

# Corporate Debt Maturity and Future Firm Performance Volatility

Meg Adachi-Sato & Chaiporn Vithessonthi

Presented at PIER Research Workshop

July 8-9, 2016

Dr. oec. HSG. Chaiporn Vithessonthi  
Faculty of Economics, Khon Kaen University

Email: [chaiporn@kku.ac.th](mailto:chaiporn@kku.ac.th)

Website: [www.chaiporn.com](http://www.chaiporn.com)

---

---

# An Overview of the Presentation

Introduction

The theoretical model

Central findings from the model

Hypotheses

Sample and empirical strategy

Empirical findings and conclusions

# Introduction

One of the main tenets in finance is that an asset's expected return is a function of risk (see e.g., Fama and French, 1993; Huang et al., 2012; Tinic and West, 1984; Watanabe and Watanabe, 2008).

That is, the expected return is an increasing function of risk.

In this paper, we develop a simple two-period model and show that the riskiness of corporate investment is a decreasing function of corporate debt maturity (hereafter "debt maturity").

# Introduction

We relate future firm performance volatility, which is one way of “ex post” measuring “ex ante” unobservable corporate risk-taking, to debt maturity, which is conceivably a measure of financial risk.

From outsiders’ perspective, levels of corporate risk-taking are usually ex ante unobservable but are known to insiders (i.e., the presence of information asymmetries between insiders and outsiders).

However, outsiders can indirectly infer levels of ex ante corporate risk-taking via “ex post” measures of realized firm performance volatility.

# The Theoretical Model

Our simple two-period model is able to capture and build on empirical evidence that

(1) firms tend to have shorter debt maturity in years prior to banking / financial crises (Brockman et al., 2010; Harford et al., 2014)

and

(2) firms appear to have higher performance volatility in recent years (e.g., Faccio et al., 2011).

Both facts are also documented in this study.

# The Theoretical Model

When firms use debt to finance their investment, they also choose their level of short- and long-term debt. Shortening debt maturity (i.e., increasing the share of short-term debt) subjects firms to a greater level of rollover risk (Acharya et al., 2011; He and Xiong, 2012).

In our model, a macro-level financial shock (e.g., a banking/financial crisis) can occur at the interim period.

# The Theoretical Model

When short-term debt investors anticipate a financial shock to occur with high certainty, they withdraw from the debt markets by not rolling over firms' maturing short-term debt.

Due to lack of the secondary market for long-term debt (or due to illiquidity of the secondary market for long-term debt), long-term debt investors cannot reverse their position at the interim period and thus are more exposed to a financial shock.

# The Theoretical Model

Focusing on the discounted value of net profit of the success state of nature, we show that the investment's probability of success must equal or exceed a certain level (called "the investment threshold") so that the discounted value of net profit of the success state of nature is nonnegative.

Focusing on the investment threshold, we find that **the investment threshold decreases when the share of short-term debt in total debt increases**. Lowering the investment threshold implies that riskier projects (e.g., projects with lower probabilities of success) become investable, allowing firms to invest in riskier projects even if financial leverage remains unaltered.



# Central Findings from the Model

First, having shorter debt maturity allows or induces firms to invest in riskier projects.

The larger proportion of short-term debt in total debt not only allows firms to invest in projects with smaller probability of success but also exacerbates the problem of maturity mismatch.

This insight supports the notion that when firms rely on short-term debt to finance their investment too excessive, the level of corporate risk-taking in the economy becomes substantially higher.

# Central Findings from the Model

Second, investors prefer to buy short-term debt than long-term debt since short-term debt allows holders to be largely exempt from bearing bankruptcy costs prior to the onset of a financial shock and corporate default in the interim period.

The demand for short-term debt results in the higher value of short-term debt and thus the lower return on short-term debt.

# Central Findings from the Model

Third, due to lack of the secondary market for long-term debt (or the presence of illiquidity of the secondary market for long-term debt, investors require the higher return on long-term debt to compensate for bearing additional risk, relative to short-term debt.

# Hypotheses

Building from the insights obtained from our model, we argue that “observable” debt maturity contemporaneously correlates with the level of ex ante “unobservable” corporate risk-taking in investment.

If ex ante corporate risk-taking in investment highly correlates with ex post realized firm performance volatility, debt maturity should be able to explain future firm performance volatility.

# Sample

We test our predictions using a panel data set of publicly listed firms in 10 countries (i.e., six advanced economies, including Germany, Japan, South Korea, Switzerland, the United Kingdom, and the United States, and four emerging markets economies, including Brazil, Indonesia, Malaysia and Thailand) during the period 1991–2013.

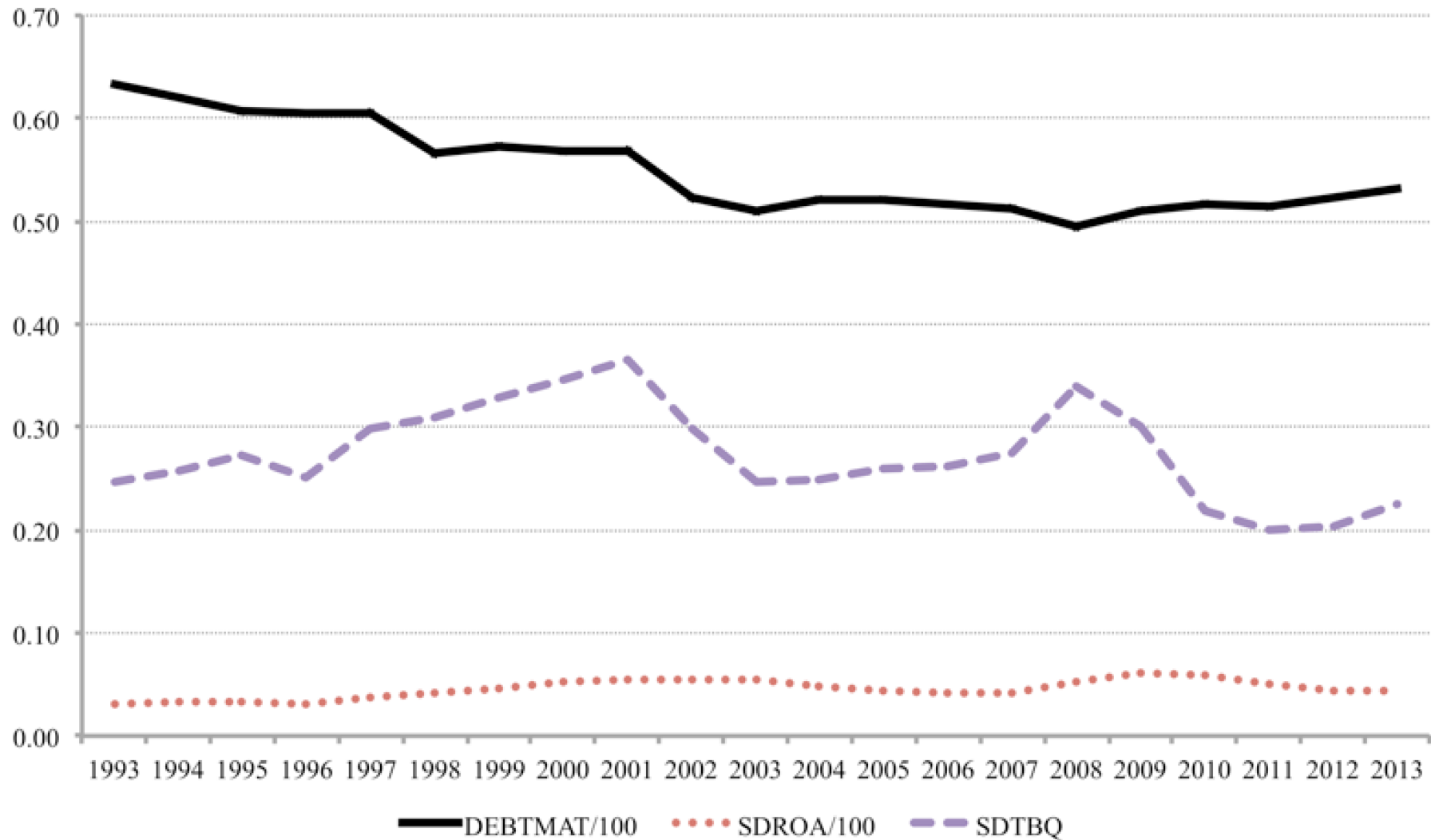
The final sample consists of 95,240 firm-year observations.

# Empirical strategy

We use (1) firm operating performance volatility, measured as the three-year rolling standard deviation of ROA, and (2) firm value volatility, measured as the three-year rolling standard deviation of Tobin's Q, to proxy for firm performance volatility.

To estimate the impact of debt maturity on future firm performance volatility, we employ panel OLS regressions as well as two-stage least squares (2SLS) regressions.

# Debt Maturity, Firm Operating Performance Volatility and Firm Value Volatility



# Empirical Findings

We empirically show that current firm operating performance volatility, which is observed at time  $t$ , is negatively associated with past debt maturity, which is observed at time  $t-3$ , after controlling for a large set of firm characteristics, industry conditions, and macroeconomic conditions.

Our findings are also robust to controlling for unobservable time-invariant firm-specific effects, unobservable time-invariant industry-specific effects, unobservable time-invariant country-specific effects, and year effects.



# Empirical Findings

We show that leverage is positively associated with future firm performance volatility in models that include both leverage and debt maturity. This result is consistent with Faccio et al. (2011) and Bruno and Shin (2014), who find that leverage is associated with firm performance volatility.

We find that capital investment, firm size, the current ratio, the fixed assets ratio, and growth opportunities have a positive effect on future firm operating performance volatility.

Inconsistent with prior studies such as Bruno and Shin (2014), we find that the GDP growth rate is negatively associated with firm operating performance volatility.

# Empirical Findings

Better industry stock price performance, which proxies for industry-level investment opportunities, is negatively associated with firm operating performance volatility.

We find that firm operating performance volatility decreases as the degree of banking sector development increases.

# Empirical Findings

However, we find no evidence for the effect of debt maturity on future firm value volatility, measured as the volatility of Tobin's Q.

We find that capital investment, leverage, growth opportunities, and gross profit margin tend to increase future firm value volatility, while firm size, the current ratio, and the fixed asset ratio decrease it. These findings appear to suggest that corporate investment decisions, profitability and leverage play an important role in explaining future volatility of firm value.

# Empirical Findings

The results of our paper provide new evidence that debt maturity and “unobservable” ex ante corporate risk-taking are more likely to be highly correlated, given that debt maturity is negatively associated with future firm operating performance.

# Empirical Findings

Our findings, by quantifying the relationship between debt maturity and future firm performance volatility, are relevant for banks' loan officers considering loan applications.

That is, when assets with long maturity are financed with shorter debt maturity, it is possible that firms are more likely to have higher corporate risk-taking.

This finding is important because the effect of debt maturity on future operating performance remains evident even after controlling for growth options. Scholars such as Harford et al. (2014) note that firms with higher growth options (e.g., proxied by MBV) should have shorter debt maturity.

# Empirical Findings

Our results show that the degree of banking sector development and the level of export intensity play an important role in explaining firm operating performance volatility.

That is, firm operating performance volatility is negatively associated with the degree of banking sector development and is positively associated with the degree of export intensity.

The magnitude of economic impact of both variables is larger than that of the GDP growth. The findings suggest that policymakers may be able to curb the firm's risk-taking by promoting the banking sector development.

# Conclusions

Corporate debt structure maturity has been the subject of interest in corporate finance.

We build a simple two-period model to analyze the effect of debt maturity on the riskiness of corporate investment.

We argue that debt maturity correlates with future firm performance volatility and test our prediction empirically using a sample of firms in 10 countries over the period 1991–2013.

Our empirical results show that debt maturity has a negative effect on future firm operating performance volatility but has no effect on future firm value volatility.