr>
<tr>
<td>Peak to Trough</td>
<td>-21%</td>
<td>-30%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All 15 Crises</th>
<th>Group I: Developed Countries Post-WWII</th>
<th>Great Depression U.S. – 1930’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real Economy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPS – Peak to Trough</td>
<td>-102%</td>
<td>-130%</td>
<td>-67%</td>
</tr>
<tr>
<td>GDP (per Capita, Annualized)</td>
<td>-6.7%**#</td>
<td>-4.0%#</td>
<td>-30.8%</td>
</tr>
<tr>
<td>Unemployment: % Pt. Incr.</td>
<td>6.6%*</td>
<td>5.2%</td>
<td>21.0%</td>
</tr>
<tr>
<td><strong>Real Equity Price</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak-to-Trough Drop (%)</td>
<td>-50%</td>
<td>-51%</td>
<td>-81%</td>
</tr>
<tr>
<td>Peak-to-Trough Years</td>
<td>3.0</td>
<td>4.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Years to Regain Peak:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Peak to Peak</td>
<td>10.6</td>
<td>6.9</td>
<td>26.5</td>
</tr>
<tr>
<td><strong>Real Loan Growth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-Years-Prior to Peak</td>
<td>21%</td>
<td>18%</td>
<td>27%</td>
</tr>
<tr>
<td>Peak to Trough</td>
<td>-21%</td>
<td>-20%</td>
<td>-45%</td>
</tr>
</tbody>
</table>

* Figures shown are for the adjusted benchmark, a more representative benchmark for these two characteristics; the Great Depression crisis is excluded from the adjusted benchmark.

# The most representative benchmark for GDP change is -4.0% associated with Group I developed countries.

**Note:** The benchmark for GDP, utilizing all 14 banking episodes for which data exists, is -9.1%; benchmark for change in unemployment rate, utilizing all 15 banking episodes, is 8.0% points.
and could extend the bear market beyond its 1.4 years to the three-year downturn associated with the benchmark. Reinhart and Rogoff (2009) warn, “The bad news is that these down price cycles typically last for several years. So, even if the big hit on stocks and house prices has come already, the bottom might not be reached until the end of 2010.”

- In their recent study of 14 global episodes of bear markets during banking crises, Reinhart and Rogoff found “The average historical decline in equity prices is 55.9 percent, with the downturn phase of the cycle lasting 3.4 years.” (Reinhart, 2009). The latter figure represents duration 13 percent longer than the 3.0 years associated with the benchmark.
- The decline in real equity prices for the benchmark is 50%; the upper and lower bound decreases are 38% and 61%, respectively. The expected decreases in stock prices are 51% for the benchmark for Group I and 81 percent for the Great Depression.
- From the S&P 500 Index peak on October 9, 2007, through its current year’s low on March 9, 2009, the real total equity return exhibited a decline of 56.0 percent. The real equity price decrease over that period was 57.5 percent. Total return is defined as price-plus-gross-cash-dividend return, as previously noted. [Equity returns and price changes were derived in the Methodology section.]
- The nominal (i.e., non-inflation-adjusted) declines were 55.3 percent for total return — including cash dividends — and 56.8 percent for the equity prices. As noted above, Reinhart (2009) suggests “The average historical decline in equity prices is 55.9 percent” — virtually the same figure as the actual decline of 56.8% already experienced by the S&P 500 Index.
- The expected decline in real equity prices of 50 percent associated with the benchmark based on the fifteen banking crises has been exceeded by current events, as represented by the real decline of 57.5 % in the S&P 500 Index attained on March 9, 2009. The 95 % confidence bound of a 61% decline in real equity prices could be regarded as an upper limit to the decline, based on past banking episodes.
- However, I am unwilling to suggest the equity price decline has necessarily reached its trough in early March 2009, marking the end of the bear market, because there are indications of longer downturn duration. As previously noted, the benchmark expects real equity prices to decline for 3.0 years. Also, we may be experiencing a rally with diminished volatility which is likely to be followed by a “retesting” of those lows. Some observers expect increased volatility and a possible severe contraction of perhaps 10 – 20% (Lim, 2009).

2. Number of Years for Equity Prices to regain their Inflation-adjusted Peaks
- If today’s crisis turns out to be similar to the benchmark, a peak-to-peak recovery period of 10.6 years in real prices would be expected. Then, prices could return to inflation-adjusted peaks by mid-2018, from the prior peak of October 9, 2007.
- The recovery period based on the benchmark 15 banking crises could be as low as 6.0 years or as high as 15.2 years. The benchmark for Group I suggests a 6.9-year recovery period. It is worth recalling, following the Great Depression, stock market prices took 26.5 years to regain their pre-1930s inflation-adjusted peaks.

3. Real annual Total Returns required for regaining prior Peaks
- The expected real annual total returns associated with equity prices regaining their inflation-adjusted peaks in 10.6 years
— with a time from trough to recovery of 9 years, assuming the trough in the S&P 500 Index of March 9, 2009 — is 9.6%, or about 10%. A real equity price return of 10.0% over 9 years is implied. For comparative purposes to other studies, nominal annual total returns — unadjusted for inflation — and nominal annual equity price returns — unadjusted for inflation and excluding dividends — of 9.3% and 9.8%, respectively, would be expected for the nine-year recovery period. The close proximity of these four returns — lying in a fairly tight band of 9.3–10.0% — is attributable to the future inflation rate, assumed equal to the actual rate of 1.81% experienced over the 17-month peak-to-trough period and adoption of the actual dividend return over this period of about 2.9%, with the latter two figures close to 2%. In the future, the real annual total returns will depend to some extent upon the relative offset of inflation by dividends, and the close association between these four figures of return will likely be loosened.

“What we face now could, in fact, be worse than the Great Depression — because the world is now so much more interconnected and because the banking sector is now so big.”

Simon Johnson, former chief economist of the IMF

• The real annual total equity returns of approximately 10% may be compared to the findings of Wharton Professor Jeremy Siegel – the stock market has generated an annual average, inflation-adjusted return of 6.8% from 1802 through year-end 2006. For post-World War II periods, the compound annual total real equity returns were 6.9% for 1946-2000, 10.0% for 1946-1965, (0.4)% for 1966-81, 13.6% for 1982-99, and 8.4% for 1985-2006. (The 1966-81 period, which exhibited negative compound annual returns, did not follow a severe banking crisis and thus was not a “recovery period.”) “This remarkable stability is called the mean reversion of equity returns, which means that returns can be very unstable in the short run but very stable in the long run. … Periods during which the market fell below the trend line, such as during the early 1980s, pointed to promising future returns.” (Siegel, 2008, p. 13).

4. Peak Unemployment Rate

• The October 2009 unemployment rate of 10.2% is the highest since December 1982 (10.8%) and has increased 5.3 percentage points over its trough of 4.9% in December 2007 (Bureau of Labor Statistics, 2009). The latter date is the official beginning of the recession (National Bureau of Economic Research, 2009). Nevertheless, observers might consider it highly unlikely, given our current social net, for the rate to increase an additional 15.7 percentage points to match the 21.0 percentage point increase of the Great Depression. The Great Depression figure cited was treated as an influential outlier, which, in my judgment, is highly unlikely to be experienced again, due to changed external conditions. Therefore, I created an “adjusted benchmark” consisting of all banking crises but excluding the U.S. 1930s episode.

• Peak unemployment of about 11.5% is expected based on the trough-to-peak 6.6 percentage-point increase in the
unemployment rate associated with the adjusted benchmark for 14 banking crises. The increase in the unemployment rate for the adjusted benchmark of 6.6 percentage points represents a marked difference from the benchmark’s 8.0 percentage points. The former figure of the adjusted benchmark is displayed in Exhibit 2 [with an asterisk], along with its lower and upper confidence bounds of 3.9 and 9.3 percentage points, respectively. Based on these two bounds, unemployment is very likely to peak between 8.8% and 14.2%, with the lower bound already surpassed by October’s rate of 10.2%.

- In close agreement with the 6.6 percentage-point increase associated with the adjusted benchmark, Reinhart states, “The unemployment rate rises an average of 7 percentage points over the down phase of the cycle, which lasts on average over four years.” (Reinhart, 2009). Reinhart and Rogoff (2009) also state that “If the United States follows the norm of recent crises, as it has until now…Unemployment will continue to rise for three more years, reaching 11–12% in 2011.” Roubini expects the unemployment rate “to peak at around 11%” and to remain at a very high level for two years or more (Roubini, 2009).

- The unemployment rate was 10.2% in October, with many economists now expecting a peak of over 10% in 2010 (Herbert, 2009). The government’s stress tests for banks used 10.3% as the worst-case unemployment rate for 2010, which may prove to be an insufficiently-low figure. About 8 million jobs have been lost since the recession’s inception in December 2007, with nearly 16 million people now unemployed. President Obama’s top economic advisor, Lawrence Summers, admitted in July 2009 that job losses and unemployment at the end of the second quarter of 2009 were higher than the government expected (Calmes, 2009). The underemployment rate — which also counts civilians who have given up searching for a job — was 17.5% in October, almost certainly its highest level since the Great Depression (Leonhardt, 2009).

5. Real Decline in the Nation’s Output from Peak to Trough

- Real per capita Gross Domestic Product (GDP) is expected to decrease on an annualized basis by 4.0% from peak to trough calendar year, based on the benchmark for Group I. I believe this benchmark, consisting of five major credit contractions associated with developed countries after World War II, may be the most representative benchmark for the current U.S. crisis. This assertion follows from an astute Ruff-Childers observation, “This pattern [of GDP contraction being minimal relative to loan contraction for developed-market crises] indicates that modern developed economies have tended to be less severely affected by crisis-induced credit crunches, in part reflecting the powerful role now played by government fiscal and monetary authorities in responding to financial and economic emergencies.” (Ruff and Childers, 2009, p. 6).

- Based on the adjusted benchmark for 13 banking crises — which excludes the U.S. 1930’s banking episode deliberately and the U.S. 1870’s financial crisis (for which GDP data was unavailable) — real per capita GDP is expected to decrease by 6.7% on an annualized basis. The real GDP decline of 30.8% associated with the Great Depression is unlikely to recur, as previously discussed in the Methodology section. Both the 6.7% and 4.0% GDP declines associated with the adjusted benchmark and Group I, respectively, are depicted in Exhibit 2 [with an asterisk and pound sign].

- Real GDP shrank at an annual rate of 2.6% from 2008 to 2009, based on quarterly GDP data in chained 2005 dollars (Bureau of Economic Analysis, 2009).
of Economic Analysis, 2009). This actual decrease in year-over-year GDP is well within the confidence bound associated with the expected decline of 4.0% associated with the benchmark for Group I. Actual real GDP declined by 4.0% from the first quarter of 2008 to the first quarter of 2009, according to revised figures from the BEA.

- An unlikely expected total decline of 9.1% in the real GDP is suggested by the upward-biased benchmark for all 15 banking episodes, including the Great Depression. This figure is much higher than the declines of 4.0% and 6.7% associated with the benchmark for Group I and the adjusted benchmark, respectively. This observation may tend to cast some doubt on the applicability of the following valid statement of Reinhart: “As to real per capita GDP around banking crises, the average magnitude of the decline is 9.3%.” (Reinhart, 2009). Since the latter average of 9.3% includes the U.S. financial crisis of 1929, it too is unrepresentative as a likely outcome due to its upward-bias.

**Some observers expect increased volatility and a possible severe contraction of perhaps 10–20%.**

**Comparison of Results**

A comparison of the results for each crisis-characteristic associated with the more robust weighted-average benchmark adopted in this paper with the “average” figures depicted in the Ruff-Childers paper reveals:

- a significant difference of 22% in the decline of real EPS;
- a negligible difference (of less than 4%) in the percentage decline for real equity prices; and
- moderate differences of 11 - 15% in the other six characteristics.

For example, there is a difference of 15% in the number of years of peak-to-peak recovery for real equity prices — 10.6 years associated with the weighted-average benchmark in this paper vs. 9.2 “average” years in the Ruff-Childers paper. There is an 11% difference in the increase in the unemployment rate from trough to peak — 8.0 percentage points associated with the weighted-average benchmark vs. an “average” 7.2 percentage points by Ruff and Childers.

Comparisons of benchmarks in this paper with corresponding average rates generated by Reinhart and Rogoff [R&R] were discussed for 5 characteristics in the Findings section. There is very close agreement in the typical unemployment rate increase (adjusted benchmark with 14 episodes of 6.6 percentage points vs. 7 percentage points of R&R) and the expected peak unemployment rate (adjusted benchmark of 11.5% vs. 11 — 12% of R&R), while the benchmarks for the decline in stock prices and their associated downturn period are about 13% below the average figures of R&R.

I am uncomfortable with the applicability of the average decline in real per capita GDP of 9.3% displayed by R&R, since the average includes the unlikely-to-recur 30.8% decrease associated with the Great Depression (Reinhart, 2009). Also, the robustness of their results is uncertain, for they did not utilize the weighted-average technique strongly advocated in this paper. Reinhart and Rogoff did not generate annual real total returns needed to regain the inflation-adjusted equity price peaks (Reinhart and Rogoff, 2009a).

**Conclusions**

This recession is already the longest since the Great Depression of the 1930s. It is unlike previous recessions, as noted by former Federal Reserve Chairman Paul Volker, because it was not brought about by tight credit and high interest rates but by an excess of capital (Volker, 2009).
The current illiquidity, credit and capital crisis was meaningfully viewed from the perspective of fifteen prior banking crises selected by Ruff and Childers.

1. That shared the characteristic of “a severe shock to a country’s financial system” in terms of impairing the effectiveness of credit intermediaries in maintaining liquidity.
2. Were preceded by inflationary asset bubbles and multiyear credit expansion, followed by credit contractions of roughly the same magnitude.

The expected decline in real equity prices of 50% associated with the benchmark based on the fifteen banking crises has been exceeded by current events, as represented by the real decline of 57.5% in the S&P 500 Index attained on March 9, 2009.

In addition, this author was successful in addressing five specific issues of interest and general concern which underlie the current mood of uncertainty.

(1) Real equity prices are expected to decline for 3 years from the last peak of the S&P 500 Index in October 2007 to their trough, based on the benchmark generated from the 15 prior banking events. Therefore, stock prices may continue to decline until October 2010, if the 2000’s credit crisis turns out to be similar to its predecessors.

(2) A recovery period of 10.6 years in real prices from prior peak to peak would be expected if today’s crisis turns out to be similar to the benchmark. Prices could then return to inflation-adjusted peaks by mid-2018, if March 9, 2009, were adopted as the date of the true trough in equity prices.

(3) Real total returns of about 10% annually for nine years would be implied for equity prices to regain their inflation-adjusted peaks, if today’s crisis turns out to be similar to the benchmark and assuming March 9, 2009, as the date of the true trough in equity prices.

(4) Peak unemployment of about 11.5% is expected, based on the increase in the unemployment rate associated with the adjusted benchmark for 14 banking crises. Many economists now expect a peak of over 10% in 2010.

(5) Real per capita GDP is anticipated to decrease by 4.0% on an annualized basis from 2008 to 2009, based on the benchmark for Group I, consisting of five major credit contractions associated with developed countries after World War II. Actual GDP decline was 2.6%.

The unprecedented magnitude of government intervention, including possible “jobs creation” programs in 2010, may tend to blunt the severe impacts anticipated in the peak unemployment rate and the duration of the equity market downturn.

August 28, 2009
Revised: January 31, 2010

Acknowledgement
The author particularly wishes to acknowledge the assistance provided by Mr. Vincent L. Childers in fully explaining the methodology he utilized, as well as for furnishing several unpublished details underlying the Ruff-Childers (2009) paper. In reaction to my suggestion of generating a benchmark crisis by taking a weighted average of the component credit contraction events, he agreed that “some kind of weighted average like you’ve laid out would be more accurate in trying to really look at an “average” crisis.”
A Perspective on 2000’s Illiquidity and Capital Crisis

Appendix I: Fifteen Systemic Banking Crises*

Group I: Developed Countries, Post World War II
1. U.S. – Late 1980s  Deregulation contributed to unsound real estate lending, ending in failure of 2700 banks/S&Ls
2. Japan – 1990s     Cheap credit led to bad loans and massive asset bubble, engulfing banking system as it deflated
3. Norway – Late 1980s Deregulation led to lending and house price boom, ending in recession and eventual banking crisis
4. Sweden – Early 1990s Credit and real estate boom followed financial deregulation, ending in banking/currency crisis
5. Finland – Late 1980s Deregulation led to lending and asset boom that ended in banking/currency crisis

Group II: Open Developing/Emerging Countries, 1990+
6. South Korea – Late 1990s Excessive lending and overinvestment ended in banking/currency crisis
7. Argentina – Early 2000s Recession and large public debt led to loss of confidence in currency and run on banks
8. Thailand – Late 1990s Economic and real estate boom supported in part by foreign debt ended with banking/currency crisis
9. Turkey – Early 2000s Bank unwinding of large government bond positions snowballed and resulted in banking/currency crisis
10. Colombia – Late 1990s Credit and real estate boom followed financial liberalization that ended in banking/currency crisis

Group III: U.S., 1870 – World War II
11. U.S. – 1930s Credit and stock market boom ended in crash and eventual banking crises in the Great Depression
12. U.S. – Mid-1910s Outbreak of WWI caused foreigners to sell U.S. assets for gold, resulting in closing NYSE and capital controls
13. U.S. – Early 1900s Failed stock corner resulted in runs on the banks that ended in a rescue by J. P. Morgan
14. U.S. – 1890s Lending boom related to railroads overbuilding ended with 600+ bank failures and run on U.S. gold supply
15. U.S. – 1870s Railroad- and reconstruction-related lending boom ended with 400+ bank failures and the “Long Depression”

Source: International Monetary Fund, National Bureau of Economic Research, AllianceBernstein

* Appendix I is a copy of Display 1 (Ruff and Childers, 2009, p. 2).
Appendix II: Systemic Banking Crises

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<td>10. Colombia – Late 1990s</td>
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<td>12. U.S. – Mid-1910s</td>
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References


IRS Offers Relief for Investors of Fraudulent Investment Schemes

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Executive Summary

On December 11, 2008, Bernard Madoff was arrested and charged with securities fraud for orchestrating a so-called Ponzi scheme. Named for Charles Ponzi who organized such a scam in 1919, a Ponzi scheme is a fraudulent investment arrangement whereby unsuspecting investors give cash and property to the lead figure of the arrangement, who then misappropriates some or all of the funds, but reports to the investors that the fund made profits. The purported income being reported and even paid to investors comes from amounts received by the leader from later investors. The arrangement usually falls apart when a large number of investors want to withdraw their investments at the same time, especially during times when there is not enough new money being supplied by new investors. In the most recent Ponzi scheme, it is estimated that Madoff duped investors out of more than $50 billion by the time the arrangement was uncovered.

Obviously, the cheated investors are devastated by their losses, and their only consolation is the potential for a tax benefit to mitigate the loss. The Internal Revenue Service (IRS) recently issued two forms of guidance for investors who suffer losses from this type of fraudulent investment scheme. Revenue Ruling 2009–9 addresses the proper treatment of such losses, and Revenue Procedure 2009–20 provides a safe harbor for taking a deduction for the loss. Although the guidance is not limited to the Madoff scheme, it came on the heels of his arrest as both pronouncements were released on March 17, 2009.

Relevant Statutory Law

Capital Losses

The Internal Revenue Code of 1986, as amended (Code) provides a different set of rules for the proper tax treatment of a loss, depending on whether the loss resulted from theft or from a capital transaction. Prior to release of guidance from the IRS it was unclear which set of rules would apply to losses resulting from a Ponzi scheme.

Whether a loss is capital or ordinary in nature is determined by the asset that generated the loss. Sales of ordinary assets result in ordinary losses, while sales of capital assets result in capital losses. The determination of whether an asset is ordinary or capital is made by reference to §1221 of the Code. Section 1221 states that all assets are capital assets, with the exception of certain assets — such as inventory, accounts receivable and depreciable assets used in a trade or business — which are ordinary in character. Since §1221 does not except assets held for investment or personal use from the definition of capital assets, these assets are considered to be capital assets. Accordingly, sales of investment or personal property result in capital gains and losses.

The realized gain or loss on the sale of an asset is calculated as the difference between the amount received on the sale and the seller’s adjusted basis. Where the amount realized is less than the adjusted basis, a realized loss results. The Code places limits on a taxpayer’s ability to recognize realized losses for tax purposes. Specifically, the maximum amount
of net capital losses that an individual taxpayer may deduct in any one year is limited to $3,000. Net capital losses in excess of $3,000 may be carried over indefinitely to future tax years. The capital loss deduction is taken for Adjusted Gross Income (AGI) (i.e., above-the-line deduction).

Due to the requirement that losses must be realized in order to be recognized, no deduction is permitted for securities which decline in value. However, a deduction is permitted at such time a security becomes completely worthless, meaning it has $0 value.

**Theft Losses**

The Code also allows a deduction for a loss that results from theft. Specifically, Code §165 allows a deduction for loss due to the theft of property that is not compensated by insurance. For this purpose, theft is interpreted to include larceny, embezzlement and robbery. The amount of the loss, for tax purposes, is generally measured by the adjusted basis of the stolen property, reduced by any amounts the taxpayer reasonably anticipates will be recovered. As a result, an individual cannot deduct amounts where there is an expectation of recovery, even if such recovery does not occur by the end of the tax year.

The deduction for losses due to theft is permitted in the year the taxpayer discovers the loss (as opposed to the year the loss occurred). Classification of the deduction turns on how the stolen asset had been used by the taxpayer. For example, a loss resulting from the theft of business property is taken for AGI, and a loss from the theft of investment or personal-use property is generally taken as an itemized deduction. Accordingly, the taxpayer will not receive a tax benefit from the theft of investment or personal-use property unless the total of all itemized deductions exceeds the taxpayer’s standard deduction.

In situations where property held for personal use is stolen, Code §165(h) places two limitations on the amount of the deduction.

- First, the amount of loss is subject to a $100 floor for each casualty or theft event which resulted in loss to personal property during the taxable year (the $100 floor). The floor has the effect of reducing the loss by $100. [Note: Because of the recession, the floor was temporarily increased to $500 for the year 2009.]
- Secondly, the total of all losses (after the $100 floor is applied) is then subject to another floor, which is calculated as 10% of AGI (the 10% of AGI floor). In other words, total losses of personal property are deductible only to the extent they exceed 10% of AGI. These limits do not apply to losses from the theft of business or investment property.

**Code §165 allows a deduction for loss due to the theft of property that is not compensated by insurance.**

**Prior IRS Guidance**

**Revenue Ruling 77-17**

In Revenue Ruling 77-17, the IRS addressed the treatment of losses that result from fraudulent activities. The specific issue was whether investors in corporation X were entitled to a theft loss deduction under Code §165 where the officers and directors of X engaged in securities fraud. The facts of the ruling indicated that the goal of the officers and directors was “to inflate and keep aloft the market price of X’s stock ... by reporting nonexistent income and assets on the corporate books and failing to record liabilities. The public was thereby induced to purchase stock in what was thought to be a large, fast-growing and solvent enterprise.”
The IRS cited *Edwards v. Bromberg* for the definition of theft as “a word of general and broad connotation, intended to cover and covering any criminal appropriation of another's property to the use of the taker, particularly including theft by swindling, false pretenses, and any other form of guile.” Next, the IRS outlined the requisite elements of theft by false pretenses as follows:

1. The perpetrator of the crime had the specific intent to fraudulently deprive an owner of the owner's property.
2. The perpetrator actually obtained possession and title to the property of the victim.
3. The property was obtained through the use of false pretenses.
4. The owner of the property relied upon fraudulent representations in parting with the owner's property.

Although the officers had obtained possession of the victims' property through use of false pretenses, the IRS found that the factual situation described in the ruling did not fall within the definition of theft because the officers did not intend to defraud a specific investor, thereby failing the first requirement. Accordingly, the investors were not entitled to take a deduction for theft under Code §165.

**Revenue Ruling 71-381**

Revenue Ruling 71-381 addressed the classification of theft losses. In that ruling, an investor had been specifically defrauded when she loaned money to a corporation based on information in the financial statements presented to her, and such statements were later found to be false and misleading. The IRS ruled that based on these facts, the investor was entitled to a theft loss deduction, and further that such deduction was subject to limitation. Although later amended, at the time of the ruling the Code placed limitations on the amount of the deduction for losses relating to any property that was not connected with a trade or business, including investment property. Accordingly, the ruling indicated that the deduction for losses due to theft of investment property was limited by the $100 floor and the 10% of AGI floor.

**New IRS Guidance**

**Revenue Ruling 2009-9**

In March 2009, the IRS issued Revenue Ruling 2009-9 which addresses several questions regarding the proper tax treatment of losses from fraudulent investment schemes. These questions include:

- Whether the losses are deductible as capital losses or theft losses
- Whether such losses are subject to limitations
- The amount of the loss.

The ruling makes clear that losses resulting from a fraudulent investment scheme shall be treated as theft losses, as opposed to capital losses. The ruling specifically distinguishes Revenue Ruling 77-17, which held that losses sustained in the open market resulting from fraudulent activity of a corporation's officers or directors are capital in nature. Unlike the facts of Revenue Ruling 77-17, the mastermind of a Ponzi scheme specifically intends to deprive a particular individual of money or property. Accordingly, the definition of “theft” is satisfied and any resulting loss is deductible as such under Code §165.

The mastermind of a Ponzi scheme specifically intends to deprive a particular individual of money or property. Accordingly, the definition of “theft” is satisfied and any resulting loss is deductible as such.

As described above, the Code currently provides that if a person sustains a loss in a transaction entered into for profit (whether as a business or an investment), such loss is
IRS Offers Relief for Investors of Fraudulent Investment Schemes

Losses resulting from a fraudulent investment scheme shall be treated as theft losses, as opposed to capital losses.

Revenue Ruling 2009-9 follows the general rules of Code §165 with regard to when the deduction may be taken. The deduction is allowed in the year in which the taxpayer discovers the loss. In the case of theft, the year of discovery may not be the same year in which the loss actually occurred. For example, if a taxpayer makes an investment in Year One but does not discover that the investment scheme was fraudulent until Year Five, the deduction will be allowed in Year Five even though the loss occurred in Year One. The regulations provide, however, that no deduction is permitted if the taxpayer has a reasonable expectation of recovery. If the taxpayer has any outstanding claim for reimbursement, for example from insurance, the deduction is not allowed until the year it can be determined whether the reimbursement will be received or not. The taxpayer would be allowed a deduction at that time for any loss which has not been recovered.

Consistent with the regulations under Code §165, Revenue Ruling 2009-9 indicates that the amount of the loss is measured by the basis of the property (i.e., the amount invested) decreased by any amount reimbursed or recovered. In the context of a fraudulent investment scheme, the amount invested includes the original investment and any subsequent investments, as well as any fictitious income from the investment which was included on the taxpayer’s federal income tax return and reinvested in the scheme. Any amounts actually received by the taxpayer as a return on the investment decrease the amount of the deductible loss.
Revenue Procedure 2009-20

In addition to Revenue Ruling 2009-9, the IRS also issued Revenue Procedure 2009-20, which simplifies compliance by providing an optional safe harbor for the deduction of losses from fraudulent investment schemes. If certain requirements are satisfied, the safe harbor allows the taxpayer to take a deduction which will not be challenged by the IRS. In addition, the safe harbor allows investors and preparers to avoid factually difficult inquires regarding whether a theft in fact occurred, in what the year the loss was discovered, and the amount of the loss.

In a nutshell, the safe harbor allows a Qualified Investor with a Qualified Loss from a Specified Fraudulent Arrangement to take a deduction under Code §165 in the Year of Discovery equal to the Deductible Amount, provided that certain Procedures are followed.

Specified Fraudulent Arrangement. A Specified Fraudulent Arrangement is an investment arrangement where the “lead figure” of the arrangement “receives cash or property from investors; purports (falsely) to earn income for the investors; reports income amounts to the investors that are partially or wholly fictitious; makes payments, if any, of purported income or principal to some investors from amounts that other investors invested in the fraudulent arrangement; and appropriates some or all of the investors’ cash or property.” Although not specifically mentioned in the guidance, Ponzi schemes fit squarely within this definition of Specified Fraudulent Arrangement.

Qualified Investor. In order to qualify for the safe harbor, the investor must not have had actual knowledge that the investment scheme was fraudulent before investing in it. In addition, only those persons that invested directly qualify. This means that a loss resulting from an investment through an intermediary will not qualify for the safe harbor. However, the intermediary investment fund may itself qualify, and if the intermediary is organized as a partnership any resulting losses would flow through to investors on the Schedule K-1s.

Qualified Loss. Revenue Procedure 2009-20 takes the guesswork out of whether a theft actually occurred. A Qualified Loss is a loss which results from a Specified Fraudulent Arrangement in which two circumstances exist. First, the “lead figure” in the investment arrangement was either the subject of a complaint or charged with committing fraud, embezzlement or a similar crime under state or federal law. Second, the lead figure admitted guilt, either allegedly in the complaint or by affidavit. The second requirement can also be satisfied if the assets of the investment arrangement were frozen or a receiver/trustee was appointed with respect to such assets.

If both conditions are satisfied, a theft is deemed to have occurred. Absent these safe harbor provisions, in order to take a deduction under Code §165 an investor would have the burden of proving that a theft did in fact occur, and that the lead figure specifically intended to defraud the investor.

In the context of a fraudulent investment scheme, the amount invested includes the original investment and any subsequent investments, as well as any fictitious income from the investment which was included on the taxpayer’s federal income tax return and reinvested in the scheme.

Year of Discovery. Code §165 says that losses from theft are taken in the year of discovery. However, it can be difficult to pinpoint when a loss is discovered in a Ponzi scheme. For this reason, Revenue Procedure 2009-20 defines the Year of Discovery as the taxable year in which the indictment or complaint, as referred to in
the definition of Qualified Loss, is filed.

**Deductible Amount.** Revenue Procedure 2009-20 also provides rules for determining the amount that can be deducted. The investor must first calculate the Qualified Investment and then determine how much of that Qualified Investment is deductible.

The amount of the Qualified Investment is calculated as the total amount of cash or property invested in the fraudulent arrangement in all years, plus any amounts included in income for federal tax purposes by the investor (based on information received from the lead figure of the arrangement), less the total amount of cash or property the investor withdrew from such arrangement in all years.

Finally, Revenue Procedure 2009-20 indicates that a specified percentage of such Qualified Investment is deductible pursuant to the safe harbor. An investor who does not pursue any potential third-party recovery may deduct 95% of the Qualified Investment, while investors pursuing a third-party recovery may deduct 75% of the Qualified Investment. The investor must reduce this specified percentage amount by the amount of any actual or potential recovery, whether such recovery is direct or from a third-party.¹²

**Procedures.** In order to receive the favorable safe harbor treatment, an investor must follow certain procedures. First, the investor must write “Revenue Procedure 2009-20” on the top of Form 4684, the form used to report theft losses for federal income tax purposes. Second, the investor must complete and sign a statement which is provided in Appendix A to Revenue Procedure 2009-20 and attach it to his or her federal income tax return for the year in which the deduction is taken. The required statement includes detailed information about how the amount of the deduction was computed, as well as certain declarations from the investor. Finally, by electing to use the safe harbor, the investor agrees to certain items. For example, the investor agrees not to file an amended return which recharacterizes income which had been reported in an earlier tax year as a result of the fraudulent investment arrangement. The safe harbor of Revenue Procedure 2009-20 applies to all losses that are discovered in tax years that begin after December 31, 2007.

**Conclusion**

Revenue Ruling 2009-9 clarifies that investors can deduct losses from Ponzi schemes under Code §165 as theft losses. Further, if all conditions and procedures outlined in Revenue Procedure 2009-20 are satisfied, the IRS will not challenge:

1. The deduction of the loss as a theft loss under Code §165,
2. The taxable year in which the theft was discovered (and accordingly the year the deduction was taken), and
3. The amount of the deduction.

However, if an investor chooses to deduct losses from a Ponzi scheme outside the parameters of the safe harbor, the IRS is free to challenge any of these items. Investors have a choice – elect the safe harbor or risk being audited.

In order to qualify for the safe harbor, the investor must not have had actual knowledge that the investment scheme was fraudulent before investing in it.
References

Internal Revenue Code §62.
Internal Revenue Code §67
Internal Revenue Code §165.
Internal Revenue Code §1001.
Internal Revenue Code §1212.
Internal Revenue Code §1221.
Internal Revenue Code §1222.
Revenue Ruling 77-17, 1977-1 C.B. 44.
Treasury Regulations §1.165-8.

Endnotes

1 Bernard Madoff later pleaded guilty and in June 2009 was sentenced to 150 years in prison.
2 Section 1222 calls for the netting of capital gains and losses within holding periods. Therefore, capital losses that exceed capital gains by $3,000 may be deducted.
3 Code §165 also allows a deduction for casualty losses, such as losses that result from fire, storm, shipwreck or other casualty.
4 However, a loss from the theft of investment property which is held for the production of rent or royalty income is taken for AGI.
5 The standard deduction amount is based on filing status. For example, for tax year 2008 the standard deduction for a taxpayer with a filing status of Single was $5,450 and Married Filing Joint was $10,900.
6 This amount is increased to $500 for 2009.
7 The Internal Revenue Code was later amended to clarify that the limitations apply only to losses from theft of personal-use property, and not property used in a trade or business or held for investment.
8 Treating the losses as theft, as opposed to capital, is favorable to the taxpayer because the deduction for capital losses is limited to $3,000 per year for individual taxpayers (although excess capital losses can be carried over indefinitely to future tax years).
9 The ruling also noted that any net operating losses generated by theft losses can generally be carried back three years or forward 20 years.
10 The ruling also indicated that the mitigation provisions of IRC §§1311-1314 do not apply in this situation. Accordingly, no adjustments can be made to the taxpayer’s tax liability for tax years in which income was incorrectly reported and for which the statute of limitation has run.
11 To satisfy this condition, the “similar crime” must meet the definition of theft under Code §165.
12 The investor may have income or an additional deduction in a subsequent tax year once the amount of actual recovery is determined.
Trustee Liability under the New York Prudent Investor Act

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Executive Summary

This article discusses the standard of care and liability of trustees in managing trust proceeds in New York when a portfolio incurs losses. The Prudent Investor Act spells out the standard of care that a trustee must adhere to when managing New York trust funds. Cases and examples are discussed to illustrate the requirements under the Act.

The recent stock market drop has had a devastating effect on many trust portfolios. In addition, the collapse of many banking institutions and the arrest and convictions of money managers such as Bernie Madoff have damaged the confidence of many investors. Beneficiaries have seen their trust income and corpus reduced significantly. This has led some beneficiaries to examine the conduct and actions of their respective trustees, who made investment decisions on their behalf. Are the losses due to market forces, or are they actually the result of improper trustee conduct? Can a beneficiary recover any lost proceeds from a trustee? This article will discuss the standard of conduct that trustees in New York must adhere to when managing trust funds.

Beneficiaries have two ways to assert a claim against a trustee. Beneficiaries can sue a trustee, or they can object to documents filed by the trustee and ask the court to hold a trustee liable for an investment loss. Based upon the facts and circumstances of the case, the court will determine if the trustee breached his fiduciary duty to a beneficiary. What does a court consider when deciding if a trustee and not the market is responsible for a loss?

Standard of Care

Generally, a trustee has a fiduciary duty in managing a trust’s assets. He owes a duty of care, loyalty, and obedience in carrying out his objectives. As trustee, he must act in the trust’s best interests, even if they conflict with his own personal interests. He is generally bound to following the instructions of the document which gives rise to his trusteeship.

A trustee is bound to use the same diligence and prudence in the care and management of a trust that prudent men would use in managing their own affairs.1 New York has codified the standard by which trustees are judged when investing trust funds, with Section 11-2.3 of the Estates, Powers, and Trusts Law, also known as The Prudent Investor Act. The Act applies to all investments made after January 1, 1995, and states in part that:

A trustee has a duty to invest and manage property held in a fiduciary capacity in accordance with the prudent investor standard defined by this section, except as otherwise provided by the express terms and provisions of a governing instrument with the limitations ser forth by section 11-1.7 of the Chapter. This section shall apply to any investment made or held on or after January first, nineteen hundred ninety-five by a trustee.2

Under the prudent investor standard articulated in the Act, a trustee must use reasonable care, skill and caution and make decisions based on the entire portfolio and the terms of the governing instrument.3
When applying the standard, look at the circumstances at the time a decision was made. The portfolio is looked at as a whole and a single investment is not judged in a vacuum.⁴ Therefore, a trustee may not be found to have breached his duty based on a single transaction. This gives the trustee somewhat more leeway when it comes to a single individual investment decision.⁵ A trustee is judged by risk management and the appropriate level of risk for a particular portfolio.⁶

**Investment Results**

1. Does the overall market performance play a role in deciding if a trustee acted prudently?

2. Can a trustee use the defense that losses were inevitable given a down market?

3. Is the trustee exonerated from any wrongdoing if the portfolio had a gain as a result of a questionable investment? A trustee may argue that his ultimate duty is to grow the trust portfolio, and a return that outperforms the market benefits everyone. Therefore, the ends justify the means.

4. Are portfolio losses prima facie evidence of trustee misconduct?

*A trustee is bound to use the same diligence and prudence in the care and management of a trust that prudent men would use in managing their own affairs.*

The Prudent Investor Act looks at trustee conduct and not investment outcome.⁷ A trustee can be found to breach his fiduciary duty even when the portfolio increases in value, because an unrelated upturn in the market should not absolve the trustee of his improper actions.⁸

**Exculpatory Clauses in Trust Documents**

*A trust may contain language dictating a standard of care to which a trustee must adhere. It can also contain investment directives.* The Prudent Investor Rule is meant to apply as a default rule in the absence of an express statement in a governing instrument. In order not to breach a fiduciary duty, a trustee only has to comply with the rule or reasonably rely on a controlling document such as a trust or a will.⁹ The court has held that the governing instrument controls when there is a conflict between the statute and governing instrument.¹⁰ Courts have deferred to a testator’s or grantor’s desires, and are reluctant to override a testator’s intent.¹¹ However, even though a testator or grantor can create a different standard, he cannot exonerate a fiduciary for not using “reasonable care, diligence and prudence.”¹²

A provision in a document which relieves a trustee of an essential fiduciary element will be held null and void.¹³ Provisions which require beneficiaries to accept accountings in order to receive benefits,¹⁴ prevent beneficiaries from objecting,¹⁵ or allow a trustee to retain assets and not be held liable for decreases,¹⁶ are void as against public policy and will not exonerate a trustee from his duty. Therefore, a trustee cannot shirk his fiduciary duty by blindly relying on a clause in a will or trust. The drafter of a controlling document must also be mindful of this if he wishes to limit a fiduciary’s liability. An overbroad exculpatory clause may be stricken by the court, thus defeating the original intent of the settlor or testator.

Courts may also look to who drafted the document. If a trustee or trustee’s firm assisted the settlor or testator in drafting the document and the exculpatory clause, a court may rule that the trustee drafted the clause to protect himself, thus breaching his fiduciary duty.

*A trustee is allowed to deviate from the provisions a testator provided if the trustee intended to authorize the conduct.*
deviates from the document in order to preserve the testator’s or settlor’s intent. In re Terranova, the trust settlor wanted to provide the beneficiaries with income. At the time the trust was funded, fixed income securities had less risk and had high interest rate yields. The trust restricted investments to fixed income securities to achieve the settlor’s intent. When interest rates decreased, the court allowed the trustee to invest in different assets to balance out the loss in income, in order to carry out the testator’s wishes to provide a steady income stream to the beneficiaries. In addition, when unproductive property is placed in a trust, the trustee normally has a duty to convert the property so that the beneficiaries receive income from more productive property.

Diversification

Under the Prudent Investor Act, is a trustee required to diversify the trust assets? People generally tend to equate a diverse portfolio with prudence because a diverse portfolio generally will not have each holding react in a similar fashion to the same market effect. Therefore, in theory, all of the trust positions would not simultaneously decline based on a single event or market force. Prior to the Act, trustees were not required to diversify.

Section (C) from The Prudent Investor Act requires a trustee:

“to diversify assets, unless the trustee reasonably determines that it is in the interest of the beneficiaries not to diversify taking into account the purposes and terms and provisions of the governing instrument.”

It would not be presumed that the trustee breached his duty by failing to diversify. The court will look at the factors surrounding the trustee’s decision not to diversify on a case by case basis. Liquidity of assets, tax consequences, and settlor intentions are some of the factors a court will consider.

The court will look at the factors surrounding the trustee’s decision not to diversify on a case by case basis.

In the Matter of Hyde, a trust was funded with large amounts of the stock of a closely-held corporation, which was not sold to diversify the portfolio. The settlor of the trust funded the trust with stock of a closely held corporation that he founded. His daughters were the trust beneficiaries. The corporation had two classes of stock. The Class A shares had the voting rights, but would only receive $.01 per share if the corporation was liquidated. The Class B shares had no voting rights, but would receive the remaining proceeds of the liquidation of the corporation. This created a state of gridlock, whether intended or not, since it would not make financial sense for the Class A shares to vote for a liquidation.

The trust beneficiaries sought an accounting and they brought an action against the trustee for failure to diversify. The court determined that the trustee acted properly in not selling the stock and diversifying the portfolio. First, the corporate shares were not liquid and would have to have been sold at a deep discount. Second, the stock paid a considerable dividend and it would have been questionable to give up that dividend in light of the discounted sales price. In addition, given the structure of the stock, it appeared that the settlor wanted the stock of the family business to remain in the family and not be sold.

There is no fixed time by which a trustee must diversify if diversification is determined to be the prudent position. The court will look at the overall circumstances and actions of the trustee. Capital gains tax rates and market movements are two factors that may be considered. The court may also examine the availability of alternative investments when determining if diversification is prudent.
Given the recent bank failures and scandals involving money managers, a new issue may arise involving diversification. Should a trustee “diversify” a portfolio by not depositing all investments with a single institution? Although this issue may be litigated over the coming years, you could conclude that a trustee could have all assets with one institution if the trustee had no reason to believe that there was improper conduct taking place or that an institution was in financial jeopardy. You might look at the overall financial health of the institution, its experience and investing record, and the returns of a certain institution relative to market performance. A trustee should have a good faith reason why money was placed with a certain institution.

A beneficiary who consents to certain trustee conduct cannot hold the trustee liable for any losses resulting from the conduct.

The following should raise a trustee’s concerns about a financial advisor or institution:

- Unusually high returns in relation to market performance
- Guarantees of future returns
- Unauthorized transactions
- Unusual or unexplained fees
- Lack of transparency and communication on behalf of the institution
- Failure or reluctance to explain investments
- Any activity which makes the trustee suspicious or uncomfortable

Beneficiary Consent

A beneficiary who consents to certain trustee conduct cannot hold the trustee liable for any losses resulting from the conduct. In order for the consent to be valid, the beneficiary must be apprised of the effect of the ratified acts and all available legal remedies. A beneficiary may withdraw consent and a trustee would then be liable for any continuing improper conduct. This is especially true if the settlor of the trust is a beneficiary. Minors may object to improper investments even if consent was given on their behalf. A trustee may not be exonerated or excused by consent from an essential fiduciary element such as not accounting for the assets of the estate to the beneficiaries.

A beneficiary’s silence or failure to object will generally not be construed as consent. The duty is not on the beneficiary to object. However, situations may arise when silence equals estoppel. In re Packards Estate, the trustee invested trust funds in mortgages which were not authorized by law. The beneficiaries were informed of the investments in writing and wrote back to the trustee that they understood the investments and requested that the trust continue with the investments. The beneficiaries never objected to the investments or sought an accounting for a 21 year period.

The real estate market then collapsed, and the mortgages were not paid. The beneficiaries then sought to surcharge the trustee for the investments. The court ruled that the beneficiaries could not object since they had never inquired into the investments, never objected to the investments made and acquiesced in writing to the investments being made.

Trustees often discuss investments with beneficiaries and may get their input when making investment decisions. Trustees may have the beneficiaries sign an agreement consenting to certain investment strategies. An agreement does not completely exonerate a trustee from advising and counseling beneficiaries. In the Matter of the Estate of John P. Saxton, a testamentary trust was created naming the decedent’s wife as income beneficiary, with his two children named as residuary beneficiaries. The trust was managed by a professional trustee. The trust was funded
in part with IBM stock. The beneficiaries executed an **Investment Direction Agreement** (IDA) which permitted the trustee to hold the IBM stock and not diversify the portfolio and stated that the beneficiaries would not hold the trustee liable for any loss in value of the stock. Twenty-four years passed and the beneficiaries began to meet with the trustee and demand a diversification plan. The trustee admitted to never consulting, recommending, or even discussing diversifying the portfolio or considering the capital gain tax consequences. During the time that the trust held the stock, it was known within the financial community that IBM’s financial condition was deteriorating. The trust was not diversified, IBM stock declined in value, and the trustees commenced an action to surcharge the trustees for the losses.

The question for the court was whether the IDA absolved the trustee from any breach of duty. The court held that since the bank had its own policy of diversifying assets, held itself out as a professional advisor, and did not offer the same advice regarding IBM stock as it did to its other clients, it had breached its fiduciary duty.

**Capital gains tax rates and market movements are two factors that may be considered.**

The court acknowledged that a trustee is afforded some protection through an IDA. A trustee is allowed to rely upon an IDA to deviate from a regular investment pattern for a reasonable period of time as long the beneficiaries agree and the trustee does not completely abdicate his responsibilities. Although there is no hard and fast rule, the court felt that a fiduciary should reaffirm an IDA at least every four years. The court went on to say that a trustee should reaffirm an IDA within 30 days of any repudiation or disagreement among the beneficiaries. The court felt that this was not an unreasonable burden on a corporate fiduciary given modernized computer recording and accounting systems. A trustee should not simply rely on the trust document or any investment direction agreement (IDA) and feel they are shielded from any breach of fiduciary duty.

**Professional Trustees**

A trustee who holds himself out as an investment advisor has a superior duty to a beneficiary. This superior duty is recognized in the Surrogates Court Procedure Act Section 2312 in allowing professional fiduciaries to charge higher fees for their services than non-professional trustees. A professional trustee is expected to offer the same advice and counsel as it would its non-trust clients. An investment agreement which stated that a mother (who was her son’s guardian) read and agreed to certain mutual fund prospectuses, thus shifting responsibility from a trust company trustee, is void as it is against public policy.

Courts will defer to an IDA if the beneficiaries are in agreement as to the investment strategy. An IDA cannot be blindly relied upon when some or all of the beneficiaries are not in agreement. The trustee must also advise the beneficiaries as to the investment strategies despite an IDA.

Under the Prudent Investor Act, a trustee may employ a professional advisor to manage the trust funds with the beneficiaries’ consent, but must continue to carry out its duty to any non-consenting beneficiaries. However, a trustee must then monitor the activities of the professional advisor and cannot simply abdicate all responsibility.

**Breach of A Trustee’s Duty**

What if a trustee is found to have breached its fiduciary duty? Courts have ruled that a trustee who failed to properly diversify assets was responsible for lost capital. Trustees held for improperly hiring an investment advisor would
be liable for commissions paid to the advisor.39

Generally speaking, all fiduciaries are treated as a single entity; however, the courts will also apportion liability among the respective trustees. In the Matter of the Estate of Dorothy C, Witherhill,40 Witherhill hired the respondent Barker as her attorney and financial advisor. Respondent Ritchie was Barker’s legal secretary and then served as Witherhill’s administrative assistant and then as her attorney-in-fact. Barker and Ritchie became co-executors of Witherhill’s estate, with Barker making the financial decisions.

The sole estate beneficiary objected to the estate accounting, and the court surcharged the co-executors for losses incurred and denied Barker’s commission. The court ruled that Barker held himself out as a professional advisor and was compensated accordingly. Therefore, he had to exercise the diligence that a professional investment advisor should exercise, and failed to do so. It was also discovered that Barker made significant investment decisions without ever consulting Ritchie. The court felt that since Ritchie was unaware of Barker’s misfeasance and the passive role that Ritchie had taken, Ritchie was not jointly and severally liable and could be assessed in proportion to her conduct.

Conclusion

In New York, a trustee’s actions for investments made after January 1, 1995 are judged under the Prudent Investor Act. A trustee may not be required to follow the Act if the controlling instrument allows him to deviate from it. However, a trustee must always use reasonable care and skill when investing and must perform all essential duties of a fiduciary regardless of what the controlling document states. In addition, professional trustees should always manage trust investments with the same diligence used when managing non-trust funds.

Courts look at the actions of a trustee, and

The court may also examine the availability of alternative investments when determining if diversification is prudent.

not the results, to determine proper conduct. Factors considered by the trustee at the time of the decision, as well as the surrounding circumstances, are considered. Failing to diversify is not an automatic determinant of whether a trustee breached a fiduciary duty. With the recent market decline and investment controversies, it is likely that courts will have to decide more cases with respect to trustees’ investment decisions in the near future.

(Please note that the preceding article is for information purposes only and is not intended to be legal advice. All issues discussed in this article are of a complex nature. Always seek the assistance of an attorney when faced with any of the issues discussed.)

References

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3. N.Y. Est. Powers & Trusts Law 11-2.3 (b)(3)
7. N.Y. Est. Powers & Trusts Law 11-2.3 (b)
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<th>Trustee Liability under the New York Prudent Investor Act</th>
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<td>21. N.Y. Est. Powers &amp; Trusts Law 11-2.3 (c)</td>
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<td>27. <strong>Sherman v. Parish</strong>, 53 NY 483, 1873 WL 10393(1873)</td>
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<td>33. <strong>In re Packard’s Estate</strong>, 146 Misc. 65, 261 N.Y.S. 580 N.Y.Sur. 1932</td>
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<td>35. <strong>NY Surrogates Court Procedure Act Section 2312</strong></td>
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<td>38. N.Y. Est. Powers &amp; Trusts Law 11-2.3 (c)</td>
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Executive Summary

Financial crisis seems to be an intrinsic part of an economic cycle and system. When one occurs, it cuts deeply into the gains previously secured. If anticipated, perhaps proper protective measures could be taken to soften the impact. Reinhart and Rogoff (2008) have developed a Five Element Model (FEM) as a predictor of financial crisis. The five variables are housing prices, equity prices, current account balance as a percentage of gross domestic product (GDP), real GDP growth per capita and public debt. The objective of this paper is to test whether the FEM could have been able to predict the 1907 financial crisis, which occurred in a pre-Federal Reserve environment. This is a unique application since Reinhart and Rogoff’s FEM was only tested on post-Federal Reserve crises. This analysis shows compelling parallels in conditions leading up to the 1907 crisis to those of other crises, suggesting a reasonable conclusion that the FEM has effectiveness that is also relevant in the pre-Federal Reserve era.

I. Introduction

Financial crisis as a study has commanded much attention throughout the years, both in academic and business circles. To capture the economic pattern displayed by these financial trends, Reinhart and Rogoff have developed a five element model using:

1. Housing prices.
2. Equity prices.
3. Current account balance as a percentage of GDP.
4. Real GDP growth per capita.
5. Public debt to predict financial crises.

The FEM looked at 18 financial crises that have occurred since World War II in developed countries. The big five are Spain (1977), Norway (1987), Finland (1991), Sweden (1991) and Japan (1992), and a second group of thirteen other banking crises that occurred at different times in the following countries: Australia (1989), Canada (1983), Denmark (1987), France (1994), Germany (1977), Greece (1991), Iceland (1985), Italy (1990), New Zealand (1987), United Kingdom (1974, 1991,1995) and the United States (1984). These crises were also compared to the 2007 U.S. Sub-Prime Crisis. The model holds that the crises studied “share striking similarities” (Reinhart and Rogoff, 2008 p.10) leading up to each crisis and in the aftermath of each event.

The objective of this paper is to validate or negate the veracity of the FEM model when applied to a pre-Federal Reserve period. We have chosen to test the FEM in 1907 since all of the crises that were tested by Reinhart and Rogoff took place after the establishment of the Federal Reserve. The crisis of 1907 was the actual impetus for the Federal Reserve. It is of research significance to determine how similar or dissimilar a crisis that occurred during the developmental stages of the U.S. economy is to those crises that occurred after economic maturation.
This paper is organized in the following format:

- **Section II** presents the literature review of the various economic thinking and models that seek to predict financial crises, along with those specifically related to the 1907 crisis. It concludes with the seeming similarity that the 1907 crisis had with the financial crisis of 2007.

- **Section III** introduces the research methodology used in this study to explore whether the FEM could have predicted a financial crisis in a pre-Federal Reserve environment.

- **Section IV** provides the analysis and conclusion gleaned from studying the dataset.

### II. Literature Review

A body of literature has developed that says financial crises are cyclical in nature and follow rather naturally and predictably after a period of rapid economic growth, in an economic environment that is more or less overloaded with the extremes of the growth. Gieve (2008) contends that an upward momentum increases asset prices leading to overconfidence, which then translates into imprudent lending at the top of the business cycle. This is followed by a downward movement in prices, increasing default and contraction in lending. Rapid growth is a contributing factor to financial crises according to Rancier, Tornel and Wastern (2005). Keynes (1936, p.31) called it “insufficiency of effective demand” when business output and demand are not in equilibrium, which represents too much output for the market to absorb. The economy becomes saturated and can no longer expand, so a bust is the relief for the economic bubble, which has dire consequences.

Kindleberger (2005) describes financial crises as hardy perennials which are inevitable since “a bubble involves a non-sustainable pattern of price changes of cash flows (p.1). He attributes the implosion of the asset price bubble to a contagion effect that is experienced in other sectors of the economy. This is supported by the experience of the 2007 housing market run up that peaked and ebbed along with a similar pattern that was experienced within the stock market.

Kindleberger (2005) also describes in detail the Minsky model used to interpret financial crises. There are basically five stages in Minsky’s model of the credit cycle: displacement, boom, euphoria, profit taking and panic. His writings were interpretations of Keynesian economics and how they apply specifically to the theory of financial crisis. According to Keynesian economics, the market is out of equilibrium when there is market uncertainty, which is an underlying condition in financial crises. Minsky developed this idea of uncertainty to cover irrational exuberance in boom economies which lend themselves to bust economies. Minsky, thereby, does not accept the “efficiency hypothesis” of Eugene Fama (which argues that at any given time, asset prices fully reflect all available information), and has developed what is known as the “financial instability hypothesis” which proclaims that stability eventually leads to instability which lends itself back to stability. This is essentially the boom-and-bust cycle phenomenon which implies that financial crises are part of the expected financial landscape and occur in intervals of every few years.

The boom-and-bust cycle phenomenon... implies that financial crises are part of the expected financial landscape and occur in intervals of every few years.

Canova’s (1994) research paper on “Were Financial Crises Predictable?” empirically tested whether financial crises from 1880–1914 (known as the Banking Era) were predictable in the United States. It covered eight crises.
with their duration in months (in parenthesis) as follows: 1880 (6), 1890 (9), 1893 (5), 1899 (12), 1901 (5), 1903 (3), 1907 (10) and 1914 (8). He used the definition of a crisis as that of Friedman and Schwartz (1963), which is a situation where banks are forced to sell assets at a loss to replenish reserves. He tried to identify flagging variables that were germane to these crises in general. He concluded that movements in financial variables such as an increase in short-term interest rates, a drop in asset prices, and a sharp reduction in banks’ excess cash reserves are relevant in predicting a crisis.

[Canova] concluded that movements in financial variables such as an increase in short-term interest rates, a drop in asset prices, and a sharp reduction in banks’ excess cash reserves are relevant in predicting a crisis.

The interest in this study is to determine if the Five Element Model applies to the 1907 Crisis. Its application was tested on many worldwide crisis along with the 2007 Crisis, and striking similarities were found. The object here is to test the FEM on the 1907 Crisis, which has not been done, and then compare the findings to the trends of the FEM for the 2007 Crisis as reported by Reinhart and Rogoff. This will determine the degree of similarities between these two drastically different crises. Thus the 1907 Crisis and the 2007 Crisis are introduced in the following.

1907 Crisis

The Panic of 1907 is referred to as a banking crisis and is an example of an economy that grew too fast, and without regulations. Banking panics were not unusual during pre-Federal Reserve days. Calomiris and Gorton (2000) agreed by stating, “during the period from 1814-1914 the United States experienced 13 banking panics and among these, the Panic of 1907 was the worst.”

The Panic of 1907, which started in May of 1906 and ran through June 1907, occurred during an era when the U.S. economy was largely driven by agricultural products. Tallman and Moen (1990) described the logistics of transporting the crops from Middle America to the East Coast for onward transportation to Europe during the harvest season of 1907. Harvest seasons usually caused a fluctuation in interest rates and stress on the monetary flow of funds. The demand for money caused interest rates to increase. The increase in interest rates typically was attractive to investors who would then increase their bank deposits which would then be recycled back into the economy to finance the shipments. However, at this time there was a collapse in the security market, which reverberated in the banking industry. This also caused a run on the banks and the hoarding of money by the depositors. In the pre-Federal Reserve environment, there was no Federal Deposit Insurance Corporation (FDIC) or central bank to step in to provide liquidity when necessary, as we have seen in recent interventions by the Federal Reserve (Feds). In an analogous way, the FDIC can be viewed as a substitution for government subsidy as noted by Kane and Wilson (1998). Failed banks simply closed and depositors were at a loss.

Hoarding was the most logical reaction by depositors during panics. Those preferring gold presented paper money at the Treasury for redemption (also known as specie payments) causing extreme pressure on the Treasury (Studenski and Krooss, p. 217). In 1907, 90 banks failed, mostly after the failure of the Knickerbocker Trust Company in October of 1907. In 1908 there were 153 failures (Bruner, p. 217 from the U.S. Bureau of Census 1949 p. 273). This resulted in annual national product figures reflecting over an 11% decline for 1906 and 1907, per Friedman and Schwartz, (1963).
Tallman and Moen (1990) also cited the growth and unregulated transactions of the trusts as a contributing factor to the 1907 Panic. Although the trusts were profitable, they concentrated on collateralized loans that were considered riskier. These loans were given to parties that had questionable credit and or questionable cash flows.

Another particular reason cited for the 1907 panic was the Heinze-Morse banking and stock scandal case, which highlighted the linkage between stock market trades and banking crises through the risk imposed by margin trades. Heinze and his brothers held shares in United Copper Company which were used as collateral to secure their banking transactions. When the stock prices declined, the margin calls were made. Impending defaults on these loans led to rumors that the trust companies were going to fail. By the end of one week there was a run on Knickerbocker Trust Company, which spread to several other banks including Lincoln Trust and Trust Company of America. In order to honor the depositors’ requests, the trusts and banks called in outstanding loans to brokers and dealers. In essence the downward spiral effect which was being experienced in the equity market was having a ripple effect in the banking industry (Donaldson, 1993).

The Panic of 1907 is referred to as a banking crisis and is an example of an economy that grew too fast, and without regulations.

During this period, John Pierpont Morgan met with the U.S. Treasury Secretary, George Cortelyou, who announced that the government would give $25 million to New York banks to meet financial emergencies. John D. Rockefeller pledged to deposit $10 million in New York financial institutions to help with the liquidity problems. J.P. Morgan, along with his banking constituents, supplied another $25 million. Soon thereafter, Senator Nelson Aldrich of Rhode Island introduced legislation in 1910 to meet the needs of future crises. On December 23, 1913, the U.S. President signed the Federal Reserve Act. It provided for “the establishment of federal reserve banks, to furnish an elastic currency, to afford means of rediscounting commercial paper, to establish a more effective supervision of banking in the United States and for other purposes” (FRB Boston 1992, p.11).

The 2007 Crisis as a Comparison

One century later, the United States and the world would experience the effects of the Sub-Prime Mortgage Crisis of 2007 that seems to follow a well trodden path. The Sub-Prime Mortgage Crisis refers to the 2006-2007 period when stock and housing prices were increasing in a period of low interest rates. According to The Origins of the Financial Crisis by Baily, Litan and Johnson (2008), there were one dozen factors that caused this financial crisis. Low interest rates, erosion of lending standards, securitization of mortgage loans along with credit default swaps were listed as the obvious causes. However, this national crisis, which morphed into a global crisis, included less obvious causes, which were listed as mark to market accounting, failure on the part of credit rating agencies and credit insurance, along with improper regulation and supervision. Its name changed over time from the Sub-Prime Mortgage Crisis to the Crisis of 200–2008.

Mark to Market accounting replaces historical cost accounting for investments, and requires that the assets be reported at market value. According to Baily, Litan and Johnson:

This has the affect, on the upside of increasing these values which increase asset values and equity and tempt companies to expand lending and over-leverage. When the bubble bursts, asset prices fall too much and banks are forced to contract lending sharply and they may become insolvent if liabilities
exceed the value of the assets when marked to market (p. 43).

Banks extended loans to borrowers who had questionable credit, low income, and/or low to zero down payments. Bordo (2008) states “the default on a significant fraction of subprime mortgages produced spillover effects around the world via the securitized mortgage derivatives into which these mortgages were bundled, to the balance sheets of investment banks, hedge funds and conduits (p. 3). This is the situation when the underwriting banks sell off the mortgages to be pooled into an investment vehicle for investors to acquire. According to Bordo, the housing boom in the U.S. was largely triggered by a long period of abnormally low interest rates, attributed to loose monetary policy from 2001 to 2004; and the bust was likely induced by a rise in rates in reaction to the inevitable inflationary pressure (p.8).

Carr and Beese (2008) list three reasons for the Crisis:

2. Recessionary pressures.

They present that 1980 ended the year with a historically high prime interest rate of 21.5%. In June 2003, the prime rate was 4%, and it had not been that low since 1958. Availability of low interest rates encouraged real estate price inflation, since the supply of credit made housing affordable for first time buyers, those who wished to upgrade, and those wishing to buy a second home. Their study correlates the increase in oil prices that started in 2004 to interest rate increases. In 2004 the Federal Reserve moved from a low interest rate policy to one of a steady increasing policy, which spilled over into the variable interest rate mortgage market.

Morris and Shin (2008) cite leverage as a dominant cause of the Crisis. Leverage ratios are calculated several ways. A familiar computation is to divide total assets by stockholders equity. The higher the multiple means that equity is a lower factor in the asset financing. The situation, especially in the banking/financial sector, is high leverage ratios. It is not uncommon, even post Crisis, for the leverage ratios to range from 15-25 times, which if this ratio is flipped around to Equity over Stockholders Equity calculates in the 7% to 4% range, which is a low percent of equity. This supplies a small cushion which is easily absorbed in economic downturn. Morris and Shin (2008) proposed a prescribed maximum leverage ratio for corporations, which is the case in Switzerland. Their theory is that if there was more equity and less debt, then the financial crisis could have been weathered.

By July 2007, the U.S. Sub-Prime Mortgage Crisis had morphed into a global financial crisis. Some early casualties, such as New Century Financial Corporation, were compelled to cease operations, exit the sub-prime lending business, and file for bankruptcy. By 2008, there were capital crises at many banks including large well-capitalized banks with at least two major banks failing: Bear Stearns (which has been acquired by JP Morgan Chase) and Lehman Brothers (which was acquired by Barclays Capital). A number of other vaunted financial institutions, including Goldman Sachs and Citibank, have sought and received or are receiving bailouts from the federal government, without which they faced certain failure. A series of events led to this precarious situation: homeowners who took on too much debt, the prevalence of adjustable rate mortgages that adjusted in an upward direction for homeowners, predatory lending practices of sub-prime lenders, appraisers inflating home values, investment banks selling mortgage securities without properly testing underlying assets, and even the lack of proper
government oversight are cited for their share of the blame in this morass (Bruner and Carr, 2007). In comparison, the 1907 financial crisis lasted fifteen months from a stock market peak in September 1906 to the trough in November 1907 (Bruner and Carr, 2007). The 2007 Crisis was thirty months, beginning in July 2007 through December 2009, and in the interim became a global crisis. There are parallels between the 2007 Sub-prime financial crisis and the 1907 crisis, including:

- In the 2007 crisis, there were 26 bank failures in 2008 and 141 failures in 2009, so far per FDIC data1 (in addition to Bear Stearns and Lehman Brothers, there were other notable institutions such as New Century Financial Corporation), versus 90 banks that failed in 1907 and 153 failures in 1908 (Bruner and Carr, 2007).
- Value declined by 37% in 1907, affecting virtually every industrial sector (Bruner and Carr, 2007) versus combined losses amounting to several trillion dollars in a $13 trillion economy in 2007 (Minsky Conference 2008, p. 57).
- Collateralized loans (unregulated), those held by the trust companies of 1907, and the collateralized securitized instruments (laxly regulated) of 2007 played detrimental roles.
- There was financial intervention through private funding (a small group of business leaders organized a collective action) in 1907, as well as financial intervention by the Federal Reserve during the 2007 crisis.
- In both crises the meshing of the banking and equity industries had a ricocheting effect on value decline.
- Severe economic contraction led to intense depression in 1908. This followed the same pattern as the economic contraction in 2007, which led to intense recession bordering on depression in 2008.

The Heinze-Morse scandal highlighted the crisis of 1907. In similar manner, the Ponzi schemes such as the Bernard Madoff and Stanford scandals are identified with the 2007 crisis.

Ironically, J.P. Morgan was involved in 1907, and JP Morgan Chase was involved in 2007.

III. Methodology and Data Section

Given the similarities between the two crises, it is our intent to determine if the Reinhart and Rogoff’s Five Element Model could also apply to the 1907 Crisis. This research will attempt to duplicate the methodology used by Reinhart and Rogoff to compare the Panic of 1907 to the 2007 U.S. Sub-Prime Crisis to test the veracity of the FEM. A series of comparisons were conducted on the five variables between the run up to both crises to determine whether there are indeed similarities in the conditions considered during these periods. We graphed the trends in the same manner as did Reinhart and Rogoff, and we examined asset prices (specifically, housing and equity), real economic growth (current account balance as a percentage of GDP and real GDP growth per capita) and public debt. For purposes of illustration, as with Reinhart and Rogoff’s research, period T represents the onset year of the financial crisis. By that convention, period T-4 represents four years prior to the crisis with the examination continuing into T+3 representing three years after the start of the crisis date. With the 2007 crisis, the outcome post three years has not yet come to pass (as of this writing), so T+1 was the last data year.

[Morris and Shin’s] theory is that if there was more equity and less debt, then the financial crisis could have been weathered.
**Exhibit 1. Housing Prices and Financial Crisis**

Exhibit 1 graphs the real Housing Prices using the single-family house price index to depict whether it conforms to case study literature and Reinhart and Rogoff’s (2008) contention that asset prices run up prior to financial crises. The graphed data seems to support this contention in both crises periods examined.


To substantiate the claim that the trend is similar, a paired t-test was added to test these findings. (This test was not applied in the Reinhart and Rogoff’s FEM, but was added here to determine the robustness of the trend). Since the data points were only six for the Reinhart and Rogoff graph, this was expanded to nine, with the added categories of: seven years before, point in time, and one year after to run the statistics.

For \( a=0.05 \), and 9 degrees of freedom, critical \( t = 1.321, p=0.223 \).

A \( p >.05 \) reflects the null hypothesis, \( H_0 \) is accepted. The \((u_1-u_2) = 0\), confirming that the two sample means are assumed to be the same.

---

**Housing Prices**

An analysis of the equity market price index illustrated in Exhibit 2 reflects that the run up in equity prices resembles the archetypical crisis period in both the 1907 and 2007 crises. Exhibit 2 seems to support the run up prior to the financial crisis hypothesis. In 1907, the run up crested at time “T-1” and began to drop earlier than what was experienced in 2007. Reinhart and Rogoff (2008, p. 5) reasoned that the delay in the fall of equity prices experienced in the 2007 crisis was “perhaps because the U.S. Federal Reserve pumped in an extraordinary amount of stimulus in the early part of the most recent episode.”


A paired t-test was added to test these findings in which the data points were again expanded from six to nine.

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**Exhibit 2. Equity Prices (S&P 500) and Financial Crisis**

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**T-Test**

T-TEST PAIRS=SubPrime WITH Panic (PAIRED) /CRITERIA=CI(.9500)

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<th>t value</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
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<td>Pair 2007-1907</td>
<td>1.321</td>
<td>8</td>
<td>0.223</td>
</tr>
</tbody>
</table>

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For a \( =0.05 \), and 9 degrees of freedom, critical \( t = 1.321, p=0.223 \).
For \( a=0.05 \), and 9 degrees of freedom, critical \( t = -1.549, p = .160 \).

A \( p \) value > .05 reflects the null hypothesis, \( H_0 \) is accepted.
The \((u_1-u_2) = 0\), confirming that the two sample means are assumed to be the same.

**T-Test**

T-TEST PAIRS=Sub-Prime WITH Panic (PAIRED)
/CRITERIA=CI(.9500)

<table>
<thead>
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</table>

**Current Account Balance**

Exhibit 3 looks at the current account balance as a percentage of GDP. In general, a negative balance on the current account represents a deficit economy that is a net debtor to the rest of the world and is spending more than it is saving by using resources from other economies to meet its domestic consumption, which is the case with the United States in the 2007 Crisis. Also, in general a positive balance on the current account represents a surplus economy that is a net creditor to the rest of the world and is saving more than it is spending by supplying resources to other economies to meet their domestic consumption, which is the case with the United States in the 1907 Crisis. So the two experiences of the current account balances are starkly different:

- In 1907, the United States had a current account surplus. In 2007, it had a huge deficit.
- In 1907, the current account surplus was quickly depleted and then turned into a deficit. With regard to the 2007 crisis, there is a sustained increase in foreign savings flowing into the purchase of U.S. assets. Reinhart and Rogoff (2008) agree by suggesting that during the same period, the U.S. was on a typical path, with capital inflow rising significantly up to the eve of the crisis (p. 7).

Interestingly, during the four year period leading up to the 1907 crisis, the current account balance/GDP appears to show sustained decreases although still with a positive balance. The current account surplus, albeit decreasing, could have been impacted by the U.S. playing a dominant role in trade around the world at that time.

While the two periods are in different segments (a decreasing surplus for 1907 and an increasing deficit for 2007), they show some movement in the same direction, although the 2007 crisis appears to be more dramatic.


A paired t-test was added to test these findings in which the data points were again expanded from six to nine.

For \( a = 0.05 \), and 9 degrees of freedom, critical \( t = 2.941, p = .019 \).

A \( p \) value < .05 reflects the null hypothesis, \( H_0 \) is rejected, and \( H_1 \) is accepted.
The \((u_1-u_2) \neq 0\), disproving that the two sample means are assumed to be the same.
T-Test

T-TEST PAIRS=Sub-Prime WITH Panic (PAIRED) /CRITERIA=CI(.9500)

<table>
<thead>
<tr>
<th>Paired Samples Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>Pair 2007-1907</td>
</tr>
</tbody>
</table>

Real GDP Growth

Exhibit 4 looks at Real GDP growth, which measures the change in production reflecting the standard of living of the population, with an increase indicating an improvement and a decrease indicating deterioration. Reinhart and Rogoff (2008) opined that real per capita GDP growth will take an inverted V shape, which they observed in previous crises in other developed countries. This indicated a pattern of declining real GDP growth leading up to the crisis and a recovery afterwards.

The 2007 crisis to date shows this pattern with a slight but steady decrease in Real GDP growth, meaning that there is a continuous fall in growth momentum going into the crisis. The 1907 crisis, while exhibiting some growth earlier on, between years T-4 and T-3 and between T-3 and T-2; later, it shows a severe drop in Real GDP growth between T-2 and T-1 and between T-1 and T. Friedman and Schwartz (1963) pointed out that annual national product figures were down by over 11% for 1906 and 1907.

It has been noted that the 2007 crisis stemming from the Sub-Prime Mortgage Crisis is steeped broadly throughout the economy and is, as Baily, Litan and Johnson (2008) say, “wreaking havoc in the market in the U.S. and across the world since August 2007 and had its origins in an asset price bubble that interacted with new kinds of financial innovations that masked risk management procedures, and with regulators and supervisors who failed to restrain excessive risk taking (p.7). The 1907 crisis was more of a cyclical crisis, which had short run shortage of liquidity in an era in which “the economy was thought to be more prone to crises during the planting and harvesting times when the money market was seasonally stringent” (Canova 1994, p. 104).

Exhibit 4. Real GDP Growth per Capita and Financial Crisis


A paired t-test was added to test these findings in which the data points were again expanded from six to nine.

For a=0.05, and 9 degrees of freedom, critical $t = 2.006$, $p = .080$.

A $p > .05$ reflects the null Hypothesis, $H_0$ is accepted.

The $(u_i-u_j) = 0$, confirming that the two sample means are assumed to be the same.
T-Test

T-TEST PAIRS=Sub-Prime WITH Panic (PAIRED)/CRITERIA=CI(.9500)

<table>
<thead>
<tr>
<th>Pair</th>
<th>t value</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-1907</td>
<td>2.006</td>
<td>8</td>
<td>0.080</td>
</tr>
</tbody>
</table>

Public Debt

In Exhibit 5, we examine the pattern of U.S. total public debt obligations. Reinhart and Rogoff (2008) suggest that a rising public debt has played a role in and acted as a precursor to previous financial crises globally in the post-war era. Our goal is to see if this view holds in a pre-war era focusing on the 1907 Crisis. Data shows that public debt for the 1907 crisis period under study was largely unchanged. This does not follow a similar pattern with the upward trend in the period leading to the 2007 Crisis. The 1907 period reflected a time when the U.S. did not have a need to run up public debt. This was a pre-World War environment, and an infrastructure that was rather not as complex.


A paired t-test was added to test these findings in which the data points were again expanded from six to nine.

For \( a = 0.05 \), and 9 degrees of freedom, critical \( t = 1.120 \), \( p = .295 \).

This reflects the null hypothesis, \( H_0 \) is accepted. The \((u_1 - u_2) = 0\), confirming that the two sample means are assumed to be the same.

T-Test

T-TEST PAIRS=Sub-Prime WITH Panic (PAIRED)/CRITERIA=CI(.9500)

<table>
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<td>0.295</td>
</tr>
</tbody>
</table>
The current account surplus, albeit decreasing, could have been impacted by the U.S. playing a dominant role in trade around the world at that time.

IV. ANALYSIS and CONCLUSION

Although they occurred in different eras, there are similarities between these two crises periods. Applying the Reinhart and Rogoff's Five Element Model against the 1907 financial crisis shows interesting results that seem to support the contention of the FEM. We find that movements in four of the five variables are parallel to the movement of the FEM model. These are the run up in housing prices, equity prices, a fall in growth momentum represented by the real GDP growth per capita variable, and public debt.

The one variable, current national account balance, does not move in the same direction. In 1907 the United States had a current account surplus. In 2007, it had a huge deficit. And in 1907 the current account surplus was quickly depleted and then turned into a deficit. Oddly enough, though, on some level they appear to be related. In 1907, the current account surplus decreases, while in 2007 the current account deficit decreases. However, when statistically tested, this similarity is not significant.

The United Stated Public Debt statistically shows a related pattern for the studied period. This is true even though the debt of the United States was relatively unchanged during 1907 and graphically shows increases for 2007. The 1907 period was the time before World Wars I and II. Although World War I lasted only nineteen months, it cost approximately ten times as much as the Civil War, which lasted four years (Studenski and Krooss p.280). It was also the period that was pre-Federal Reserve, pre-New Deal, and pre-Security Exchange Commission and other financially expensive governmental institutions that followed. The United States first allowed government borrowing for war time debt in 1917, when Congress approved the Liberty Loan Act, which allowed for borrowings of up to five billion dollars at 3.5 percent (Studenski and Krooss p.289). Government public debt became mainstream with the auctioning of United States Treasury debt instruments in the form of Treasury Bills and Treasury Bonds, which first occurred in 1929. So although the public debt looks unrelated in the charts, when statistically tested their similarity is significant. Statistically, over the tested time frame, public debt for these two periods is similar.

This study shows that four out of the five elements of the model, when applied to the 1907 Crisis, moved on average in the same direction. It is very clear that a steep run up in housing prices is a precursor to a financial crisis, along with a run up in equity prices — a pattern of declining real GDP growth leading up to the crisis, and a recovery afterwards — but based on the data points and periods examined, this could be either a leading or lagging indicator. Public Debt was consistently in the same range, and the current account did not move in the same way as a precursor to financial crisis in both eras studied.

It is very interesting to compare these two economic events. Although the times were so different, the crises of 1907 and 2007 are quite similar, as can be seen when they are charted according to the Reinhart and Rogoff Five Element Model. It is hard to imagine that all the regulatory changes that have been adopted over these intervening one hundred years has made little difference in deterring a financial crisis which seems to take on an unbridled path all its own, regardless of regulation. Thus, it is reasonable to infer that the resulting similarities prove FEM is quite promising as a predictor model, even in a pre-Federal Reserve environment.
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Endnotes

1 http://www.fdic.gov/bank/individual/failed/banklist.html
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