

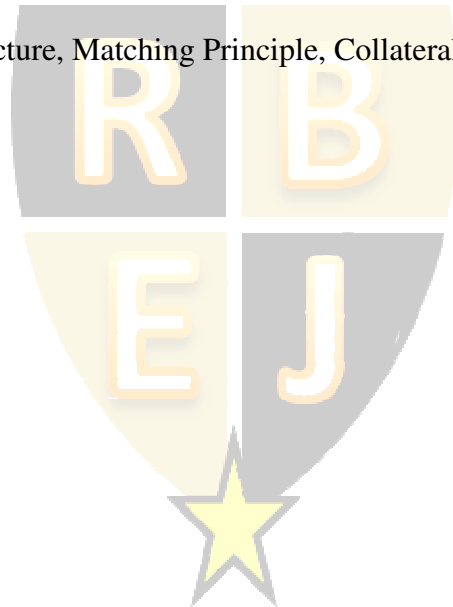
## Determinants of short-term debt financing

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### ABSTRACT

In this study, it is shown that both theories put forward to explain the amount of short-term debt financing that a firm employs have validity. The matching principle correctly predicts that the amount of short-term debt financing that a firm uses is directly related to the quantity of the firm's current assets. Additionally, other factors that have been shown to affect the levels of long-term debt financing that a firm employs are also shown to affect the amount of short-term debt financing that a firm uses. Specifically, the amount of firm short-term debt financing is shown to be inversely related to the amount of the firm's non-debt tax shields, growth opportunities, product uniqueness and firm size. Additionally, short-term debt financing was found to be directly related to the quantity of tangible assets the firm owns.

**Keywords:** Debt, Capital Structure, Matching Principle, Collateral, Financing



## **INTRODUCTION**

The matching principle of finance is the standard theory used to explain the amount of short-term debt financing and other current liabilities that a firm has on its balance sheet. Briefly, the theory states that firms should finance their short-term assets with short-term liabilities (Guin (2011)). This implies that the amount of short-term debt financing that a firm uses depends on the amount of the firm's short-term assets and its other sources of short-term financing. However, since short-term debt has characteristics that are similar to the characteristics of long-term debt, the factors that have been shown to affect the amount of long-term debt financing that a firm uses may also affect the amount of short-term debt financing a firm employs. These factors include firm size, profitability and market-to-book ratio. The purpose of this study is to determine whether the matching principle fully explains the amount of short-term debt financing that a firm employs or if factors that affect the amount of long-term debt financing that a firm uses also affect the amount of short-term debt financing that a firm employs.

## **SHORT-TERM DEBT THEORY**

According to the matching principle of finance, short-term assets should be financed with short-term liabilities and long-term assets should be financed with long-term liabilities (Guin (2011)). Short-term assets and liabilities are generally defined to be those items that will be used, liquidated, mature or paid off within one year (Guin (2011)). A firm's current assets (including cash, inventories, accounts receivable, etc.) are generally considered short-term assets while plant and equipment are generally considered long-term assets. Nevertheless, current assets can be long-term if they are not completely used or liquidated during the year. For example, suppose a firm's raw materials inventory is used and replenished periodically so that the level of inventory varies between \$600 and \$900 during the year. The minimum level of raw materials inventory (\$600) is effectively a long-term inventory investment as the inventory level never drops below this amount. The difference between the maximum and minimum values (\$300) is a temporary inventory investment that is liquidated at some point during the year. On the other side of the balance sheet, current liabilities (accounts payable, short-term debt, etc.) are usually considered short-term liabilities while long-term debt (debt with a maturity of more than one year) and equity capital are considered long-term liabilities. However, current liabilities can be a source of long-term financing if they are not completely paid off during the year. For example, assume a firm periodically receives and pays off short-term loans in such a way that the firm's short-term loan balance varies between \$300 and \$500 during the year. The \$300 minimum loan balance is effectively a long-term source of financing while the difference between the maximum and minimum loan balances (\$200) is short-term financing that is paid off during the year.

Notwithstanding the above, if it is assumed that a firm's current assets (CA) and current liabilities (CL) are short-term assets and short-term financing, respectively, the matching principle implies that a firm's current assets should equal its current liabilities. Next, define spontaneous current liabilities to be liabilities whose values change during the year without any explicit action by the firm's managers. For example, when a firm grows it generally purchases more goods and services from its suppliers resulting in a spontaneous increase in accounts payable. Assuming current liabilities, other than short-term debt, are relatively spontaneous

sources of financing then the firm's short-term financing choice variable is short-term debt. Accordingly, the matching principle implies that a firm should adjust its short-term debt financing until the amount of the firm's current liabilities equals the amount of its current assets. Defining other current liabilities (OCL) to be all current liabilities except short-term debt (STD), then the amount of a firm's short-term debt should be equal to the amount of its current assets less other current liabilities ( $STD = CA - OCL$ ). The matching principle thus implies that a firm's short-term debt financing should vary over time as the amount of the firm's current assets and other current liabilities change. This implies that there are at least two ways that a firm's short-term debt financing can change. One is if firm size changes. For example, if a firm grows the amount of its current assets will likely increase as well. To maintain the  $CA = CL$  equality, if current assets increase then so must current liabilities. An increase in spontaneous current liabilities is likely to account for part, but not all, of the increase in current liabilities. Consequently, the firm will have to increase the amount of its short-term debt financing as well. Conversely, if the firm's current assets decrease the amount of its short-term debt financing and other current liabilities should decrease also. This will be called the size effect on short-term debt and implies a direct relationship between short-term debt financing and the firm's current assets balance.

A second source of change in a firm's short-term debt financing may exist if short-term debt and other current liabilities are substitute forms of short-term financing. Holding current assets constant, if the amount of a firm's spontaneous current liabilities increases the firm will have less need for short-term debt financing to finance its short-term assets. Conversely, if spontaneous short-term financing decreases the firm will need to increase the amount of its short-term debt financing. This will be called the substitution effect and implies an inverse relation between short-term debt financing and other current liabilities. In a regression with short-term debt as the dependent variable and current assets and other current liabilities as explanatory variables, the size effect implies that the coefficient of current assets should be positive while the substitution effect implies the coefficient of other current liabilities should be negative.

Additionally, short-term debt could be used as permanent source of financing if the debt is continually refinanced as it matures. One reason to use short-term debt as a permanent source of financing is to take advantage of an upward sloping yield curve to reduce the firm's interest expense. When the yield curve is upward sloping, as it usually is, the interest rate on short-term debt is lower than the interest rate on long-term debt. Thus, using short-term debt as a long-term source of debt capital financing should reduce the firm's interest expense. There are, however, at least two sources of risk associated with continually refinancing short-term debt. One is default risk. If for one reason or another, lenders do not wish to refinance the firm's debt when it matures, the firm will be in peril of default if sufficient capital is not available to retire the debt. The other risk is the risk that the interest rate charged on the refinanced debt will rise and cause the firm's interest expense to rise. Both the default risk and the interest rate risk are continuing risks that a firm faces every time it refinances its short-term debt. The sum of these two risks will be called refinancing risk. If the firm feels that the interest expense savings are large enough to compensate for the refinancing risk incurred the firm may be willing to use continually refinanced short-term debt as a permanent source of financing. If not, long-term debt could be used to finance a firm's permanent current assets. That is, if a firm found the refinancing risk associated with rolling over its short-term debt unacceptably high, they could reduce the risk by substituting long-term debt financing for the continuously refinanced short-term debt. The disadvantage of doing so would be to increase the firm's interest expense.

The second theory of short-term debt determination tested here is that the factors that have been shown to affect the amount of long-term debt financing that a firm employs also affect the amount of short-term debt financing a firm uses. For example, the interest paid on both short-term and long-term debt is a tax deductible expense that generates a tax saving (interest tax shield) for the firm. Other tax shields that can reduce the value of the interest tax shield, like depreciation and amortization expense, have been shown to reduce the amount of long-term debt financing that a firm uses. Since depreciation and amortization expense would also reduce the value of the interest tax shield generated by short-term debt, they might also affect the amount of a firm's short-term financing. Other factors that have been shown to affect the amount of long-term debt financing that a firm employs will be discussed below. See Fama and French (2002) and Flannery and Rangan (2006) for a detailed discussion of the factors that affect long-term debt financing.

### **SAMPLE SELECTION**

An empirical examination of the factors that affect the amount of short-term debt financing that a firm employs is conducted as follows. For each year from 2001 through 2007 an initial sample of firms was taken from all firms listed on the current and research files of the COMPUSTAT data base. Firms in the financial services or utilities industries were excluded from all annual samples. Companies with non-positive book value of common equity, negative values for short-term debt and current liabilities to current assets ratios of five or better were also excluded from the annual samples. To be included in the initial sample for a year a firm must have sufficient data available to calculate the firm's book and market short-term debt ratios. A firm's book short-term debt ratio (BSDR) is defined to be short-term debt divided by total assets. Short-term debt includes short-term loans and commercial paper. A firm's market short-term debt ratio (MSDR) is defined to be book short-term debt divided by the market value of the firm. Firm market value is calculated as total assets less book common equity plus market common equity (common shares outstanding times share price). This procedure yielded initial annual sample sizes ranging from 4,358 to 5,250 firms. Table 1 contains the mean values of selected variables for the sample firms for three sample years. Looking at the short-term debt ratios, it is apparent that firms are using less short-term debt financing than they have in the past. The mean BSDR declined from 2.9% in 2001 to 2.0% in 2007 while the mean MSDR declined from 2.5% to 1.2% over the same period. This is confirmed by looking at the mean dollar value of firm short-term debt, which declined from \$142 million in 2001 to \$106 million in 2007. Mean long-term debt financing however increased markedly over the sample period, rising from \$458 million in 2001 to \$744 million in 2007.

Another interesting fact revealed by the data is that mean current liabilities is significantly less than mean current assets in each of the sample years. Additionally, the mean current liabilities divided by current assets ratio has remained fairly stable over the sample period varying between 57% and 59%. That is, firms are only financing 57% to 59% of their current assets with current liabilities. A matching principle interpretation of this result is that, on average, firms view 41% to 43% of their current assets as long-term assets that should be financed with long-term liabilities. This should be viewed as a lower bound on the percentage of current assets that are being financed with long-term liabilities as firms could be using permanent amounts of short-term debt to finance some of the current assets. Another fact revealed by the data is that the average sample firm has experienced significant growth over the sample period as

mean total assets increased from \$2,351 million in 2001 to \$3,979 million dollars in 2007. Cash holdings, which include currency, bank deposits and short-term marketable securities, doubled over the sample time period. This growth is mirrored in the mean values of all the other variables in table 1 (that are not ratios) except short-term debt.

## EMPIRICAL ANALYSIS

In the first part of the empirical analysis, the sample firms' book short-term debt ratio is regressed on variables the matching principle suggests should be related to short-term debt financing. The results of these regressions, which use data from all of the sample years, are contained in table 2. To minimize the heteroskedasticity of the regression errors all explanatory variables in tables 2 and 3 are scaled by total assets. Additionally, all test statistics of the regression coefficients in all regressions are calculated using White (1980) heteroskedasticity adjusted standard errors. In the first regression in table 2 the coefficient of current assets (Current A.) is positive and significant at the 1% level. The positive coefficient of current assets indicates that, as predicted by the matching principle, an increase in short-term debt is used to partially finance increases in current assets. The coefficient of other current liabilities (OCL) is also positive and significant at the 1% level. This finding is inconsistent with the predictions of the matching principle. In the second regression one specific current liability, accounts payable (Acct. Pay.), is substituted for OCL. As with OCL, the coefficient of accounts payable is positive and significant at the 1% level. In the last regression, three of the major components of current assets (cash, inventories and accounts receivable) are used in place of current assets as explanatory variables. The coefficients of inventories (Inven.) and accounts receivable (Acct. Rec.) are both positive and significant at the 1% level. These results suggest that short-term debt is used to partially finance increases in both inventories and accounts receivable. The coefficient of cash, however, is negative and significant at the 1% level. This suggests a more complicated relationship between cash and short-term debt than is implied by the matching principle. Specifically, firms with large operating cash flows use those cash inflows to pay down short-term debt and increase their cash holdings. Conversely, firms with low operating cash flows are forced to draw down their cash reserves and increase their short-term borrowings to finance firm operations. Additionally, the coefficient of other current liabilities has become negative and significant at the 1% level. This is consistent with the matching principle prediction that short-term debt and other current liabilities are substitute methods of financing short-term assets.

In table 3, the market short-term debt ratio is employed as the dependent variable in the regressions. The results of these regressions are very similar to those reported in table 2 where book short-term debt ratio is used as the dependent variable. Specifically, firm market short-term debt ratio is shown to be directly related to firm current assets, accounts payable, inventories and accounts receivable and inversely related to cash. The coefficient of other current liabilities is again positive in the first regression and negative in the third. All the coefficients are significant at the 1% level. Most of these results support the matching principle explanation of firm short-term debt financing.

Next, a test is performed to see if the same factors that affect the amount of long-term debt financing that a firm employs also affects the amount of short-term debt financing that a firm uses. Numerous studies have shown that certain variables, like firm size and profitability, affect the amount of long-term debt in a firm's capital structure. A brief discussion of these variables and their effects on firm debt financing follows. As larger firms have been found to

employ more long-term debt in their capital structures, the natural log of total assets (Assets) is used as a size proxy. It is believed that larger firms have better access to credit markets and, consequently, use more debt financing in their capital structures. The profitability measure used is earnings before interest and taxes divided by total assets (EBIT). Firm profits have been shown to be inversely related to the amount of long-term debt capital a firm employs. Contrary to these findings, theory says that more profitable firms are thought to be better able to service their debt and, therefore, should use more debt financing. Net property, plant and equipment divided by total assets (PPE) is used to proxy for the quantity of tangible assets that a firm owns. More tangible assets are associated with a greater use of long-term debt financing. It is believed that tangible assets provide better collateral for firm borrowings and, consequently, firms with more tangible assets can borrow more. Depreciation and amortization divided by total assets (Depr) is used to measure the quantity of non-debt tax shields the firm has available. The level of depreciation and amortization expense is inversely correlated with the amount of long-term debt in a firm's capital structure. Theoretically, non-debt tax shields should reduce the amount of debt financing that a firm employs because they reduced the expected interest tax shields the debt will generate. The market to book ratio (M/B) is used to capture company investment opportunities. The market to book ratio is calculated as total assets less book value of common equity plus market value of common equity divided by total assets. Firms with more investment opportunities generally employ less long-term debt in their capital structures. It is believed that firms with larger growth prospects have less debt in their capital structure because lenders consider growth prospects to have little collateral value. Assets uniqueness is measured by research and development expense divided by total assets (R&D). The more R&D expense a firm has the less long-term debt they usually have in their capital structures. Unique assets are thought to have lower collateral values and, therefore, support lower debt levels.

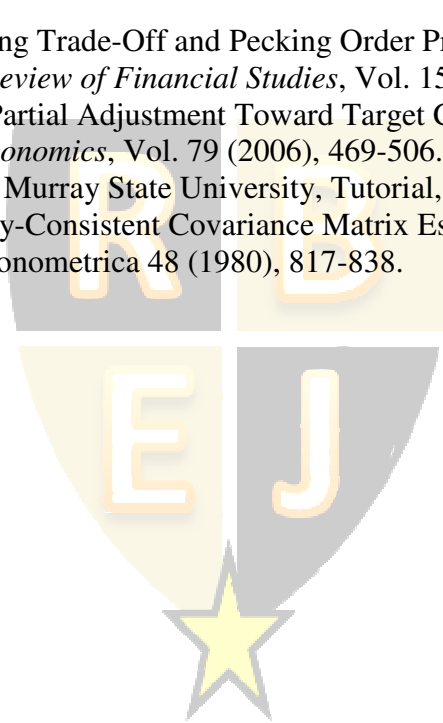
In the second regression in table 4, market short-term debt ratio is regressed on two matching principle explanatory variables (current assets and other current liabilities) and six explanatory variables shown to affect a firm's long-term debt financing. Both current assets and other current liabilities are scaled by total assets. As in previous regressions, the sign of the coefficient of current assets is positive and significant at the 1% level. Thus, even when other factors that affect firm debt financing are included in the regressions, the matching principle is still effective in explaining variations in firm short-term debt financing. Many of the other variables that have been shown to affect the amount of long-term debt financing that a firm employs are also effective in explaining the amount of short-term debt financing that a firm uses. Consistent with long-term debt studies, the coefficients of Depr, M/B and R&D are negative and significant at the 1% level. These results imply that firms with greater non-debt tax shields (depreciation and amortization expense), more growth prospects (market-to-book ratio) and more unique assets (research and development expense) employ less short-term debt financing. Also consistent with long-term debt studies, the coefficient of PPE is positive and significant at the 1% level. That is, the more tangible assets the firm has the more short-term debt financing the firm can obtain. The one result that contradicts the long-term debt studies is that the coefficient of Assets is negative and significant at the 1% level. A possible explanation for this is that larger firms are able to obtain better trade credit terms and therefore have more accounts payable financing of their short-term assets and, therefore, use less short-term debt financing. The coefficient of EBIT is not significantly different from zero. The results when the book short-term debt ratio is used as the dependent variable (the first regression) are similar those just discussed except that the coefficients of Depr and M/B are statistically insignificant.

## CONCLUSION

In this study, it is shown that both theories put forward to explain the amount of short-term debt financing that a firm employs have validity. The matching principle correctly predicts that the amount of short-term debt financing that a firm uses is directly related to the quantity of the firm's current assets. Additionally, other factors that have been shown to affect the levels of long-term debt financing that a firm employs are also shown to affect the amount of short-term debt financing that a firm uses. Specifically, the amount of firm short-term debt financing is shown to be inversely related to the amount of the firm's non-debt tax shields, growth opportunities, product uniqueness and firm size. Additionally, short-term debt financing was found to be directly related to the quantity of tangible assets the firm owns.

## REFERENCES

- Fama, E. and K. French. "Testing Trade-Off and Pecking Order Predictions About Dividends and Debt," *Review of Financial Studies*, Vol. 15 No.1 (2002), 1-33.
- Flannery M. and K. Rangan. "Partial Adjustment Toward Target Capital Structures," *Journal of Financial Economics*, Vol. 79 (2006), 469-506.
- Guin, L. "Matching Principle," Murray State University, Tutorial, 2011.
- White, H. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica* 48 (1980), 817-838.



**Table 1**

Means of Selected Variables (\$ million)

	<u>2001</u>	<u>2004</u>	<u>2007</u>
BSTD	.029	.020	.020
MSTD	.025	.014	.012
<b>Current Liabilities</b>	525	650	914
Acct. Pay.	206	256	329
Short-term Debt	142	97	106
<b>Current Assets</b>	711	912	1,246
Cash	191	322	380
Acct. Rec.	385	475	570
Inventories	183	221	311
C. Liab./ C. Assets	.58	.59	.57
Total Assets	2,351	3,081	3,979
PPE	743	966	1,292
Long-term Debt	458	678	744
Common Equity	894	1,131	1,668



**Table 2**

## Book Short-term Debt Ratio

Intercept	.010** (12.8)	.009** (12.0)	.009** (11.4)
Current A.	.009** (6.42)	.006** (4.69)	-
OCL	.003** (13.2)	-	-.014** (4.53)
Acct. Pay.	-	.116** (20.7)	
Cash	-	-	-.018** (16.7)
Inven.	-	-	.095** (19.6)
Acct. Rec.	-	-	.066** (13.5)
Adj. R <sup>2</sup>	.03	.01	.08
N	32,168	32,139	31,815

\* and \*\* represent significance at the 5% and 1% levels.

**Table 3**

## Market Short-term Debt Ratio

Intercept	.008** (12.9)	.007** (10.7)	.007** (10.8)
Current A.	.007** (6.76)	.005** (4.68)	-
OCL	.019** (9.24)	-	-.025** (9.62)
Acct. Pay.	-	.085** (19.0)	
Cash	-	-	-.016** (18.8)
Inven.	-	-	.094** (20.2)
Acct. Rec.	-	-	.057** (14.1)
Adj. R <sup>2</sup>	.01	.02	.09
N	31,293	31,320	30,992

\* and \*\* represent significance at the 5% and 1% levels.

**Table 4**

## Other Determinants of Short-term Debt Financing

Dependent Var.:	<u>BSDR</u>	<u>MSDR</u>
Inter.	.020** (11.0)	.015** (10.1)
Current A.	.009** (4.32)	.012** (6.38)
OCL	.035** (13.8)	.020** (9.83)
Assets	-.002** (10.6)	-.002** (10.2)
EBIT	.000 (0.78)	-.000 (1.55)
PPE	.006** (3.63)	.008** (5.46)
Depr	-.011 (1.72)	-.014** (3.00)
M/B	.000 (0.77)	-.001** (3.16)
R&D	-.027** (3.14)	-.024** (2.96)
Adj. R <sup>2</sup>	.02	.02
N	31,166	31,166

\* and \*\* represent significance at the 5% and 1% levels.