“Do corporate borrowers crowd out each other in the bond markets?”

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Do corporate borrowers crowd out each other in the bond markets?

Abstract

This study examines whether corporate bond issuers crowd out other bond issuers in the U.S. First, the author determines whether the market is crowded or not based on the number of issuers in the market during each month. Then the author tests to see if there is a significant relation between the "*Crowded*" dummy variable and the size of the debt offering. The findings show that firms tend to borrow in smaller amounts in the public debt market when the market is "Crowded". This result implies that due to the capital limitations in the crowded markets, each firm is forced to reduce the size of its offering. In the second part of the study, the author tests to see if this "timing" behavior has a significant impact on the borrowing firms' capital structure. The results show that the "crowding-out effect" does not have a significant impact on the borrowers' leverage ratios in the long run.

Keywords: debt market timing, crowding-out effect, leverage, capital structure, corporate bond offerings, public debt.
JEL Classification: G30, G32.

Introduction

In Economics literature, there are numerous studies (Spencer and Yohe, 1970; Buiter, 1977; Cebula, 1978; Barro, 1990; Ahmed and Miller, 2000; Kumar and Woo, 2010) that examine the "crowding out" effect in global debt markets. These studies have shown that debt offerings by governments tend to "crowd out" private sector borrowing. More specifically, these papers find that increased government borrowing leads to a shortage of capital in the debt markets which in turn leads to higher interest rates. As a result, some corporate borrowers as well as some smaller countries are forced out of the debt markets. This is called the "crowding out effect". Here, I have to note that Friedman (1979) supports the crowding-in effect (i.e. government borrowing increases corporate borrowing) rather than the crowding-out effect. According to this view, government spending expands the market for private-sector products, and thus "crowds in" private sector borrowing and investment.

If government borrowing shrinks the available supply of funds and forces out the private sector borrowers, then we can expect to see a similar situation when large numbers of private borrowers flock to the market at the same time. When too many borrowers go to the debt markets at the same time, the interest rates will go up, and as a result, some of the potential borrowers will be forced out of the market where others will be forced to reduce the size of their offerings (i.e. the crowding-out of the corporate borrowers by other firms).

The market timing literature in Finance (Baker and Wurgler, 2002; Alti, 2006; Kayhan and Titman, 2007) suggests that firms try to time their equity and debt offerings by observing the changes in the cost of equity and cost of debt. The "crowding-out effect" tells us the same thing: Firms try to avoid going to the debt market when it is too "crowded". By doing this, they are able to avoid paying too much in interest, and this, in turn, increases their value.

In this paper, I examine the "crowding-out" effect within the U.S. public debt market for the period 1984-2004. More specifically, I test to see if firms reduce their borrowing significantly when there are too many borrowers in the market. First, I create a dummy variable (i.e. *Crowded*) that takes the value "1" when the issue month is among the top twenty percent of the sample months in terms of the detrended number of issues (i.e. since the economy grew by approximately three percent per year during the sample period, I use a detrending factor of 0.25% per month), and takes the value "0" otherwise. Then, I test to see if there is a significant relation between the "*Crowded*" dummy variable and the size of the debt offering.

The market timing theory of capital structure developed by Baker and Wurgler (2002) suggests that the firms that time their equity or debt offerings do permanently lower their leverage (i.e. debt) ratios. So, market timing is seen as a positive event: When you successfully time the market, you reduce your cost of capital, and in the long run, you don't have as much debt as the other firms. On the other hand, more recent studies like Alti (2006) and Kayhan and Titman (2007) show that market timing has only a short-run impact (i.e. 2- or 3-year impact) on the leverage ratios of the market timers. Therefore, previous papers have conflicting results regarding the capital structure implications of market timing.

If I find evidence of timing (i.e. the "crowding-out effect") in the first part of the study, in the second part of the study, I will test to see if this "timing" behavior has a significant impact on the borrowing firms' capital structure. Do firms alter their capital structure permanently when they avoid the crowded markets? Do the results support the market timing theory of capital structure in the public debt markets?

This paper contributes to the literature in several ways. First, I use a very detailed, comprehensive sample that is downloaded from SDC database. This sample includes all US public debt offerings for the 1984-2004 period. Second, I use quarterly financial data from Compustat rather than annual data. All of the previous papers use annual data for accounting variables. However, studies on market timing should use more frequent data (like quarterly data) since market timing is a behavioral phenomenon. Third, this is the first study that examines the "crowding-out effect" in the public debt markets that is actually caused by too many corporate borrowers coming to the market at the same time. This is different from the previous studies because the previous papers focus on the "crowding-out effect" due to the government's borrowing (i.e. Does government borrowing crowd-out corporate borrowers?). Fourth, this is the first study that links the "crowding-out effect" to the capital structure of the borrowing firms. Here, I am testing to see if firms alter their leverage ratios permanently by avoiding the crowded markets.

The paper proceeds as follows. Section 1 discusses the previous literature. Section 2 explains the hypotheses. Section 3 explains the data and the methodology. Section 4 shows the results, while the final section concludes.

1. Literature review

The "crowding-out effect" is generally discussed in the context of the impact of government borrowing on private sector borrowers. The proponents of this theory state that increased government borrowing tends to increase market interest rates. At some point, corporations and individuals can no longer afford to borrow, thereby they lower their spending. As a result, the additional government borrowing simply crowds out of the market an equal (or even greater) volume of borrowing that would have financed private expenditures (Spencer and Yohe, 1970; Buiter, 1977; Cebula, 1978).

Barro (1990) examines the effects of tax-financed government expenditure on investment and output. He differentiates between spending on unproductive (consumption) services and spending on productive services like building infrastructure. He finds that while spending on unproductive services has a negative effect on growth, spending on productive services has a positive effect on growth.

Bairam and Ward (1993) examine the relationship between investment and government expenditure for 25 OECD countries. They find that for 24 out of the 25 countries, there is a negative correlation between investment and government expenditure.

Argimon, Gonzales-Paramo and Roldan (1997) examine the effects of public consumption and public investment on private investment. They find that while both public consumption and public investment have a negative impact on private investment, only the public consumption effect is significant.

Ahmed and Miller (2000) explore the effects of tax- and debt-financed government expenditures on private investments in developed and developing countries. They find that, in general, tax-financed government expenditure crowds out more investment than debt-financed expenditure does. They also find that, while expenditure on social security and welfare reduces investment in both developed and developing countries, expenditure on transport and communication induces private investment in developing countries.

Kumar and Woo (2010) examine the impact of high public debt on long-run economic growth. They find that there is a negative relation between the level of public debt and growth. Their results show that, on average, a ten percent increase in the public debt-to-GDP ratio slows down the annual per capita GDP growth by approximately 0.2 percent per year. On the other hand, they find that this negative impact is smaller in advanced economies.

Traum and Yang (2010) examine when government debt crowds out investment for the US economy. Their estimation accounts for the interaction between monetary and fiscal policies. They find that the crowding-out effect depends on the fiscal or monetary shock that triggers the debt expansion. Their results show that if money is used to reduce the capital tax rates or to make more productive investments, then higher debt can, in fact, crowd in investment despite a higher real interest rate.

If government borrowing shrinks the available supply of funds and forces out the private sector borrowers, then we can expect to see a similar situation when large numbers of private borrowers flock to the market at the same time. If the available supply of funds is relatively stable, an increase in borrowing (whether it is done by the government or by the private sector) would force the interest rates to go up, and in the end, while some of the potential borrowers would be completely forced out of the market, others would be forced to reduce the size of their offerings.

The market timing literature in Finance is closely related to the "crowding-out effect". It suggests that firms try to lower their cost of capital by timing their equity and debt offerings. Here, the "crowding-out effect" tells us the same thing: Firms try to avoid going to the debt market when it is too "crowded" and the borrowing costs are too

high. By doing this (i.e. timing the market), they are able to avoid paying too much in interest, and this, in turn, increases their value.

The market timing literature can be subdivided into two groups: (1) studies on equity market timing, and (2) studies on debt market timing. In their article titled "Market Timing and Capital Structure", Baker and Wurgler (2002) show that the timing of equity issues have long-lasting effects on capital structure. They find that low leverage firms are those that raised funds when their market valuations were high, as measured by the market-to-book ratio (i.e. M/B), while high leverage firms are those that raised funds when their market valuations were low.

Interestingly, more recent studies (see Alti, 2006; and Kayhan and Titman, 2007) do not support Baker and Wurgler (2002) findings on capital structure. These studies find that, within a period of two years, the impact of equity market timing on capital structure disappears.

On the other hand, the literature on debt market timing dates back to Taggart (1977). Taggart (1977) and Marsh (1982) examine the relation between the level of interest rates and the amount borrowed in debt markets. They find that the level of debt issues is sensitive to various measures of interest rates. When it is costlier for firms to issue debt (i.e. the interest rates are high), firms tend to borrow in smaller amounts in debt markets.

Later, Guedes and Opler (1996), Barclay and Smith (1995) and Stohs and Mauer (1996) examine the relation between the term premium and the maturity choice of new issues. They find that, to reduce their cost of capital, firms tend to choose shorter maturities when the term premium is higher.

More recently, Kaya (2011a, 2011b) test for market timing in public debt and syndicated bank loan markets, and find that firms do not tend to borrow more when the interest rates are low relative to the historical rates (up to three years before the financing). He also shows that there is no statistically significant difference in the long run between the leverage ratios of firms that borrow in 'favorable' (i.e. low yield) versus 'unfavorable' (i.e. high yield) markets, therefore he rejects the 'Market timing theory of capital structure' for public debt and syndicated loan firms. On the other hand, he shows some evidence of timing in terms of the maturity choice. He finds that firms tend to choose longer maturities when the rates are 'favorable' relative to the historical rates.

2. Hypotheses

Since I expect to see a negative impact on the size of the issue, my first hypothesis can be stated as:

H_1: Firms borrow in smaller amounts when the market is "Crowded".

As discussed in the previous sections, the "equity market timing" studies have conflicting results regarding the impact of timing on capital structure. While Baker and Wurgler (2002) contend that equity market timing has a significant impact on the issuing firms' capital structure in the long run, other studies fail to support Baker and Wurgler (2002) findings. Theoretically, if firms observe the market conditions and then time their offerings (or adjust the size of their offerings) accordingly, they may be able to lower their leverage ratios in the long run. Here, in this study, if I find that firms adjust the size of their offerings by looking at how crowded the market is, then I will test to see whether this behavior has an impact on their leverage ratios. The hypothesis of interest regarding the capital structure of the borrowers is:

H_2: Firms that borrow in "Crowded markets" have lower leverage ratios in the long run compared to the other borrowers.

3. Data and methodology

I obtain the data on US public debt offerings from Thomson Financial's SDC database. My sample covers the debt issuance activities from January 1984 through December 2004. I restrict the sample to exclude unit offers, financial firms with SIC codes between 6000 and 6999, and firms with book values of assets below $10 million in 2004 dollars at the end of the last issue quarter. Following the previous literature, and to minimize the influence of outliers, observations with a market-to-book ratio greater than 10, book leverage (D/A) greater than 1, and earnings before interest, taxes, and depreciation scaled by assets (EBITDA/A) greater than 1 are dropped. Since financing choices of subsidiary companies may be motivated by the parent companies' own needs, all subsidiary companies are dropped from the sample. After excluding the financial firms, the subsidiaries, the outliers, and the observations without the required Compustat data, I am left with 3,326 public debt offerings.

For each of the 3,326 debt offerings, I calculate the following variables regarding the issuer characteristics: *Size* is the natural logarithm of sales. *Tangibility* – the net property, plant, and equipment divided by the total assets. *Profitability* – the earnings before interest, taxes and depreciation (i.e. EBITDA) divided by the total assets. *Market-to-book ratio* is the "total assets minus the book value of equity plus the market value of equity" divided by the total assets. *Leverage* is the debt (i.e. long-term plus short-term debt) divided by the total assets.

These are the control variables that are found to be the determinants of firms' capital structure.

To measure the size of each offering relative to the issuing firm's assets, I calculated the following variable: *Proceeds/A*$_t$ – the total debt proceeds scaled by the total assets.

In order to measure how crowded the market is, I create the *Crowded* dummy variable. First, I find the total number of public debt offerings in each month during my sample period. Then, in order to take care of seasonality, I calculate the three-month centered moving average for each month by averaging the number of issues in the issue month, in the preceding month, and in the month following the issue month. Since the economy grew by approximately 3% each year for my sample period, normally we would expect to see larger number of issues in the later years. In other words, the number of issues in the earlier years should be multiplied by a detrending factor. Here, since the annual growth rate in the economy is 3%, I use a detrending factor of 0.25% per month. In the end, I find the detrended three-month centered moving average for the number of issues in each month.

In the final step, I create the *Crowded* dummy variable by taking the top 20% of the most active months as "Crowded markets" with a value of "1" and the remaining months as "Uncrowded markets" with a value of "0". This variable is the main explanatory variable in this study.

Similar to the *Crowded* variable for the corporate bond market, in order to control for the sovereign debt market activity, I create a dummy variable for the sovereign debt market. I call this variable *Active*. After detrending, any quarter that is in the top 20% in terms of market activity (in total $) is called an *Active* period. So, the *Active* dummy variable takes the value "1" when the issue quarter is among the top 20% of the most active quarters in my sample period, and the value "0" otherwise.

Since most of the firms in my sample pay dividends, I do not create a separate dummy variable for dividend-paying (versus non-paying) stocks. I am using the five firm-specific control variables that are widely used in capital structure studies and the "Active" variable which controls for the sovereign debt market activity.

Table 1 shows the summary statistics for the sample. The mean and the median values as well as the standard deviations for each variable are shown in the table. When we look at *Proceeds/A*$_t$, we can see that the mean value is 0.05 while the median value is 0.02. These numbers indicate that the size of the offering is relatively small when compared to the value of the assets. The mean (median) issue size is just 5% (2%) of the value of the assets. On the other hand, when we look at the standard deviation of *Proceeds/A*$_t$, we see that it is 0.11 (11% of the total assets). Therefore, we can say that although the offerings are generally small, there is a large variation within the sample (some are relatively larger and more important than the others).

Table 1. Summary statistics for public debt offerings

Variable	Median	Mean	Std. deviation
M/B	0.675	0.910	0.729
Profitability	0.216	0.229	0.127
Size	7.036	6.909	1.494
Tangibility	0.496	0.502	0.243
Leverage	0.338	0.344	0.133
Proceeds/A$_t$	0.017	0.046	0.092
N	3326	3326	3326

Notes: The sample covers debt issuance activities from January 1984 through December 2004. The market-to-book ratio is the (total assets – book value of equity + market value of equity)/total assets. *Profitability* is EBITDA (Item 21)/total assets (Item 44). *Size* is the natural logarithm of sales (Item 2). *Tangibility* is measured as net property, plant, and equipment (Item 42)/total assets (Item 44). *Leverage* is long-term debt (Item 51) + short-term debt (Item 45)/total assets. *Proceeds/A*$_t$ is the total debt proceeds from the debt transaction scaled by end-of-quarter total assets. The "total debt proceeds" is defined as the money borrowed from a creditor. *N* is the number of observations. Except *for Proceeds/A*$_t$, all variables are measured at the end of the previous quarter (*t*-1).

In this paper, in order to test for the "crowding-out effect", I perform two types of analyses: First, I run non-parametric tests (i.e. the Mann-Whitney-Wilcoxon test) to compare the borrower characteristics as well as the issue size (i.e. proceeds scaled by assets) in "Crowded" versus "Uncrowded" markets. Then, I use regression analysis to see if the *Crowded* dummy variable has a significant impact on the size of the issue (i.e. *Proceeds/A*$_t$). The following model is used in these regressions:

$$Proceeds/A_t = c_0 + c_1 Crowded + c_2 M/B_{t-1} + \\ + c_3 Profitability_{t-1} + c_4 Size_{t-1} + c_5 Tangibility_{t-1} + \\ + c_6 Leverage_{t-1} + c_7 Active + \varepsilon_t. \quad (1)$$

In this model, *M/B*, *Profitability*, *Size*, *Tangibility*, and *Leverage* are the five control variables that are used in the previous studies. *Crowded* is our main explanatory variable. *Active* is the control variable for the sovereign debt market. The dependent variable is either *Proceeds/A*$_t$ (i.e. the proceeds in US dollars divided by the end-of-issue quarter assets) or *Proceeds/A*$_{t-1}$ (i.e. the proceeds in US dollars divided by the end-of-previous quarter assets).

If I find evidence of timing (i.e. *Crowded* has a significant impact on the size of the offering), I will examine its implications on the borrowing firm's capital structure in the long run (i.e. up to five years after the borrowing). First, I will examine the impact

of timing on the change in the leverage ratio. Then, I will examine the impact on the level of leverage ratio. The regression models that will be used are:

$$(D/A)_z - (D/A)_{t-1} = c_0 + c_1 Crowded + \\ + c_2 M/B_{t-1} + c_3 Profitability_{t-1} + \\ + c_4 Size_{t-1} + c_5 Tangibility_{t-1} + \\ + c_6 Leverage_{t-1} + c_7 Active + \varepsilon_t. \quad (2)$$

$$(D/A)_z = c_0 + c_1 Crowded + c_2 M/B_{t-1} + \\ + c_3 Profitability_{t-1} + c_4 Size_{t-1} + \\ + c_5 Tangibility_{t-1} + \varepsilon_t + c_6 Active + \varepsilon_t, \quad (3)$$

where the dependent variable in Model 2, $(D/A)z$-$(D/A)t$-1, is the cumulative change in book leverage from the last day of the pre-issue quarter through the end of quarters Issue + 8, Issue + 12, Issue + 16 and Issue + 20, and the dependent variable in Model 3, $(D/A)z$, is the level of book leverage on the last day of quarters Issue + 8, Issue + 12, Issue + 16 and Issue + 20.

4. Empirical results

Table 2 shows the summary statistics for the borrower characteristics and the issue size in "Crowded" versus "Uncrowded" debt markets. The last column shows the results of the Mann-Whitney-Wilcoxon test that compares the variables in "Crowded" and "Uncrowded" markets.

As we can see from the table, the "Crowded" market borrowers are smaller firms with fewer tangible assets compared to the other group. While the median values of size and tangibility are 6.93 and 0.45 (i.e. 45%) for "Crowded" market borrowers, for other firms, the corresponddding values are 7.10 and 0.51 (i.e. 51%). These differences are statistically significant at 5% level (i.e. *p*-values are 0.0290 and 0.0159, respectively).

Table 2. Comparison of borrower characteristics and issue size in "Crowded" versus "Uncrowded" public debt markets

	Crowded markets			Uncrowded markets			Wilcoxon 2-sample test
Variable	Median	Mean	St. dev.	Median	Mean	St. dev.	*p*-value
M/B	0.767	0.983	0.775	0.637	0.864	0.694	<0.0001
Profitability	0.210	0.231	0.138	0.220	0.228	0.119	0.4531
Size	6.930	6.858	1.402	7.096	6.941	1.549	0.0290
Tangibility	0.451	0.490	0.244	0.512	0.511	0.243	0.0159
Leverage	0.330	0.339	0.128	0.344	0.348	0.136	0.0942
Proceeds/A$_t$	0.014	0.041	0.086	0.018	0.050	0.096	0.0024
Observations	1294			2032			

Notes: The "Crowded" markets are the top 20% of the most active months in terms of the detrended number of monthly offerings. The remaining months are classified as "Uncrowded" markets. This table compares borrower characteristics and issue size in "Crowded" versus "Uncrowded" markets using the Mann-Whitney-Wilcoxon test.

When we compare the two groups' *M/B* ratios, we find that while the median value for the "Crowded" market borrowers is 0.77 (i.e. 77%), the corresponding value for the other group is just 0.64 (i.e. 64%). This difference is significant at 1% level (i.e. *p*-value < 0.0001).

In terms of pre-issue leverage, the results show that the "Crowded" market borrowers have relatively lower leverage ratios compared to the other group. This difference is significant at 10% level (i.e. *p*-value = 0.0942).

To summarize, the results in Table 2 indicate that the "Crowded" market borrowers are relatively smaller firms with better valuations (relative to book values) and lower debt levels. In terms of issue size, Table 2 shows that the debt offerings in the "Crowded" markets are, on average, much smaller than the offerings in the "Uncrowded" markets. While the median *Proceeds/A*$_t$ is just 0.01 (i.e. 1%) for "Crowded" market offerings, it is 0.02 (i.e. 2%) for "Uncrowded" market offerings. The difference is significant at 1% level (i.e. *p*-value = 0.0024). This result implies that firms tend to borrow less when the market is crowded.

Before running the regression analyses, I look at the Pearson correlation coefficients between the independent variables that I will use in the regressions. Table 3 shows the Pearson correlation coefficients between the five control variables, the "Active" variable, and the "Crowded" dummy variable. The variance inflation factors range from 1.01 to 1.41. These numbers indicate that there is no multicollinearity problem.

Table 3. The Pearson correlation coefficients

	Crowded	*M/B*	*Profitability*	*Size*	*Tangibility*	*Leverage*
Crowded	1.0000					
M/B	0.080	1.0000				
Profitability	0.012	0.289	1.0000			

Table 3 (cont.). The Pearson correlation coefficients

	Crowded	*M/B*	*Profitability*	*Size*	*Tangibility*	*Leverage*
Size	-0.027	0.191	0.191	1.0000		
Tangibility	-0.042	-0.386	-0.429	-0.232	1.0000	
Leverage	-0.033	-0.251	-0.283	-0.265	0.126	1.0000
Active	0.028	-0.084	-0.034	-0.016	0.072	0.001

Table 4 shows the results of the robust regressions that explain issue size (i.e. proceeds scaled by assets) by the five control variables (*M/B*, *Profitability*, *Size*, *Tangibility*, and *Leverage*) as well as the *Active* and the *Crowded* variables (Model (1)). While the first column shows the results for $Proceeds/A_t$ (i.e. proceeds scaled by end-of-issue quarter assets), the second column shows the results for $Proceeds/A_{t-1}$ (i.e. end-of-previous quarter assets).

As we can see from the table, the coefficient for the *Crowded* variable is negative and significant in both columns. While in the first column, the regression coefficient for *Crowded* is -0.004 (p-value = 0.00), it is -0.005 (p-value = 0.00) in the second column. In other words, the *Crowded* variable significantly explains (significant at 1% level) the issue size. When the market is crowded, firms tend to borrow less. This finding supports the "crowding-out hypothesis" in the public debt markets.

Interestingly, the coefficient for the *Active* variable is positive and significant in both columns (coefficients are 0.003, and p-values are either 0.00 or 0.01), meaning that when the sovereign debt market is more active, private sector tends to borrow more in the corporate bond markets. Here, it is important to note that a bond offering is only one of the ways for a corporation to borrow (i.e. they also borrow through syndicated loans, private placements, and smaller bank loans). Still, the results here for the impact of sovereign debt on private borrowing support the papers on the crowding-in effect (Friedman, 1979; Ahmed and Miller, 2000, for some government expenditures like the expenditures on transport and communication) rather than the papers on the crowding-out effect.

Table 4 also shows that smaller firms that are more profitable tend to borrow more. In the first column, the coefficients for *Profitability* and *Size* are 0.041 (p-value = 0.00), and -0.009 (p-value = 0.00), respectively. They are both significant at 1% level. These results are as expected because better performance provides these firms with the ability to borrow in larger amounts compared to the other firms in the financial markets and also smaller firms generally have more investment opportunities compared to larger and more established firms. In the second column where I look at $Proceeds/A_{t-1}$, I find that besides *Profitability* and *Size*, *M/B* is also significant (at 10% level). So, this result suggests that firms with higher valuations compared to their book values tend to borrow more (coefficient = 0.001, p-value = 0.06).

Table 4. The crowding-out effect in the public debt market

Regression analysis		
Dependent variable: Proceeds scaled by assets		
Model	$Proceeds/A_t$	$Proceeds/A_{t-1}$
Intercept	0.075 (0.00)	0.079 (0.00)
Crowded	-0.005 (0.00)	-0.005 (0.00)
M/B	0.001 (0.08)	0.001 (0.04)
Profitability	0.041 (0.00)	0.045 (0.00)
Size	-0.009 (0.00)	-0.010 (0.00)
Tangibility	-0.003 (0.14)	-0.003 (0.08)
Leverage	0.003 (0.39)	0.004 (0.22)
Active	0.003 (0.00)	0.003 (0.01)
Adj. R^2	0.1210	0.1180
N	2758	2761

Notes: The first column in this table reports the coefficients of regressions of the form: $Proceeds/A_t = c_0 + c_1 CROWDED + +c_2 M/B + c_3 Profitability + c_4 Size + c_5 Tangibility + c_6 Leverage + +c_7 Active + \varepsilon_t$, where the dependent variable is the dollar proceeds scaled by end-of-issue quarter assets. In the second column, the dependent variable is $Proceeds/A_{t-1}$ (i.e. dollar proceeds scaled by end-of-previous quarter assets). The time subscript t denotes the issue quarter. All of the control variables are measured at the end of the previous quarter. Robust p-values are in parentheses.

Table 5 shows the results of the robust regressions that explain borrowing firms' capital structure by the five firm-specific control variables, the *Active* variable, and the *Crowded* variable. While Panel A shows the results for $(D/A)_z$-$(D/A)_{t-1}$ (i.e. the change in leverage over the next 8, 12, 16, and 20 quarters), Panel B shows the results for $(D/A)_z$ (i.e. the level of leverage at the end of quarters Issue + 8, Issue + 12, Issue + 16, and Issue + 20).

Both panels show that the impact of the *Crowded* variable on capital structure is insignificant in the long run, although Panel A results are weaker. Since firms borrow less in Crowded markets, it is possible that they would continue to have lower debt ratios compared to the borrowers in Uncrowded markets. Therefore, the question is whether the *Crowded*

variable has a negative and significant impact on leverage in the long run. In Panel A, I look at the impact of Crowded markets on the changes in the borrowers' leverage ratios, and in Panel B, I look at the impact on the level of leverage itself.

Panel A shows that the regression coefficients for quarters Issue + 8, Issue + 12, Issue + 16, and Issue + 20 are -0.002 (p-value = 0.40), -0.007 (p-value = 0.05), -0.002 (p-value = 0.62), and 0.007 (p-value = 0.06), respectively. So, 8 quarters after the issue, the impact of the *Crowded* variable on the change in leverage is insignificant (p-value = 0.40). Even though, the results for 12 quarters and 20 quarters are significant (the first one negative, the second one is positive), this is not due to the crowding-out effect since the impact is insignificant for Issue + 8.

When we look at the impact on the level of leverage itself in Panel B, we can see that none of the coefficients for *Crowded* is significant. The regression coefficients for quarters Issue + 8, Issue + 12, Issue + 16, and Issue + 20 are -0.003 (p-value = 0.46), -0.006 (p-value = 0.19), -0.007 (p-value = 0.14), and 0.002 (p-value = 0.65), respectively. As a result, I conclude that the "crowding-out effect" does not have a significant impact on leverage in the long run.

When we look at the coefficient for *Active*, we are seeing that it is negative and significant for the whole five-year period in Panel A, and for four-years in Panel B (except for quarter Issue + 20). From Table 4, we know that sovereign debt increases private borrowing. Here, in Table 5, we are seeing that the borrowers' leverage ratios are lower compared to their original levels for at least four-years after the borrowing. So, when the sovereign debt market is active, firms borrow more and this lower leverage levels continue for at least four more years.

Table 5. The long-run implications of the crowding-out effect on capital structure

Panel A: Dependent variable: $(D/A)_t$-$(D/A)_{t-1}$				
	Issue + 8	Issue + 12	Issue + 16	Issue + 20
Crowded	-0.001 (0.63)	-0.005 (0.11)	-0.0002 (0.95)	0.008 (0.05)
M/B	0.002 (0.38)	0.007 (0.01)	0.003 (0.34)	0.005 (0.11)
Profitability	0.059 (0.00)	0.042 (0.01)	0.054 (0.00)	0.076 (0.00)
Size	-0.008 (0.00)	-0.011 (0.00)	-0.010 (0.00)	-0.012 (0.00)
Tangibility	-0.002 (0.76)	-0.004 (0.62)	-0.0002 (0.98)	0.028 (0.00)
Leverage	-0.253 (0.00)	-0.297 (0.00)	-0.344 (0.00)	-0.399 (0.00)
Active	-0.019 (0.00)	-0.016 (0.00)	-0.019 (0.00)	-0.005 (0.31)
R^2	0.1379	0.1387	0.1377	0.1600
N	2581	2482	2410	2356

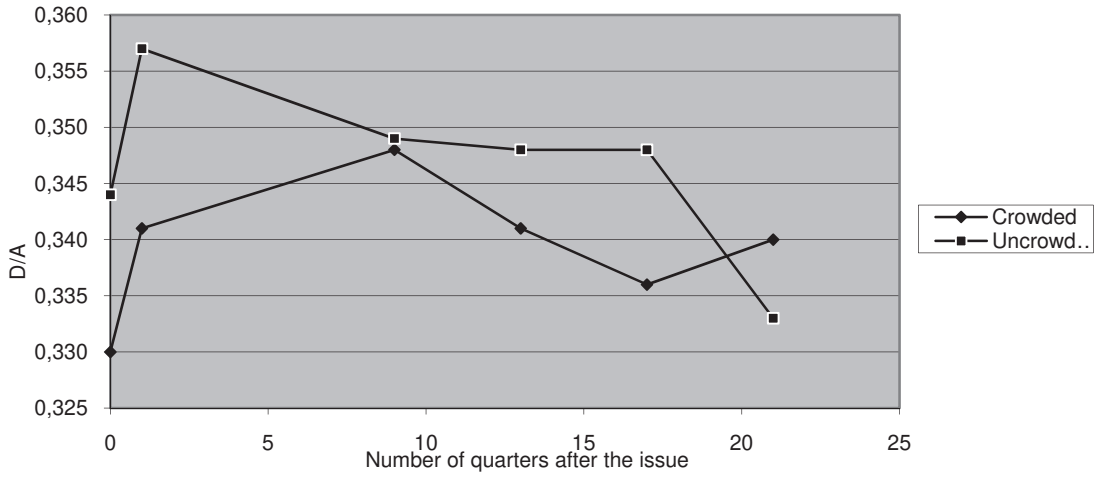
Panel B: Dependent variable: $(D/A)_t$				
	Issue + 8	Issue + 12	Issue + 16	Issue + 20
Crowded	-0.001 (0.79)	-0.003 (0.45)	-0.005 (0.32)	0.003 (0.48)
M/B	-0.022 (0.00)	-0.019 (0.00)	-0.025 (0.00)	-0.019 (0.00)
Profitability	-0.102 (0.00)	-0.086 (0.00)	-0.099 (0.00)	-0.117 (0.00)
Size	-0.009 (0.00)	-0.011 (0.00)	-0.010 (0.00)	-0.014 (0.00)
Tangibility	0.006 (0.56)	-0.001 (0.91)	-0.021 (0.07)	-0.005 (0.72)
Active	-0.030 (0.00)	-0.028 (0.00)	-0.023 (0.00)	-0.010 (0.09)
R^2	0.0636	0.0529	0.0466	0.0570
N	2582	2483	2411	2357

Figure 1 plots the median values of the leverage ratios of the borrowers in "Crowded" versus "Uncrowded" markets over time. Time "0" represents the end of the pre-issue quarter. Time "1" represents the end of the issue quarter. Times 9, 13, 17, and 21 represent end of quarters Issue + 8, Issue + 12, Issue + 16, and Issue + 20. Just before the issue (i.e. time "0"), for the Crowded market issuers, the book leverage, on average, is 0.330 (i.e. 33%), while for other issuers, it is 0.344 (i.e. 34.4%). This confirms our result in Table 2 with regard to the pre-issue leverages of the two groups. Naturally, both groups leverage ratios go up just after the issue (i.e. time "1"). So, at the end of the issue quarter, while the median leverage ratio for the crowded market issuers rises to 0.341 (i.e. 34.1%), the corresponding number for the other firms is 0.357 (i.e. 35.7%).

After that point, we can see from the figure that, while the other firms continuously reduce their debt levels, the Crowded market issuers first increase, then reduce, and then again increase their leverages. In fact, at the end of quarter Issue + 20, the Crowded market issuers have higher leverage ratios than the other issuers. Table 2 results have indicated that the larger, more established firms tend to avoid the crowded markets, while smaller firms cannot or do not do that. First of all, the smaller, newer firms do not have the ability to look at other financing alternatives as much as the larger, more established firms do, therefore they go to the market without considering how crowded it is. Second, the smaller, newer firms have more investment opportunities compared to the larger, more established firms; therefore, their financing needs are more urgent, so they choose to go to the market even though it is crowded. In the long run, these smaller, newer firms rely on debt financing more than the other firms do; therefore, they cannot or do not reduce their leverage levels for at least a few years. Figure 1 confirms this.

My nonparametric tests (i.e. Wilcoxon two-sample test) show that the difference between the two groups' leverage ratios is insignificant at the end of quarters

Issue + 8, Issue + 12, Issue + 16, and Issue + 20. Therefore, I conclude that, even though there is evidence of the crowding-out effect in the public debt market, in the long run, it does not have a significant impact on the borrowing firms' capital structure. The leverage ratios of the Crowded and Uncrowded market borrowers are not significantly different from each other for at least five years after the issue.



Number of quarters after the issue	-1	0	8	12	16	20
Crowded market issuers	0.330	0.341	0.348	0.341	0.336	0.340
Uncrowded market issuers	0.344	0.357	0.349	0.348	0.348	0.333

Notes: The Wilcoxon two-sample test shows that the differences between the two groups' leverage ratios just before the issue, at the end of the issue quarter, and at the end of quarters Issue+8, Issue+12, Issue+16, and Issue+20 are all insignificant at 10% level.

Fig. 1. The leverage ratios of the borrowers in Crowded versus Uncrowded markets over time

Conclusion

In Economics literature, the "crowding-out effect" is defined as the shrinkage of the available supply of funds and the resulting increase in interest rates due to government borrowing, that, in turn, force private sector borrowers out of the market either completely or partially (i.e. reduced amounts of borrowing). If government borrowing shrinks the available supply of funds and forces out the private sector borrowers, then we can expect to see a similar situation when large numbers of private borrowers flock to the market at the same time. In other words, corporate borrowers themselves may force other potential borrowers out of the market.

In this paper, I examine the "crowding-out effect" within the US public debt market for the period 1984-2004. More specifically, I test to see if firms reduce their borrowing significantly when there are too many borrowers in the market. First, I create a dummy variable (i.e. *Crowded*) that takes the value "1" when the issue month is among the top twenty percent in terms of the detrended number of issues, and takes the value "0" otherwise. Then, I test to see if there is a signify-cant relation between the "crowded" dummy variable and the size of the debt offering.

I find that firms tend to borrow in smaller amounts in the public debt markets when the market is "Crowded". This result implies that due to the capital limitations in the crowded markets, each firm is forced to reduce the size of its offering. In other words, the "crowding-out effect" exists among the public debt issuers in my sample.

In the second part of the study, I test to see if this "crowding-out effect" (i.e. the "timing" behavior) has a significant impact on the borrowing firms' capital structure. As discussed in the previous sections, the previous papers on equity market timing find conflicting results regarding the impact of timing on capital structure. While Baker and Wurgler (2002) find that there is a long-run impact, Alti (2006) and Kayhan and Titman (2007) find that there is only a short-run impact (i.e. 2 or 3 years). Here, I find that the "crowding-out effect" does not have a significant impact on the borrowers' leverage ratios in the long run (i.e. up to five years after the offering). Therefore, I reject the market timing theory for public debt offerings. Firms do not alter their capital structure when they avoid the Crowded markets.

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