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'Hot' Debt Markets and Capital Structure

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Abstract

This paper examines the motives of debt issuance during hot-debt market periods and its impact on capital structure over the period 1970–2006. We find that perceived capital market conditions as favourable, an indication of market timing, and adverse selection costs of equity (i.e., information asymmetry) are important frictions that lead certain firms to issue more debt in hot- than cold-debt market periods. Using alternative hot-debt market issuance measures and controlling for other effects, such as structural shifts in the debt market, industry, book-to-market, price-to-earnings, size, tax rates, debt market conditions and adjustment costs based on debt credit ratings, we find that firms with high adverse selection costs issue substantially more (less) debt when market conditions are perceived as hot (cold). Moreover, the results indicate that there is a persistent hot-debt market effect on the capital structure of debt issuers; hot-debt market issuing firms do not actively rebalance their leverage to stay within an optimal capital structure range.

Keywords: *hot debt markets*, *information asymmetry*, *capital structure*, *market timing*

JEL classification: *G*12, *G*14, *G*31, *G*32

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1. Introduction

Equity market timing has emerged as one of the primary factors that shape corporate capital structure decisions. Survey evidence in Graham and Harvey (2001) shows that market timing is a major concern of corporate executives: two-thirds of CEOs admit that timing considerations play an important role in financing decisions. In their seminal paper, Baker and Wurgler (2002) show that equity market timing is an important aspect of firms' financial policies: they find that firms tend to raise external funds when their cost of equity capital (valuation) is temporarily low (high) and argue that this result is consistent with the view that capital structure is the cumulative outcome of past attempts to time the equity market.[1] The persistent timing effects on leverage, reported in Baker and Wurgler (2002), challenge the conventional view of optimal capital structure and its determinants. Welch (2004) finds that equity price shocks also have a persistent effect on capital structure. Huang and Ritter (2005), using aggregate measures of market valuation, find evidence of a long-lasting market timing effect on capital structure. Using hot-cold market classification as the equity timing measure, however, Alti (2006) finds that the effect of market timing on leverage has very low persistence. Specifically, Alti's empirical evidence shows that the negative impact of market timing on leverage reverses completely two years after IPO issuance, suggesting that capital structure policies, in the long run, seem to be more consistent with the pursuit of optimal leverage targets. Flannery and Rangan (2006) also question the longevity and economic significance of market timing. Similarly, Leary and Roberts (2005), accounting for adjustment costs, show that firms try to rebalance leverage in an attempt to stay within an optimal range.

Notwithstanding the mixed empirical evidence, most of what is known about the impact of external financing on capital structure stems from IPO equity issues,[2] even though debt financing plays an equally important role in shaping firm financing decisions. While IPOs are likely to be seriously influenced by market timing considerations, they represent capital structure decisions that occur only once in a firm's life cycle. Further, IPOs are largely associated with relatively small, young firms characterised by high growth opportunities, not necessarily the most representative sample of firms to draw broad inferences about the effects of external financing on firm capital structure. The observed extremes in debt issue volume as a consequence of the clustering of debt issues in certain time periods, we refer to as 'hot'-debt market periods, and its effects on capital structure have not been investigated despite the enormous corporate lever up in recent years.[3] While debt-market timing has been addressed from the interest rate exposure perspective (Guedes and Opler, 1996; Barclay and Smith, 1995; Faulkender, 2005) and the debt maturity perspective (Baker *et al*., 2003; Butler *et al*., 2006),

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[1] In line with the evidence of Baker and Wurgler (2002), O'Brien *et al*. (2007) find that firms financing decisions (debt vs equity) are shaped by the degree of relative misevaluation in an attempt to increase shareholders' wealth.

[2] See Taggart (1977), Marsh (1982), Asquith and Mullins (1986), Jung *et al*. (1996) and Eckbo *et al*. (2000) for seasoned equity issues; Ritter (1991), Loughran *et al*. (1994), and Ibbotson *et al*. (1988, 1994), Baker and Wurgler (2002), Alti (2006), and Leary and Roberts (2005) for initial public offerings.

[3] Global bond issuance was $7.5 trillion in 2007 while it dropped to $3.81 trillion in 2008 (Reuters, 23 December 2008). Todd (2007), shows that debt ratios have substantially increased for firms in 34 emerging markets and attributes this largely to the increased financial openness to foreign markets.

yielding mixed results, the impact of hot-debt markets on capital structure remains unexplored.[4] Moreover, no study has yet addressed the motives underlying the hot-debt issuance phenomenon despite the fact that a large number of firms in certain periods, as documented in this study, choose to turn to the debt market. Consequently, a related important research question is whether hot-debt markets have implications for firm capital structure; that is, whether the intention to exploit favourable debt market conditions relative to other forms of capital has an impact on capital structure. The importance of this issue cannot be overstated. If true, hot-debt issuance would imply that debt financing decisions are at variance with conventional financial policy and capital structure theories.[5]

Although equity undervaluation makes debt issuance appealing, the latter is not expected to be sensitive to investor beliefs as most buyers of corporate debt consist of banks, insurance companies, and pension funds that are unlikely to make naive investment decisions (e.g., Speiss and Afflect-Gtaves, 1999; Richardson and Sloan, 2008).[6] If this is so, hot-debt market issuance is more likely to arise from managerial beliefs in the pursuit of opportunistic gains derived from switching between equity and debt markets (Baker and Wurgler, 2002). Since debt is not very sensitive to outside investor beliefs, managers may also choose to issue debt to avoid equity undervaluation that results from a difference in beliefs between managers and outside investors (asymmetry of information). This argument has its roots in Myers and Majluf's (1984) view that asymmetric information results in adverse selection costs that are of sufficient magnitude to force firms to time their debt issues for periods when the level of information asymmetry is high. Accordingly, managers' desire to avoid the adverse selection costs of equity or take advantage of a 'debt financing window' could motivate the selling of debt issues.[7] To date, there is no empirical evidence documenting whether the existence of hot-debt issuance is linked to time-varying asymmetric information costs. This paper attempts to fill this void by investigating whether the decision to issue debt in hot-market periods is associated with adverse selection costs of equity. If information costs are a major deterrent to equity issuance, then periods of increased information costs should be periods of relatively high debt issue volume.

This paper seeks to determine the motives of debt issuance in hot-debt market periods and the impact of hot-debt issuance on capital structure. Specifically, the focus of investigation is on the role of capital market conditions and adverse selection costs of

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[4] Faulkender (2005), in contrast with the standard textbook treatment of interest rate risk management, or the matching hypothesis that firms match the risk exposure of their debt to that of their assets, shows that the final interest rate exposure of newly issued debt is largely driven by the slope of the yield curve at the time of debt issuance, suggesting that interest rate risk management practices are primarily driven by speculation rather than by hedging considerations.

[5] While there is no consensus in the literature about the real meaning of managerial market timing (Barry *et al*., 2005), market timing in the context of this study refers to the clustering of debt issues or 'hot' debt market periods.

[6] Additional evidence, available upon request, from post issue calendar time portfolio returns for hot-market and cold-market issuing firms, confirms that debt market timing is not related to investor beliefs as hot-market issuers' post-debt issuance long term alphas are indistinguishable from zero.

[7] Huyghebaert and Van de Gucht (2007) find that high adverse selection problems determine the debt issuance patterns of start-up firms due to lack of prior history and reputation.

equity on the financing decision of the firm during hot-debt market periods. Focusing on debt issue events and identifying hot- and cold-debt market periods, this study attempts to examine the behaviour of hot- versus cold-market debt issuing firms and to shed light on the hot-debt issuance effects of capital structure. To examine these issues we concentrate on corporate debt issues, as a single financing event, in an effort to capture hot debt-market issuance and its influence on capital structure. The hot-debt market issuance measures used in this study are based on whether debt financing takes place in a hot (cold) issue market environment, characterised by a high (low) aggregate volume (number of deals) of debt issues.

Consistent with previous studies, we find that capital market conditions play an important role in explaining the phenomenon of corporate debt issuance waves.[8] Specifically, the results show that the aggregate volume of debt issuance is related to exogenous macro-factors in both equity and debt markets. Second, our findings provide evidence that debt financing decisions are influenced by the adverse selection costs of equity at the firm level. Put differently, when equity is out of favour firms engage in debt-financing (i.e., issue less information sensitive securities). This suggests that when a particular firm characteristic is in doubt (i.e., equity due to adverse selection costs) firms endowed with that characteristic engage in debt financing, especially when debt market conditions are more favourable. Third, using alternative hot-market measures and controlling for other effects, we show that the impact of hot-debt issuance on corporate debt financing is substantial. We find that hot-debt market firms, identified as firms issuing debt when the debt market is hot, with high adverse selection costs issue significantly more debt than do cold-debt market firms. Specifically, although the pre-issue leverage between hot- and cold-debt market issuers does differ considerably, hot-debt issuing firms having higher pre-issue leverage issue significantly higher levels of debt than do cold-debt issuing firms. The excess debt issuance of hot-debt market issuers is not induced by debt capacity, profitability, growth, or investment opportunity considerations. Interestingly, credit ratings indicate that hot-market firms are not riskier than cold-market firms. Hence, firms' debt issuance differences between cold- and hot-debt market periods do not reflect differences between investment-grade and below investment-grade issuers. Fourth, the results indicate that there is a persistent hot-debt issuance effect on the capital structure of debt issuers that lasts more than five years after the hot-debt issue year. We investigate how firms adjust their capital structure over long-term periods when debt ratios apparently deviate from normal levels due to hot-debt market clustering. The evidence shows that hot-debt market issuing firms do not actively rebalance their leverage to stay within an optimal capital structure range. This financing behaviour is inconsistent with the trade-off theory of capital structure. Finally, the persistence revealed in our empirical tests is robust to several checks, inclusive of an alternative hot-market measure, structural shifts in the debt market, industry, book-to-market, price-to-earnings, size, tax rates, debt market conditions, and adjustment costs based on debt credit ratings.

[8] Some studies reveal that financing occurs in waves over time, For example, Korajczyk and Levy (2003) look at leverage decisions and macroeconomic conditions and one of their findings suggests that unconstrained firms time debt issuance during periods of favourable macroeconomic conditions. Also, Gomes and Phillips (2007) examine financing choices over time and argue that measures of asymmetric information are important in determining the choice of security issuance. Dittmar and Dittmar (2008) argue that financing waves are the result of changes in the underlying economic fundamentals rather than misvaluation.

This study contributes to the literature in several ways. Despite the fact that debt issuance plays an equally important role in firm financing decisions, little is known about hot-debt issuance and its effects, if any, on capital structure. This is the first study to examine the short- and long-term effects of hot-debt issuance on capital structure by focusing on debt financing issues. We document systematic differences between the financial policies of hot-debt and cold-debt issuing firms. We argue that the observed excessive debt issuance in hot-market periods by certain firms is consistent with the implications of hot-debt capital being cheaper than its equity counterpart due to adverse selection costs (information asymmetry costs). Second, this study shows that changes in capital market conditions and information asymmetry costs are two important frictions that lead certain firms to issue debt than equity. The study of debt financing decisions in response to perceived market conditions yields additional insights into the subjective judgment of managers in their financing decisions. Third, examining the effects of hot-debt issuance on capital structure allows us to draw inferences from a considerably larger sample of firms than relying on a sample of IPO firms which might skew the results. Focusing on the equity financing decisions of IPO firms to learn about its capital structure implications and whether managers behave in line with the predictions of conventional capital structure theories after the issue year, is rather precarious because the equity financing of IPO firms is also associated with the decision to become a publicly traded corporation while debt issuance by public corporations represents a purely financing decision.

The rest of the paper is organised as follows. Section 2 describes the data, sample construction and descriptive statistics. Section 3 examines whether the 'hot' debt market phenomenon is associated with (i) changes in the capital market environment and (ii) asymmetric information, controlling for other factors that might motivate firms to issue debt during 'hot' debt market periods. Section 4 examines the short- and long-term effects of 'hot' debt market effect on capital structure. Section 5 reports a series of robustness checks. Section 6 concludes.

2. Data and Descriptive Statistics

2.1. *Data, sample selection and descriptive statistics*

The original sample consists of all new, nonconvertible, public bond issues from 1 January 1970 to 31 December 2006 in the US markets, as reported by Securities Data Company (SDC) in the Thompson Financial SDC new issues database. The data contain information on issue date, identity and characteristics of borrowers such as their industry and nationality, along with various bond issue characteristics such as proceeds in nominal dollars. Debt issues from non-US firms and financial firms (SIC code between 6000 and 6999) were excluded from the sample. Multiple issues by the same firm in a given month were consolidated into one issue, and the proceeds were aggregated. The sample excludes debt issues with nominal proceeds of less than 1 million US dollars. The initial sample contained 7,241 corporate debt issues. Furthermore, the sample was restricted to those firms for which COMPUSTAT accounting data were available for the last fiscal year prior to the debt issue. All the accounting data are from COMPUSTAT and they end in fiscal year 2006. Finally, this screening produced 6,110 firm-year debt issue observations.

2.2. *Variable definitions*

We use a number of variables to proxy macroeconomic and capital market conditions. The real short-term interest rate ($R_{st} - \pi$) is defined as the 3-month Treasury bill rate, R_{st}, minus the actual monthly inflation rate, π. The term spread ($R_{lt} - R_{st}$) is defined as the difference between 10-year Treasury bond rate and 3-month Treasury bill rate. The risk spread ($R_{ct} - R_{lt}$) is defined as the difference between Moody's Seasoned Baa corporate bond yields and 10-year Treasury bond rates. $R_{s\&p500}$ represents the monthly returns of S&P 500 index as the equity market returns. $\Delta P/E$ denotes the monthly changes in price-earnings ratio of S&P 500 index. *USCI* is the US coincident index, a comprehensive summary measure of US economic conditions made up of coincident indicators of the US economy including measures of production, employment, income and sales, produced by Economic Cycle Research Institute.

In terms of accounting data, variables used in the analysis are defined as follows.[9] Book debt, *D*, is defined as the total liabilities (COMPUSTAT item 181) and preferred stock (Item 10, replaced by the redemption value of preferred stock (item 56) if missing), minus deferred taxed (Item 35) and convertible debt (Item 79). Book equity, *E*, refers to the total assets (Item 6), minus book debt. Book leverage, *D/A*, is then defined as book debt divided by total assets. Firm-year observations where the book leverage exceeded 100% were dropped. Market-to-book ratio, *M/B*, is book debt plus market equity (common shares outstanding (Item 25) times share price at fiscal year-end (Item 199), divided by total assets). Consistent with Baker and Wurgler (2002) observations with *M/B* exceeding 10.0 were dropped.

The net debt issues, *d/A*, variable represents the change in book debt over total assets, *A*. The net equity issues, *e/A*, variable is the change in book equity, minus the change in retained earnings (Item 36). *RE/A* is defined as the change in retained earnings relative to total assets. *EBITDA/A*, firm profitability measure, is earnings before interest, taxes, and depreciation (Item 13) over total assets. *SIZE* is the logarithm of net sales (Item 12) in millions of 2006 US dollars. Asset tangibility, *PPE/A*, is defined as net plant, property, and equipment (Item 8). *R&D/A* is the research and development expense (Item 46, replaced by zero when missing). In our regression analysis, dummy variable *RDD* takes the value of 1 when Item 46 is missing. *INV/A* denotes capital expenditures (Item 128). *DIV/E* is common dividends (Item 21) divided by the year-end book equity. *CASH/A* refers to cash and short-term investments (Item 1). The variables *d/A, e/A, RE/A, EBITDA/A, PPE/A, R&D/A, INV/A*, and *CASH/A* are normalised by fiscal year-end total assets and are measured in percentage terms. We remove firm-year observations from the sample when *d/A, e/A, RE/A, EBITDA/A, INV/A*, or *DIV/E* exceed 100% in absolute value.

2.3. *Summary statistics*

Table 1 reports summary statistics of firm characteristics and financial decisions. All variables with the exception of *SIZE* are expressed in percentage terms. The analysis is organised with respect to debt issue time. Specifically, the *issue year* refers to the fiscal

[9] These variable definitions are in line with those of Alti (2006), who examined the market timing of hot IPO issues.

Table 1

Summary statistics of firm characteristics and financing decisions

This table reports the means and standard deviations of various firm characteristics for the period around the hot-debt issue year. The sample of US non-financial corporate debt issues was generated from the Thompson SDC Bond Issue database covering the period January 1970 – December 2006. The sample consists of all corporate debt issuers, with accounting data for the pre-issue year available in COMPUSTAT. The last year of COMPUSTAT data used is 2006. The issue year refers to the *fiscal year* in which the corporate debt issue took place. *Issue year* + *k* is the kth fiscal year after the debt was issued. All variables except *SIZE* are in percentage terms. Book Leverage, D/A, is the ratio of book debt to total assets (Book debt, *D*, defined as total liabilities, and preferred stock, minus deferred taxed and convertible debt). Market-to-book ratio, *M/B*, denotes book debt plus market value of equity divided by total assets. Net debt issues, *d/A*, is the change in book debt. Net equity issues, *e/A*, is the change in book equity minus the retained earnings. Retained earnings are measured by *RE/A*. Profitability is measured by *EBITDA/A*, which is earnings before interest, taxes, and depreciation. *SIZE* is the logarithm of net sales in millions of 2001 dollars. Asset tangibility, *PPE/A*, is refers to net plant, property, and equipment. *R&D/A* is research and development expense. *INV/A* is capital expenditure. *DIV/E* is common dividends divided by year-end book equity. *CASH/A* denotes cash and short-term investments. The variables *d/A*, *e/A*, *RE/A*, *EBITDA/A*, *PPE/A*, *R&D/A*, *INV/A*, and *CASH/A* are normalised by the fiscal year-end total assets.

	No. of Observations		*D/A*	*M/B*	*d/A*	*e/A*	*RE/A*	*EBITDA/A*	*SIZE*	*PPE/A*	*R&D/A*	*INV/A*	*DIV/E*	*CASH/A*
Pre-issue	6110	Mean	60.08	120.08	–	–	2.52	14.26	7.41	56.99	0.90	8.83	4.72	3.48
		SE	[18.26]	[75.42]	–	–	[7.31]	[7.33]	[1.77]	[27.06]	[2.13]	[7.31]	[44.79]	[5.58]
Issue year	6049	Mean	61.78	120.83	1.71	0.56	2.16	13.59	7.52	56.33	0.88	8.68	4.92	3.72
		SE	[17.87]	[73.76]	[9.54]	[11.2]	[6.41]	[6.41]	[1.71]	[26.99]	[2.1]	[7.09]	[25.54]	[5.98]
Issue year + 1	5860	Mean	62.08	119.76	0.52	0.17	2.07	13.49	7.63	56.26	0.87	8.28	4.75	3.55
		SE	[18.46]	[74.02]	[7.82]	[11.11]	[6.26]	[6.47]	[1.67]	[26.88]	[2.07]	[6.66]	[34.11]	[5.51]
Issue year + 2	5650	Mean	62.29	118.38	0.53	−0.11	1.99	13.39	7.72	56.08	0.86	7.84	5.82	3.54
		SE	[19.01]	[78.68]	[7.47]	[11.55]	[6.31]	[6.62]	[1.64]	[26.82]	[2.03]	[5.8]	[33.84]	[5.39]
Issue year + 3	5479	Mean	62.42	118.13	0.43	−0.25	1.99	13.39	7.79	55.98	0.86	7.61	4.92	3.62
		SE	[20.41]	[78.63]	[9.17]	[11.77]	[6.44]	[6.7]	[1.62]	[26.75]	[2.08]	[5.45]	[37.97]	[5.33]
Issue year + 4	5309	Mean	62.32	118.82	0.17	0.31	2.00	13.48	7.87	55.80	0.86	7.34	5.36	3.84
		SE	[21.3]	[80.89]	[9.54]	[26.03]	[6.5]	[6.39]	[1.61]	[26.71]	[2.04]	[5.21]	[22.73]	[5.58]
Issue year + 5	5153	Mean	62.11	120.49	0.27	0.09	1.99	13.29	7.94	55.57	0.87	7.16	6.16	3.92
		SE	[22.2]	[82.07]	[11.28]	[26.9]	[6.65]	[7.89]	[1.6]	[26.7]	[2.11]	[5.04]	[59.25]	[5.61]

year in which the debt issue was conducted. The issue year+k is the kth fiscal year after the debt issue.

We note that sample size declines from 6,110 to 5,153 during six years after debt issuance. This could be attributed to bankruptcies or mergers and acquisitions of debt issuers. It could be argued that the sample is, to some extent, subject to 'survivor bias' because of the exclusion of the 'dead' firms that disappeared from the sample over time. However, only about 3% of debt issuers disappear from the sample per year after the debt issue year, which is not unreasonable in a large sample of firms. The mean book-leverage ratio, *D/A*, for the total sample varies from 60.08% in the pre-issue year to 62.11% six years after the pre-issue year. The highest change in book leverage occurs in the debt issue year (1.70%) and remains fairly stable at around 62% thereafter. Accordingly, new issuance of debt and equity during this period is consistent with the pattern of changes in leverage. In the issue year, the percentage of net debt issuance, *d/A*, was 1.71%, on average, which is identical to the change in the mean book leverage of the entire sample. While net debt issuance in the following years declines sharply, it exceeds the net equity issuance during the post-debt issue period.

Retained earnings decline significantly in the debt issue year, but remain relatively stable in succeeding years at the 2% level. Profitability, *EBITDA*, exhibits a similar pattern. Firm size increases somewhat with age, whereas tangible assets decline during the five-year period after the debt issue year. While R&D expenses decline in the debt issue year, no substantive variation is found in subsequent years. However, an interesting pattern emerges in Table 1: the investment rate of debt issuers decreases from 8.83% in the pre-issue year to 7.16% five years later. This seems to suggest that debt issuance is not driven by the investment opportunities (needs) of debt issuers. By contrast, increases in dividend payments (from 4.72% in pre-issue year to 6.16% in year+5) and cash (from 3.48% in pre-issue year to 3.92% in year+5) during the post-debt issue five-year period appear to suggest that debt-issuing firms raise dividend payments while cash balances rise with the infusion of new capital in subsequent years. The rise in dividend payouts suggests that managers of hot-debt issuing firms raise dividends to preserve pre-issue equity valuation, as indicated by the relatively stable 5-year post-issue period M/B ratio and drop in profitability, *EBITDA*.

2.4. *Hot-debt markets and corporate debt financing*

Debt financing during hot-debt market periods has received no attention in the capital structure literature. Most importantly, the motives of hot-debt issuance and its impact on capital structure remain unknown. To examine whether firms time their debt raising activities, we develop a hot-cold market measure by defining hot- and cold-debt markets on the basis of monthly volume of debt issues.[10] The initial SDC sample, prior to imposition of the COMPUSTAT data requirements, is employed to determine the number and volume of debt issues for each month during the January 1970–December 2006 period. Following Helwege and Liang (2004), and Alti (2006), a three-month centred moving average of debt issue volume for each month is estimated in constant dollars, measured as of 1 December 2006 to smooth out any seasonal variation. The advantage of a moving average is that it avoids seasonal considerations for debt issue waves

[10] Bayless and Chaplinsky (1996), in the context of IPOs, also use volume to identify hot- and cold-markets.

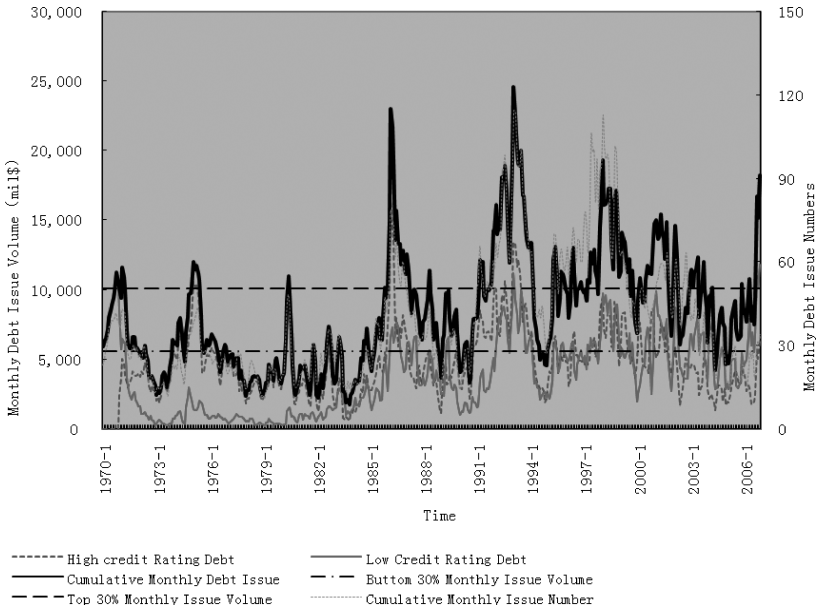

Fig. 1. Time series of the detrended monthly debt issue volume

Figure 1 plots the cumulative monthly issue volume and deals of corporate debt issues, and high-investment grade debt (A-grade or above of Moody's rating) and low-investment grade debt (below A-grade of Moody's rating) monthly issue volume for the period January 1970 – December 2006 in constant dollars measured as of 1 December 2006. The monthly volume and deal numbers of debt issues are adjusted by a 3-month detrended moving average to smooth out seasonal variations. The horizontal dash line and point-dash line denote the top and bottom 30% of monthly debt issue volume, measured as of 1 December 2006 across the sample period, which are used to define the hot- and cold-debt market, respectively.

and economic conditions become exogenous determinants of the hot-debt windows of opportunity. Hence, a hot-market based measure is used to capture the hot-debt issuance effects of debt on capital structure.

After counting the three-month moving average, the maximum monthly issue volume during the sample period was 24.57 billion in 2006 US dollars, and the minimum volume was 1.73 billion in 2006 US dollars. Hot (cold) months were, then, defined as those that ranked in the top (bottom) 30% of all months in the sample with respect to distribution of detrended monthly moving average debt issue volume. We create a dummy variable, *HOTD*, that takes the value of 1 when an individual debt is issued during a hot month, and zero if the debt was issued in a cold month. This *hot-cold* dummy, then, is our main focus in measuring firms' hot-debt issuance (debt market timing) attempts.[11]

Figure 1 plots the cumulative monthly issue volume and deals of corporate debt issues, and high-investment grade debt (A-grade or above of Moody's rating) and low-investment grade debt (below A-grade of Moody's rating) monthly issue volume for the period January 1970–December 2006 in constant dollars measured as of 1 December

[11] For robustness purposes, we construct an alternative HOTD, a dummy variable, and replicate the analysis in Section 5.

2006. The horizontal point dash line represents the bottom 30 percentile ranked by monthly volume of debt issues at 5,616 million in 2006 dollars, while the horizontal dash line denotes the top 30 percentile at 10,130 million in 2006 dollars. As this figure illustrates, the hot and cold months differ substantially in terms of cumulative volume and corresponding number of debt issues. From the whole sample of 6,110 debt issues, 3,082 issues occurred in hot months (50.4% of the sample) while 889 issues (14.5% of the sample) took place in cold months. This suggests that more firms issue debt when debt issuance activity is unusually high. Some studies have used an alternative measure to identify hot-cold markets by relying on the number of monthly debt issue deals, which we also plot in Figure 1 for comparison. Interestingly, Figure 1 shows that there is little qualitative and quantitative difference between these two measures. The two measures closely match each other numerically (3,227 debt issues during hot months and 845 during cold months) and graphically. While in this study we employ the cumulative volume of monthly debt issues first to define hot- and cold-markets and then construct our hot-markets measure, we also check the robustness of our results using a hot-markets measure based on the number of monthly debt issue deals.[12] An obvious pattern that becomes apparent in Figure 1 is that corporate debt issue clusters are denser in the post–early-1980s period than in previous years of the sample, which, to some extent, coincide with below-investment grade debt (below A-grade of Moody's rating) issue volume peaks and structural changes in the debt market that occurred in the early 1980s. In addition, the post-1982 period witnessed a dramatic rise in share repurchases. Therefore, to ensure that our results are not sensitive to this pattern of debt issue clusters, we examine the impact of hot-debt issuance on capital structure for the pre- and post-1982 period separately (see the section on robustness checks).

3. Determinants of 'Hot' Debt Market Issuance

3.1. *Debt issue waves and capital market conditions*

A number of recent studies indicate that debt issuance decisions are driven by debt market conditions (e.g. Baker *et al*., 2003; Faulkender, 2005). If market conditions play an important role in shaping the debt issuance of hot-debt firms, one would expect them to exhibit greater sensitivity to debt market conditions than that of cold-debt firms. To examine the sensitivity of corporate hot- versus cold-debt issuance to debt market conditions, we study the relation between corporate debt issuance, Dt, and debt market conditions captured by the actual inflation rate, (π), defined as the percentage change in the US consumer price index (CPI), realised real short-term rate ($R_{st} - \pi$), defined as the 3-month Treasury bill rate minus the actual inflation, and the term spread ($R_{lt} - R_{st}$), defined as the difference between the 10-year Treasury bond yield and 3-month

[12] Our results, available upon request, remain unchanged when we use the hot-cold market measure based on the number of debt issues. While the deal based hot-cold market measure captures the extent to which the debt market is hot or not as well, the choice for the volume based hot-cold market measure was mainly dictated because it has the advantage that macroeconomic conditions become exogenous determinants of hot windows of debt market opportunities. Second, because if managers believe the debt market is favourable, they would tend to time the market by issuing abnormally high volumes of debt and, therefore, it is more likely to reflect managers' market timing intentions than the number of deals.

Treasury bill return, as suggested in the literature.[13] The estimated regression takes the following specification:

$$\mathrm{Ln}(D_t) = a + b1 * (Rs_t - \pi) + b2 * (Rl_t - Rs_t) + b3 * (Rc_t - Rl_t) + b7 * \tau + \varepsilon_t \quad (1a)$$

Meanwhile, there is no reason to believe that equity and debt market conditions are irrelevant. Hence, we assume that the variation of equity market environment may have an impact on corporate debt issuance. Accordingly, the equity market conditions are also examined. We involve the monthly return and the change in the price-earnings ratio of S&P 500 index as the equity market index, as well as the US coincidence index (USCI) as a measure of the US economic cycle in the regression (1b).

$$\mathrm{Ln}(D_t) = a + b4 * (R_{s\&p500})_t + b5 * (\Delta P/E)_t + b6 * USCI_t + b7 * \tau + \varepsilon_t \quad (1b)$$

Finally, a multivariate examination involving both equity and debt market conditions is conducted by estimating regression (1c).

$$\mathrm{Ln}(D_t) = a + b1 * (Rs_t - \pi) + b2 * (Rl_t - Rs_t) + b3 * (Rc_t - Rl_t) + b4 * (R_{s\&p500})_t + b5 * (\Delta P/E)_t + b6 * USCI_t + b7 * \tau + \varepsilon_t \quad (1c)$$

where τ is the time trend of debt issuance level over the sample period.

Table 2 reports the regression results. Panel A (B) lists the sensitivity of aggregate monthly deals (volume) of debt issuance to market conditions. In line with the view that a steep yield curve is less likely to be correlated with subsequent economic recession (Estrella and Mishkin, 1996), where firms face low probability of distress and the cost of bearing interest rate volatility may thus be lower, the positive and statistically significant relationship between the aggregate debt issuance and the term spread indicates that more firms issue debt in anticipation of improving economic conditions (i.e., non-recessionary periods). This result is consistent with the evidence of Faulkender (2005) and Antoniou *et al*. (2009). Another interpretation of the positive association between debt issuance and the term spread, documented in the survey of Graham and Harvey (2001), is that managers tend to issue debt when they expect the long-term rate to decline in the future. Since the maturity of most corporate public debt is longer than one year, we do not see an obvious increase or decrease of debt issue deal numbers corresponding to the variation of the real short-term rate (Panel A). The negative coefficients of the real short-term rate, however, as shown in Panel B, suggest that, at the aggregate level, less debt is issued when the short-term rate increases.

On the other hand, debt issuance is also influenced by the variations of equity market conditions as demonstrated by the negative relation between debt issuance and the S&P 500 index, as a proxy of equity market returns. Moreover, overvaluation in the equity market, proxied by the change in price-earnings ratio of S&P 500 index, induces a decrease in debt issuance. Following Baker *et al*. (2003) this result seems to suggest that firms time capital markets by issuing overvalued equity and repurchasing undervalued equity. Contrary to the cyclical nature of equity issuance, the negative sign of USCI suggests that hot-debt issuance is countercyclical and inversely related to economic activity. In sum, the debt issuance waves appear to be associated with both equity and debt market changes and the intention of managers to time the capital markets.

[13] See Baker *et al*. (2003) for a similar regression specification and variable definitions.

Table 2

Corporate debt issuance and market conditions

This table reports regression estimates of the total debt issues D_t on debt and/or equity market condition factors.

$$Ln\,(D_t) = a + b1 * (Rs_t - \pi) + b2 * (Rl_t - Rs_t) + b3 * (Rc_t - Rl_t) + b7 * \tau + \varepsilon_t$$

$$Ln\,(D_t) = a + b4 * (R_{s\&p500})_t + b5 * (\Delta P/E)_t + b6 * USCI_t + b7 * \tau + \varepsilon_t$$

$$Ln\,(D_t) = a + b1 * (Rs_t - \pi) + b2 * (Rl_t - Rs_t) + b3 * (Rc_t - Rl_t) + b4 * (R_{s\&p500})_t + b5 * (\Delta P/E)_t + b6 * USCI_t + b7 * \tau + \varepsilon_t$$

Total debt issues consists of all debt issues generated from SDC. The sample spans the 1970 to 2006 period (444 months) and it is sorted by the number of deals, *Ln(Dn)*, and the monthly deal volume, *Ln(Dv)*, respectively. The real short-term interest rate ($R_{st} - \pi$) is defined as the 3-month Treasury bill rate, R_{st}, minus the actual the monthly inflation rate, π. The term spread ($R_{lt} - R_{st}$) is defined as the difference between 10-year Treasury bond yield and 3-month Treasury bill rate. The risk spread ($R_{ct} - R_{lt}$) is defined as the difference between Moody's Seasoned Baa corporate bond yields and 10-year Treasury bond rates. $R_{s\&p500}$ represents the monthly returns of S&P 500 index as the equity market returns. ΔP/E denotes the monthly changes in price-earning ratios of S&P 500 index. USCI is the US coincident index (a comprehensive summary measure of U.S. economic conditions made up of coincident indicators of the U.S. economy including measures of production, employment, income and sales, produced by Economic Cycle Research Institute). τ is the trend of debt issuance level over the sample period. Panel A shows the aggregate monthly deal numbers of debt issuance (natural log). Panel B shows the aggregate monthly deal volumes of debt issuance (natural log). t-statistics are hetoroskedasticity and auto-correlation robust for time-series dependence up to 2 lags.

		$R_{st} - \pi$		$R_{lt} - R_{st}$		$R_{ct} - R_{lt}$		$(R_{s\&p500})_t$		$(\Delta P/E)t$		$USCI_t$		τ		*Constant*		
Ln(Dt)	*Obs.*	b1	[t]	b2	[t]	b3	[t]	b4	[t]	b5	[t]	b6	[t]	b7	[t]	a	[t]	*R-Square*
Panel A: Aggregate monthly deal numbers of debt issuance																		
Ln(Dn)	444	0.001	[0.07]	0.065	[3.17]	0.199	[4.2]							0.002	[7.85]	2.632	[26.3]	0.218
	444							−0.012	[−1.91]	−0.126	[−3.91]	−0.026	[−3.06]	0.002	[10.8]	3.113	[57.8]	0.280
	444	0.002	[0.157]	0.062	[3.03]	0.089	[1.62]	−0.009	[−1.39]	−0.136	[−4.23]	−0.018	[−1.68]	0.002	[9.56]	2.848	[23]	0.309
Panel B: Aggregate monthly volumes of debt issuance																		
Ln(Dv)	444	−0.038	[−3.26]	0.023	[1.05]	0.224	[4.42]							0.002	[8.74]	7.979	[74.4]	0.221
	444							−0.008	[−1.17]	−0.115	[−3.26]	−0.040	[−4.31]	0.002	[9.49]	8.502	[144]	0.243
	444	−0.038	[−3.04]	0.034	[1.54]	0.143	[2.37]	−0.004	[−0.57]	−0.139	[−3.94]	−0.014	[−1.21]	0.002	[9.04]	8.144	[60]	0.278

3.2. *Information asymmetry*

Another important underlying determinant of firms' financing decisions is the level of information asymmetry at the time debt capital is raised. Myers and Majluf (1984), who argue that investors use firm-specific information about the issuing firm to condition their assessment of the motivation to issue, suggest that firms are likely (unlikely) to issue debt (equity) in periods when asymmetric information is high. Firms with high asymmetry of information costs will be subject to high adverse selection costs of equity and therefore reluctant to issue equity. Consequently, to avoid the adverse selection costs of equity firms with growth prospects will turn into the debt markets and try to take advantage of a 'debt financing window' by issuing debt. To assess the magnitude of the adverse selection costs of hot- and cold-debt issuers we use the stock price synchronicity, *SYNCH*, which measures the amount of market-wide information relative to the firm-specific information (French and Roll, 1986; Roll, 1988; Morck *et al*., 2000) embedded into stock prices. The stock price synchronicity is the residual sum of squares from a market model regression of monthly stock returns for 48 months prior to issue.[14] A lower *SYNCH* indicates that a larger amount of firm-specific information is used by investors to value equity (future cash flows). When it is more difficult for investors to observe firm-specific information (i.e., higher idiosyncratic risk) the adverse selection costs of equity increase as investors are constrained to infer the true value of the firm from market-wide information only. As a result, the adverse selection cost of equity which is negatively related to the proportion of firm-specific information is of sufficient magnitude to force firms to resort to debt financing. Hence, to the extent that adverse selection costs deter equity issuance the adverse selection costs of equity hypothesis predicts a positive relation between *SYNCH* and leverage.

We use two related measures of market-wide information relative to the firm-specific information estimated from the market model regression. The first, *SYNCH*1, is the stock's beta (β), which measures the responsiveness of the stock's return to market-wide information (market returns). The second, *SYNCH*2, is the R^2 from the market model regression, which mirrors the fraction of variation in stock returns explained by market returns. Because the R^2 is bounded between zero and one, we estimate this price synchronicity measure by taking its logit-transformation, $\ln(R^2/(1 - R^2))$. Further to the analysis of hot-debt issuance in response to capital market conditions, documented earlier, at the aggregate level, we examine now the association between information asymmetry costs and the probability of debt issuance in hot- vs cold-debt markets, accounting for capital market conditions by estimating the following regression:

$$HOTD = a + b1 * SYNCH + b2 * (Rs_t - \pi) + b3 * (Rl_t - Rs_t) + b4 * (Rc_t - Rl_t) + b5 * (R_{s\&p500})_t + b6 * (\Delta P/E)_t + \varepsilon_t \quad (2)$$

The *HOTD* is a binary variable that takes the value of 1 if debt is issued during a hot-debt market period and zero if debt is issued during a cold market period. Hot (cold) debt markets are defined as the months with an aggregate debt issue volume ranking on

[14] Ng *et al*. (2009) show that the conventional interpretation of how adverse selection, relying on measures developed in the microstructure literature, manifests in capital markets is misspecified. The stock price synchronicity measure, however, employed in this study is unlikely to suffer from this criticism since it has a more direct link with firm performance.

top (bottom) 30% of the period from 1970 to 2006, with a sample of 3825 observations generated from SDC bond issue database. The control variables are the same as in equation (3). In brief, if adverse selection costs are a major deterrent to equity issuance, then periods of increased information costs should coincide with periods of relatively high debt issues and, therefore, a positive relation is expected to emerge between *HOTD* and *SYNCH* in regression (2).

Table 3 reports the results for two measures of synchronicity. Consistent with the asymmetry of information hypothesis, the positive and statistically significant coefficient of synchronicity measures suggests that 'hot' debt issuance occurs when firms' adverse selection costs of equity are high. The regression results confirm that when equity is out of favour due to high adverse selection costs, firms engage in debt-financing (i.e., issue less information sensitive securities). This also demonstrates that when a particular firm characteristic is in trouble (i.e., equity due to adverse selection costs) firms endowed with that characteristic engage in debt financing, especially when debt market conditions are more favourable. In addition, the regression results show that the control variables, capturing market conditions, exhibit the same pattern as in Table 2. The yield and the risk spreads appear to rise during hot-debt market periods. More importantly, the negative coefficients of equity market returns and the change in the P/E ratio suggest that low equity returns and equity undervaluation (i.e., unfavourable equity market conditions) induce firms to resort to debt financing. Overall, the evidence indicates that hot-debt market periods occur when firms' equity is out of favour due to high information asymmetry costs. Hot-debt issuance appears to be associated with managerial efforts intended to reduce or avoid firm's adverse selection costs.

3.3. *Financial characteristics of hot- and cold-debt market issuers*

Now we examine a set of firm-specific characteristics that are likely to influence managers' decision to issue debt during hot-debt market periods. Panel A of Table 4 reports mean values of hot- and cold-debt issuing firm financial characteristics prior to debt issuance, including leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), capital expenditure (*INV/A*), dividend payout (*DIV/E*), and free cash (*CASH/A*). With the exception of size, market-to-book ratio and dividend payout, all variables are standardised with firm assets. The *t*-values of mean differences, based on one-tail mean comparison tests with unequal variance, are also shown in brackets. The financial characteristics of hot- and cold-market debt issuers indicate that they differ significantly in several ways. Hot-debt market issuers appear to be firms larger in size and with higher profitability than cold-market issuers. In line with Stoughton *et al*. (2001) and Benveniste *et al*. (2002), the evidence also shows that hot-debt market issuers have higher growth opportunities (i.e., market-to-book ratio and R&D expenses). However, the tangible assets, retained earnings and investment rates of hot-market debt issuing firms are relatively lower than those of cold-market debt issuers. No distinct differences are observed with respect to dividend payout policy and cash balances.

Panel B of Table 4 shows that hot-debt issuers have higher leverage (D/A_t), growth opportunities (Q Ratio), credit rating (High Credit Rating) and are less financially constrained, based on estimates of the KZ index of Kaplan and Zingales (1997), than

Table 3

Asymmetric information, market conditions and corporate debt issuance in the hot-cold markets

This table reports regression estimates of the probability of corporate debt issues happening in the hot or cold debt markets with the influences of asymmetric information and a series of exogenous debt and/or equity market condition factors. The dependent variable, *HOTD*, is a dummy variable of the hot-cold debt market, taking value on I if the debt was issued during the hot debt market, and zero if during the cold market. The hot (cold) debt markets are defined as the months with an aggregate debt issue volume ranking on top (bottom) 30% of the period from 1970 to 2006, with a sample of 3825 observations generated from SDC bond issue database.

$$HOTD = a + b1 * SYNCH + b2 * (Rs_t - \pi) + b3 * (Rl_t - Rs_t) + b4 * (Rc_t - Rl_t) + b5 * (R_{s\&p500})_t + b6 * (\Delta P/E)_t + \varepsilon_t$$

SYNCH denotes the synchronicity of the equity prices to the market (i.e., indicates the amount of firm-specific information is used by investors to value equity). *SYNCH1*, is the stock's beta (β), which measures the responsiveness of the stock's return to market-wide information (market returns). *SYNCH*2, is the stock price synchronicity based on logit-transformation of R^2: $\ln(R2/(1 - R2))$.The real short-term interest rate ($R_{st} - \pi$) is defined as the 3-month Treasury bill rate, R_{st}, minus the actual the monthly inflation rate, π. The term spread ($R_{lt} - R_{st}$) is defined as the difference between 10-year Treasury bond yield and 3-month Treasury bill rate. The risk spread ($R_{ct} - R_{lt}$) is defined as the difference between Moody's Seasoned Baa corporate bond yields and 10-year Treasury bond rates. $R_{s\&p500}$ represents the monthly returns of S&P 500 index as the equity market returns. $\Delta P/E$ denotes the monthly changes in price-earning ratios of S&P 500 index.

	SYNCH		$R_{st} - \pi$		$R_{lt} - R_{st}$		$R_{ct} - R_{lt}$		$R_{s\&p500}$		$\Delta P/E$		*Constant*		
	b1	[t]	b2	[t]	b3	[t]	b4	[t]	b5	[t]	b6	[t]	b1	[t]	*R-Square*
SYNCH1	0.08	[2.21]	−0.002	[−0.838]	0.066	[12.6]	0.163	[12.7]	−0.012	[−6.52]	−0.106	[−9.93]	0.285	[10.4]	0.155
SYNCH2	0.26	[2.55]	−0.002	[−0.859]	0.066	[12.6]	0.165	[12.8]	−0.012	[−6.56]	−0.106	[−9.96]	0.281	[10.2]	0.156

Table 4

Differences in financial characteristics between hot- and cold-debt market issuing firms

This Table evaluates the mean values of financial characteristics of hot- and cold-market firms at year-end one year before the debt-issue year (Panel A) and presents firm-specific characteristics of hot- and cold-debt issuers related to the motivation to issue debt (Panel B). Hot (cold) firms are those that issue debt in hot (cold) months, ranked in the top (bottom) 30% of all the months in the sample period with respect to the distribution of the detrended monthly moving average debt issue volume, shown in Figure 1.

The mean values of the financial characteristics of pre-issue year in Panel A include the leverage ratio (D/A), market-to-book ratio (M/B), retained earnings (RE/*A*), size (*SIZE*), short-term to total debt ratio (S/D), tangible assets (*PPE/A*), R&D expense (*R&D/A*), capital expenditure (*INV/A*), dividend payouts (*DIV/E*), and free cash (*CASH/A*). The variables are standardised by firm year-end assets (excepting size, market-to-book ratio and dividend). All variables are expressed in percentage terms. The t-statistics report the differences of each pair based on one-tailed mean difference tests with unequal variances.

The variables of financial characteristics include the leverage ratio (D/A), Q Ratio is firm's Tobin's Q at the debt issue year, High credit rating is the percentage of firms with a debt credit rating equal or above BBB in Standard & Poors, or equal or above Baa in Moody's, Financially constrained firms are defined on the basis of the Kaplan and Zingales (1997) index. Firms with a high (low) KZIndex value relative to the median of the whole sample are categorised as financially constrained (unconstrained).

$$KZIndex = -1.002 \times CashFlow + 0.283 \times Q + 3.139 \times Leverage - 39.368 \times Dividends - 1.315 \times CashHoldings$$

Bankruptcy Rate measures the percentage of firms that declared bankruptcy within three years after debt issuance. Stock price synchronicity, a proxy for adverse selection costs of equity, measures: *SYNCH*1, is the stock's beta (β), which measures the responsiveness of the stock's return to market-wide information (market returns). *SYNCH*2, is the stock price synchronicity based on logit-transformation of R^2:$\ln(R^2/(1 - R^2))$. R^2 is the residual sum of square from a market model regression of monthly stock returns for 48 months prior to issue. Ownership concentration ratio, *OCON*, is defined as the number of common shareholders over the outstanding number of common shares. Repurchase is the percentage of firms involved in share-repurchase activities one year after debt issuance. Acquisitions measure the percentage of firms involved in merger and acquisitions one year after debt issuance and the subsequent year (+1).

Panel A. Mean values of financial characteristics of hot- and cold-debt issuers one year prior to debt-issue year

	D/At − 1	*M/Bt* − 1	*RE/At* − 1	*EBITDA/At* − 1	*SIZEt* − 1	*S/Dt* − 1
Hot-market firms	61.10	130.20	2.41	14.49	7.74	9.57
Cold-market firms	58.81	95.66	2.81	13.75	6.57	8.13
t-value (difference)	[3.40]	[16.29]	[−1.95]	[3.13]	[18.2]	[4.23]

	PPE/At − 1	*R&D/At* − 1	*INV/At* − 1	*DIV/Et* − 1	*CASH/At* − 1
Hot-market firms	53.85	0.97	8.36	4.26	3.41
Cold-market firms	65.62	0.62	10.16	5.34	3.47
t-value (difference)	[−11.71]	[4.80]	[−6.27]	[−0.81]	[−0.33]

Table 4
Continued.

Panel B. Firm-specific characteristics of hot- and cold-debt issuers at debt-issue year

	Hot	Cold	t-value (difference)
Leverage (D/A_t)	62.83%	59.37%	[5.81]
Q Ratio	1.31	0.98	[4.11]
High Credit Rating	83.06%	67.52%	[2.17]
Financially Constrained	37.18%	62.82%	[−12.28]
Bankruptcy Rate	9.78%	18.41%	[−1.29]
SYNCH1	0.37	0.30	[3.87]
SYNCH2	−0.308	−1.09	[21.59]
Ownership Ratio	0.376	2.937	[−4.85]
Repurchase	13.26%	3.24%	[3.61]
Acquisitions	47.32%	11.87%	[2.52]
Acquisitions +1	84.64%	15.35%	[4.75]
No. Issues	3082	889	–

cold-debt issuers.[15] Only 37.1% of hot-debt issuers in our sample are characterised as financially constrained relative to 62.82% of cold-debt issuers. Consistent with their high investment grade status, hot-debt issuers have considerably lower bankruptcy rate (9.78%) than cold-debt issuers (18.41%).

Both measures of the stock price synchronicity of hot-debt issuers are considerably higher than those of cold-debt issuers, implying that firm-specific information has a lower weight in their equity valuation which increases the adverse selection costs of equity (i.e., higher asymmetry of information). Hence, these stock price synchronicity differences allow us to tentatively conclude that hot-debt issuers are subject to higher asymmetry of information costs than their cold-debt counterparts. The high investment grade status of hot-debt issuers and their lower bankruptcy rate relative to cold-debt issuers combined with high adverse selection costs of equity suggest that hot-debt issuers' debt preference is largely dictated by their relatively high adverse selection costs of equity.

The ownership concentration structure of debt issuers plays a role in the financing policy of the firm. In the presence of conflict of interests, agency problems emerge and control becomes valuable. Consequently, firms controlled by major shareholders are more likely to issue debt than equity in order to maintain control (Stulz, 1988). To assess ownership structure differences across firms in the sample, we report the ownership concentration ratio, defined as the number of common shareholders over the outstanding number of common shares. A close look at ownership structure of hot-debt versus cold-debt issuers reveals an important difference: hot-debt issuers have markedly more concentrated ownership than cold-debt issuers. This difference suggests that controlling shareholders of hot-debt firms who value the benefits of control the most are likely to favour debt financing to maintain control.

[15] The KZ index has been used widely in the literature and despite the controversy about its usefulness (see, among others, Almeida and Campello (2007)) as a measure of financial constraint we are not going to take an issue here.

Finally, Panel B reports the percentage of firms in our sample that engaged in share repurchases and acquisitions at the debt-issue year and in subsequent years. These estimates reveal that hot-debt issuers conduct significantly more share repurchases and acquisitions than cold-debt issuers. Specifically, about 47% (13%) of hot-debt issuers are involved in acquisitions (share repurchases) at the hot-debt issue year while only 12% (3%) of cold-debt issuers do so. More than 84% of hot-debt issuers conduct acquisitions one year after relative to 15% of cold-debt issuers. These differences are statistically and economically significant. These figures advocate that hot-debt issuers with higher adverse selection costs of equity and ownership concentration than their cold-debt issuing counterpart firms engage in significantly more share repurchases and acquisitions than cold-debt issuers with the intention to restore value. Interestingly, when we look at the buy-and-hold abnormal returns (*BHAR*) of the hot-debt issuers engaging in these transactions subsequent to the hot-debt issue year, the evidence indicates that they fail to improve long-term performance. We find that the year +1 to +5 *BHAR* are negative and economically significant.[16] This seems to be consistent with the view that when a particular firm characteristic is out of favour (equity due to adverse selection costs), firms endowed with that trait conduct debt-financed repurchase shares and/or acquisitions to restore equity value (arbitrage mispriced characteristics). In general, the share repurchases and acquisition statistics provide empirical support for anecdotal evidence that debt-financed share repurchases and acquisitions are important considerations for debt issuance in hot-debt periods.[17]

3.4. *Hot-market effects on debt issue levels*

As the first column in Panel A of Table 4 illustrates, the most interesting feature of hot-debt market issuers relates to pre-debt issue leverage. Hot issuers, on average, have a 2.31% higher book debt ratio than cold issuers (61.10% vs 58.81%). This difference is statistically significant, with a *t*-value of 3.40. The key question that emerges from the pre-issue debt figures is whether hot issuers borrow more than cold issuers, despite having higher pre-issue book debt ratios and, if they do, what are the economic forces behind their debt financing decision. To address this issue, first we estimate the $Proceeds/A_t$ variable, which measures the percentage of newly issued debt over total assets at fiscal year-end of the debt issuance. We also estimate the $Proceeds/A_{t-1}$ variable, which reflects the percentage of newly issued debt relative to pre-issue assets. A comparison of $Proceeds/A_t$ or $Proceeds/A_{t-1}$, between hot- and cold-debt market issuers is expected to reveal whether hot-debt firms issue more debt in hot- than in cold-debt markets.

Panel A of Table 5 shows average percentages of debt issue proceeds over total assets. As expected, both financing measures show that, in hot markets, firms issue significantly more debt than in cold markets. The average percentage of hot-market debt issues over total pre-issue assets is almost 2% (0.6% measured by post-issue assets) higher than that of cold-market issues. The *t*-values of the two sample tests, with unequal variances, show that the mean differences for hot- and cold-market issuers are statistically significant (2.40 and 3.81, respectively). Thus, hot-debt market issuers raise more debt capital than

[16] These results are available upon request.

[17] See, Bloomberg (30 December 2009) http://www.bloomberg.com/apps/news?pid=20601087&sid=aHNzEjVBMSuw&refer=home and Economist Staff – *The Economist*, 'Will swallowing Wyeth cure Pfizer?' 4 February 2009.

Table 5
Hot-market effects on debt issue levels

This table reports the differences between hot- and cold-market firms with respect to debt issue proceeds over firms' total assets, *Proceeds/A_t (Proceeds/A_{t-1})*. Panel A presents the mean values of Proceeds/A_t, and Proceeds/A_{t-1}, between hot and cold issuers, expressed in percentage terms. The t-statistics report the differences of each pair based on one-tailed mean difference tests with unequal variances. Panel B1 reports regression results by using the *SYNCH*1 variable, and Panel B2 reports the regression results by using the *SYNCH*2 variable. Panels B1 and B2 present the regression results of the following specification:

$$Y_t = c_0 + c_1 HOTD + c_2 HOTD \times SYNCH_{t-1} + c_3 D/A_{t-1} + c_4 M/B_{t-1} + c_5 RE/A_{t-1} + c_6 EBITDA/A_{t-1} + c_7 SIZE_{t-1} + c_8 PPE/A_{t-1} + c_9 R\&D/A_{t-1} + c_{10} RDD/A_{t-1} + c_{11} INV/A_{t-1} + c_{12} DIV/E_{t-1} + c_{13} Cash/A_{t-1} + c_{14} OCON_{t-1} + c_{15} D\text{-}OCON_{t-1} + \varepsilon_t$$

The dependent variable Y_t represents total debt issue proceeds over total assets at the end and at the beginning of the fiscal year (*Proceeds/A_t*, and *Proceeds/A_{t-1}*). The hot (cold) markets are defined as the months with a cumulative debt issue volume, which fit in to the top (bottom) 30%. The dummy variable *Hot-cold (HOTD)* takes the value of 1 when the debt issue takes place during a hot-market period, and zero otherwise. *SYNCH* denotes the synchronicity of the equity prices to the market (i.e., indicates the amount of firm-specific information is used by investors to value equity). *SYNCH1*, is the stock's beta (β), which measures the responsiveness of the stock's return to market-wide information (market returns). *SYNCH2*, is the stock price synchronicity based on logit-transformation of R^2, i.e. $\ln(R^2/(1-R^2))$. The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), cash (*CASH/A*), ownership concentration (*OCON*) and the dummy variable of ownership concentration (*D-OCON*). The dummy variable *RDD* and *D-OCON* take the value of 1 when R&D expense and ownership concentration information are missing in COMPUSTAT, respectively. Apart from the dummy variables and *SIZE*, all other variables are expressed in percentage terms.

Panel A: Mean Values	*Proceeds/At*		*Proceeds/At − 1*	
Hot	7.31		10.46	
Cold	6.68		8.49	
t-value (difference)	[2.4]		[3.81]	
Panel B1: Regression	*c*	*t-value*	*c*	*t-value*
Hot-cold (HOTD)	2.273	[8.06]	2.537	[6.24]
HOTD × SYNCH1	0.945	[3.83]	1.485	[4.18]
D/At − 1	0.021	[2.74]	0.007	[0.589]
M/Bt − 1	−0.001	[−0.08]	−0.004	[−1.49]
RE/At − 1	−0.007	[−0.447]	−0.013	[−0.618]
EBITDA/At − 1	0.090	[4.32]	0.098	[3.25]
SIZEt − 1	−3.068	[−44.3]	−4.434	[−44.4]
PPE/At − 1	−0.081	[−14.8]	−0.119	[−15.1]
R&D/At − 1	−0.191	[−2.98]	−0.297	[−3.22]
RDDt − 1	−0.530	[−1.64]	−0.822	[−1.77]
INV/At − 1	0.027	[1.63]	0.097	[4.07]
DIV/Et − 1	−0.081	[−3.97]	−0.082	[−2.77]
CASH/At − 1	0.154	[7.14]	0.296	[9.52]
OCON	−0.003	[−1.4]	−0.008	[−2.34]
D-OCON	−1.515	[−4.75]	−2.945	[−6.41]
AdjR^2	0.411		0.422	

Table 5
Continued.

Panel B2: Regression	*c*	*t-value*	*c*	*t-value*
Hot-cold (HOTD)	2.664	[9.47]	3.174	[7.84]
HOTD × SYNCH2	0.650	[7.51]	1.040	[8.35]
D/At − 1	0.019	[2.46]	0.003	[0.273]
M/Bt − 1	−0.001	[−0.59]	−0.006	[−2.25]
RE/At − 1	−0.001	[−0.067]	−0.004	[−0.194]
EBITDA/At − 1	0.086	[4.13]	0.090	[3.03]
SIZEt − 1	−3.003	[−43.1]	−4.329	[−43.2]
PPE/At − 1	−0.082	[−15.2]	−0.121	[−15.5]
R&D/At − 1	−0.204	[−3.21]	−0.319	[−3.48]
RDDt − 1	−0.728	[−2.26]	−1.142	[−2.46]
INV/At − 1	0.029	[1.8]	0.101	[4.3]
DIV/Et − 1	−0.078	[−3.83]	−0.076	[−2.6]
CASH/At − 1	0.148	[6.9]	0.286	[9.26]
OCON	−0.003	[−1.39]	−0.008	[−2.35]
D-OCON	−1.847	[−5.91]	−3.488	[−7.76]
$AdjR^2$	0.417		0.430	
Number of obs.	3825		3825	

cold-debt market issuers, although they have significantly higher pre-issue leverage than that of cold-debt market issuers. Pre-issue high leverage of hot-debt issuers does not seem to act as a deterrent of additional debt financing.

It could be argued that these differences are economically insignificant and may arise from firm-specific characteristics of hot- and cold-market issuers. To address whether the hot-debt issuance effect on the amount of debt issued is sensitive to the different characteristics of hot- versus cold-debt market firms, we examine the hot-debt market issuance effect on leverage, controlling for various firm characteristics, by estimating the following regression:

$$\begin{aligned} Y_t = {} & c_0 + c_1 HOTD + c_2 HOTD \times SYNCH_{t-1} + c_3 D/A_{t-1} + c_4 M/B_{t-1} \\ & + c_5 RE/A_{t-1} + c_6 EBITDA/A_{t-1} + c_7 SIZE_{t-1} + c_8 PPE/A_{t-1} \\ & + c_9 R\&D/A_{t-1} + c_{10} RDD/A_{t-1} + c_{11} INV/A_{t-1} + c_{12} DIV/E_{t-1} \\ & + c_{13} Cash/A_{t-1} + c_{14} OCON_{t-1} + c_{15} D\text{-}OCON_{t-1} + \varepsilon_t \end{aligned} \tag{3}$$

where, the $Proceeds/A_t$ and $Proceeds/A_{t-1}$ are used as alternative dependent variables, Y_t. The dummy variable *HOTD* takes the value of 1 for hot-debt market issuers and zero for cold-market issuers. Therefore, the coefficient of *HOTD* measures the impact of hot-debt market effect on firm's debt issuance.

In this regression specification we also focus on the cross-sectional relation between leverage and the stock price synchronicity to determine the impact of adverse selection costs of equity on debt financing during hot-debt issuance periods. As noted earlier, the adverse selection costs of equity hypothesis predicts a positive relationship between *SYNCH* and leverage. If adverse selection costs of equity act as a deterrent to equity issuance, then periods of increased information costs should be associated with periods of relatively high debt issue volume. That is, when firm-specific information becomes more difficult to observe the adverse selection risk, which is measured by the amount of market-wide relative to firm-specific information, *SYNCH*, should exert a positive impact on firm leverage. That is, leverage increases because debt

becomes a less information-sensitive security. Hence, the interaction variable between *HOTD* and *SYNCH* is expected to capture the impact of information asymmetry on debt issuance in hot-debt periods. If information asymmetry plays an important role, the coefficient of the interaction variable is expected to be positive and statistically significant. Although the hot-debt issuance dummy and its interaction with *SYNCH* are the main focus of this analysis, we also introduce a set of other control variables that other studies have shown to affect firm leverage. The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expenditures (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), cash (*CASH/A*), ownership concentration (*OCON*) and the dummy variable of ownership concentration (*D-OCON*).[18] All these variables are computed using pre-issue year-end values normalised by year-end fiscal total assets.

Panel B of Table 5 reports the regression results. In both regression specifications, the coefficients of the hot-market dummy, *HOTD*, are positive and statistically significant at conventional levels. Specifically, the coefficients of the hot-market dummy are 2.27and 2.54 in the two regressions, with *t*-values of 8.06 and 6.24, respectively. While Panel B of Table 4 indicates that hot-market issuers have higher average pre-issue leverage than cold-market issuers, the regression results in Table 5 suggest that hot-market firms issue, on average, 2.27% and 2.54% more debt than cold-market issuers, even after controlling for firm characteristics. Hence, the supplemental evidence from this regression analysis confirms that hot-debt market firms issue significantly more debt than cold-debt market firms. This is consistent with the view that debt market issuers are drawn to hot-debt markets. A more interesting result is that the $HOTD \times SYNCH1$ (Panel B1) and $HOTD \times SYNCH2$ (Panel B2) variables, in line with the prediction of the adverse selection costs of equity hypothesis, exhibit a positive and statistically significant association with leverage in both regressions. These regression estimates, consistent with our previous results, indicate that firms with increasing information asymmetry costs favour debt issuance. That is, a firm's leverage increases when a lower proportion of firm-specific information relative to market-wide information is available to investors to assess future cash flows (performance). Firms are attracted to hot-debt markets when the level of adverse selection costs of equity is high. Consequently, hot-debt markets seem to occur when firms encounter high adverse selection costs.

We turn our focus to the control variables.[19] One interesting result from these regressions is that the pre-issue debt ratio, D/A_{t-1}, has a positive and statistically significant relation with subsequent debt financing, suggesting that firms are more likely to issue debt even when their past leverage is relatively high. This is not consistent with the tradeoff hypothesis, which predicts a negative association between the pre-issue debt ratio and new debt issuance. That is, high pre-issue debt ratios do not deter firms from issuing more debt. This result does not appear to be consistent with the view that

[18] Following Alti (2006), the dummy for R&D (Ownership concentration) takes the value of 1 for missing information on R&D (Ownership concentration), and zero otherwise, since R&D (Ownership concentration) data, was missing for a large proportion of the observations in Compustat.

[19] Although the influences of firm financial characteristics on debt issuance are not the main object of this study, it is helpful when following the analysis to explore the underlying reasons for debt market timing in hot markets.

firms actively rebalance their leverage to stay within an optimal range. The statistically significant coefficients of the D/A_{t-1} variable, in both regressions, seem to be in accord with the idea that debt financing coincides with favourable debt market conditions. The market-to-book ratio enters both regressions with negative but statistically insignificant coefficients, indicating that firms with higher equity valuation (i.e., lower adverse selection costs of equity) are less likely to issue debt than equity. These results are in accord with Hovakimiam (2006), who contends that high (low) market-to-book firms use more (less) equity financing. Consistent with Baker and Wurgler (2002) who have used the market-to-book ratio as an equity market timing proxy, these regression estimates indicate that debt financing is unlikely to be reversed in favour of equity financing when a firm experiences relatively high adverse selection costs of equity. The R&D expense measure, representing the long-run investment opportunities of the firm, has a uniform association with debt financing. The negative and significant relation between R&D expenditures and debt proceeds suggests that debt financing is not the choice of firms with high growth opportunities. This is consistent with Hovakimian *et al*. (2001), who argue that firms with high R&D expenditures tend to have low preference for debt in their capital structures, to protect their growth options. Capital expenditures appear to have a positive, but weaker, relation with debt proceeds

To assess how firm capital requirements influence a firm's debt financing decision, we turn our attention to retained earnings, profitability, dividend payout and the level of cash balance variables, which reflect the new capital requirements of the firm (e.g., Woolridge and Ghosh, 1985).[20] The positive and significant coefficients of cash and profitability variables indicate that firms issue debt even when internal funds (i.e., cash flows) are high. This, coupled with the positive impact of past leverage on debt issuance, seems to suggest that debt financing is more consistent with market timing than with capital structure rebalancing considerations. High dividend payers appear to issue less debt, implying perhaps that they do attempt to manage credit ratings and implicitly leverage. Alternatively, to the extent that high dividend payout reflects a firm's low level of investment opportunities, this result seems somewhat consistent with the finding on capital expenditures.

It is well known that firm financing preferences vary by firm size; specifically, small firms rely more heavily on external capital, whereas larger firms tend to depend on internally generated funds. Indeed, the regression results confirm this by showing that larger (smaller) firms issue less (more) debt than small firms. Since tangible assets, *PPE*, vary significantly across industries, this variable may act as a proxy for industry differences, suggesting that firms in industries with high tangible assets (i.e., larger industrial firms) tend to issue less debt. The negative relation between debt financing and tangible assets also suggests that firms with low collateral (tangible assets) are more likely to issue debt in response to favourable market conditions. Finally, as expected, the results show that ownership concentration exerts significant impact on firm leverage indicating that firms with less dispersed ownership are more likely to issue debt in an attempt to retain control.

[20] Woolridge and Ghosh (1985), among others, reveal that dividend cuts with increases in retained earnings signal that the firm wishes to conserve cash to fund good investment opportunities.

3.5. *Firm-specific determinants of debt issuance in hot markets*

3.5.1. *Pre-issue debt capacity*. There are several other reasons that may potentially explain why hot-debt issuers raise more debt capital than cold-debt issuers during hot-debt market periods. First, hot-debt issuers may have a larger debt capacity than cold-debt firms. If this is the case, they are expected to be more active in taking advantage of low debt ratios, and as a result, raise more debt in an attempt to optimise their capital structure when the debt market is hot. The mean difference estimates, in Panel A of Table 6, indicate that hot-debt issuers have 2.29% (61.1% vs. 58.81%) higher pre-issue leverage than cold-debt issuers. However, this gap could be attributed to differing financial characteristics between the two groups of issuers. To shed more light on this issue, we examine the impact of the hot-cold debt issuance dummy on pre-issue book leverage, D/A pre-issue, for hot- and cold-debt issuers using the same set of control variables employed in regression (3). The first column of Table 6 displays the results of this regression. The regression results in Panel B also show that hot-debt firms do not have larger debt capacity than cold- debt firms, controlling for various firm characteristics. The insignificant coefficient of the hot-cold dummy (t-value of -1.1) suggests that the two groups of debt issuers do not differ dramatically in terms of pre-issue debt leverage.[21] Thus, these results point out that debt capacity or capital structure optimisation are not the primary reasons hot-debt issuers engage in greater debt issuance than their cold-debt counterparts. The positive and statistically significant coefficient of the interaction variable, $HOTD \times SYNCH1$, (1.33 with t-value of 1.93) indicates that hot-debt issuers subject to greater adverse selection costs of equity have higher debt ratios than cold-debt issuers in the pre-issue year. In line with our previous results this reinforces the view that hot-debt markets attract firms with high asymmetry of information costs. In unreported results, for reasons of brevity, when we employ the alternative measure of price synchronicity, *SYNCH2*, estimated from logit-transformation, $\ln(R^2/(1 - R^2))$, where the R^2 comes from the market model regression, we find similar findings. Collectively, these results confirm that adverse selection costs of equity motivate debt financing in hot-market periods and provide an explanation for hot-debt issuers' higher leverage.

3.5.2. *Growth opportunities*. Another possible explanation for the debt issuance activity of hot-debt firms is that they grow at a higher rate than cold-debt firms. Hence, if hot-debt firms invest more or expect to invest in the near future, they are likely to meet their growing capital requirements by raising debt capital. We address the investment behaviour of firms by replicating the previous regression analysis. Specifically, we now examine whether hot-debt issuance is influenced by the investment rate of debt issuers, controlling for other firm characteristics. These regression results are reported in columns (2)–(4) of Table 6. Interestingly, as shown in Panel A, we find that hot-debt issuers, on average, have a lower investment rate than their cold-debt counterparts in the issue year and in the post-issue two-year period. The differences are statistically significant and do not wane two years after the debt-issue year. The regression analysis in Panel B also shows that the investment rate of hot-debt firms is significantly lower than that of cold-debt firms in the issue year and a year after, and is indistinguishable from

[21] Other control variables exhibited significant correlations with pre-issue debt ratios. Since the main focus is to examine the difference between the debt ratios of hot and cold market issuers, the investigation was not extended to the more general question of corporate debt issue determinants implied by the control variables, for reasons of brevity.

Table 6

Pre-issue debt financing, investment and profitability of hot- and cold-debt issuing firms

This table reports the differences between hot- and cold-debt market firms with respect to their pre-issue leverage, post-issue investment rates and post-issue profitability. Panel A presents mean values for hot- and cold-debt market firms and *t*-statistics of their differences, based on one-tailed mean difference tests with unequal variances. Panels B present the estimates of the following regression:

$$Y_t = c_0 + c_1 HOTD + c_2 HOTD \times SYNCH_{t-1} + c_3 D/A_{t-1} + c_4 M/B_{t-1} + c_5 RE/A_{t-1} + c_6 EBITDA/A_{t-1} + c_7 SIZE_{t-1} + c_8 PPE/A_{t-1} + c_9 R\&D/A_{t-1} + c_{10} RDD/A_{t-1} + c_{11} INV/A_{t-1} + c_{12} DIV/E_{t-1} + c_{13} Cash/A_{t-1} + c_{14} OCON_{t-1} + c_{15} D - OCON_{t-1} + \varepsilon_t$$

The dependent variable Y_t is pre-issue leverage ratio (D/A_t), investment rate (INV/A_t), and profitability ($EBITDA/A_t$), respectively. Hot (cold) markets are defined as the months with a cumulative debt issue volume that fit into the top (bottom) 30%. The dummy variable *Hot-cold (HOTD)* takes the value of 1 when the debt issue takes place during a hot-market period, and zero in a cold-market period. *SYNCH* denotes the synchronicity of the equity prices to the market (i.e., indicates the amount of firm-specific information is used by investors to value equity). *SYNCH1*, is the stock's beta (β), which measures the responsiveness of the stock's return to market-wide information (market returns). *SYNCH2*, is the stock price synchronicity based on logit-transformation of R^2, i.e. $\ln(R^2/(1-R^2))$ (we only report results of specification involving *SYNCH1* for reasons of brevity, but available upon request). The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), cash (*CASH/A*) ownership concentration (*OCON*) and the dummy variable of ownership concentration (*D-OCON*). The dummy variable *RDD* and *D-OCON* take the value of 1 when R&D expense and ownership concentration information are missing in COMPUSTAT, respectively.. Apart from the dummy variables and *SIZE*, all variables are expressed in percentage terms.

		INV/A_t			$EBITDA/A_t$		
Event time	$D/A_{pre\text{-}issue}$	Issue year	Issue year + 1	Issue year + 2	Issue year	Issue year + 1	Issue year + 2
Panel A: Mean Values							
Hot	61.10	8.12	7.64	7.20	13.76	13.95	13.87
Cold	58.81	10.65	10.43	9.41	12.91	12.43	12.30
t-value (difference)	[3.40]	[−9.20]	[−10.94]	[−9.62]	[3.93]	[6.24]	[5.99]

Panel B: Regression	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*
HOTD	−1.1	[−1.1]	−1.195	[−6.88]	−1.551	[−7.64]	−0.055	[−0.342]	−0.288	[−1.49]	0.660	[3.38]	0.013	[0.072]
HOTD × *SYNCH1*	1.33	[1.93]	0.430	[2.82]	0.444	[2.45]	0.201	[1.43]	0.419	[2.48]	0.244	[1.41]	0.275	[1.71]
D/A_{t-1}			0.017	[3.58]	0.031	[5.44]	0.008	[1.88]	0.014	[2.53]	0.003	[0.607]	0.028	[5.71]
M/B_{t-1}	3.96	[3.96]	−0.002	[−1.34]	−0.001	[−1.03]	0.003	[3.04]	0.006	[4.7]	0.013	[10.5]	0.005	[4.36]
RE/A_{t-1}	−9.32	[−9.32]	0.004	[0.4]	−0.010	[−0.889]	0.032	[3.21]	−0.041	[−3.97]	0.005	[0.42]	0.015	[1.34]
$EBITDA/A_{t-1}$	−15.4	[−15.4]	0.139	[10.8]	0.145	[9.55]	0.065	[5.73]	0.756	[53]	0.626	[47.8]	0.837	[64.6]
$SIZE_{t-1}$	4.39	[4.39]	−0.179	[−4.17]	−0.302	[−6.01]	−0.173	[−4.21]	0.132	[2.77]	0.168	[3.38]	0.073	[1.56]
PPE/A_{t-1}	−21.1	[−21.1]	0.022	[6.54]	0.040	[10.1]	0.038	[12.1]	0.009	[2.45]	0.015	[3.87]	0.029	[8.1]
$R\&D/A_{t-1}$	−3.25	[−3.25]	−0.065	[−1.65]	−0.091	[−1.99]	−0.063	[−1.59]	−0.010	[−0.221]	−0.107	[−2.37]	0.009	[0.201]
RDD_{t-1}	3.41	[3.41]	0.440	[2.21]	0.173	[0.737]	−0.240	[−1.3]	−0.050	[−0.226]	−0.785	[−3.55]	−0.016	[−0.076]
INV/A_{t-1}	8.55	[8.55]	0.763	[74.6]	0.569	[47.8]	0.620	[59.1]	−0.062	[−5.44]	0.069	[5.99]	−0.050	[−4.2]
DIV/E_{t-1}	9.21	[9.21]	−0.034	[−2.65]	−0.046	[−3.01]	−0.001	[−0.304]	0.043	[3.04]	0.028	[3.08]	0.012	[3.67]
$CASH/A_{t-1}$	−7.09	[−7.09]	0.078	[5.9]	0.087	[5.54]	0.079	[6.34]	−0.043	[−2.95]	−0.033	[−2.32]	0.033	[2.37]
$OCON_{t-1}$	5	[5]	−0.003	[−1.86]	−0.003	[−1.77]	0.001	[1.11]	0.001	[0.807]	0.004	[2.37]	−0.001	[−0.829]
$D\text{-}OCON_{t-1}$	8.5	[8.5]	−0.438	[−2.23]	−0.781	[−3.38]	−0.095	[−0.535]	0.115	[0.529]	0.730	[3.36]	0.219	[1.09]
$AdjR^2$	0.197		0.697		0.537		0.639		0.563		0.550		0.650	
No. of Observations	3825		3786		3665		3534		3786		3665		3534	

that of cold-debt issuers two years later. This pattern persists five years after the hot-debt issue year.[22] However, hot-debt issuers with high asymmetry of information costs, as the coefficient of the interactive term (*HOTD* × *SYNCH1*) shows, tend to invest more than cold-market issuers during the issue year and one year after. This result appears consistent with the figures in Panel B of Table 4 which show that a large percentage (47%) of hot-debt issuers, engage in mergers and acquisitions immediately after the debt issuance year. Therefore, the evidence seems to support the argument that hot-debt issuers with high adverse selection costs of equity are attracted to hot-debt markets because they intend to undertake more investments than cold-debt issuers aiming of restore equity value.

3.5.3. *Profitability*. Another potential explanation for the excessive debt issuance activity of hot-debt firms is their high profitability during the issue year and subsequent years. More profitable firms may consider financing their profitable investment projects with debt when debt market conditions are favourable than when debt markets are less active and, therefore, more costly. To address this issue, we repeat the previous analysis using EBITDA as the profitability proxy and examine its relationship with the hot-debt issuance measure for both hot- and cold-debt firms. Columns 5–7 in Table 6 report profitability results for hot- and cold-debt issuing firms at the time of debt issuance and in subsequent years. The mean difference results, in Panel A, show that hot-debt issuers have 1–1.5% higher profitability than cold-debt issuers; however, this difference could be attributed to differing financial characteristics between the two groups. When we account for these effects in the regression analysis, the results in Panel B demonstrate that the coefficients of the hot-debt market dummy are either negative or insignificantly positive in subsequent years.[23] However, hot-debt issuers with high asymmetry of information costs, as the coefficient of the interactive term (*HOTD* × *SYNCH1*) indicates, appear to be more profitable than cold-market issuers during the issue year, but fail to retain their superior profitability in subsequent years. Therefore, the evidence does not seem to corroborate the view that hot-debt issuance periods are strongly related to the profitability of hot-debt issuing firms.

In summary, we find that hot-debt market firms issue significantly more debt than cold-debt market firms during hot-debt market periods mainly as a result of high adverse selection costs of equity and in an attempt to exploit favourable capital market conditions as perceived by the managers of these firms. Moreover, the evidence shows that the higher level of debt financing of hot-debt issuers is not attributed to their low pre-issue leverage or large debt capacity. In contrast, their pre-issue debt ratios are, on average, greater than those of their cold-debt issuer counterparts.

4. Short- and Long-term Effects of Hot-Debt Market Issuance on Capital Structure

4.1. *The short-term effect of hot-debt market issuance on capital structure*

The preceding section demonstrates that the hot-debt market effect is greater for hot-debt issuers with high adverse selection costs of equity. Consequently, the impact of hot-debt

[22] These results are available upon request.

[23] For the sake of brevity, we report only results two years subsequent to the debt-issue year. Results five years after the hot-debt issue year are similar and available on request.

issuance on leverage should be positive and more pronounced for hot-debt firms with high information asymmetries. The first column of Panel A in Table 7 shows the mean change in book leverage of hot- and cold-debt issuing firms at the end of issue year. As expected, the leverage of hot-debt firms increases by 1.25 percentage points (1.77 vs. 0.52) more than cold-debt firms. The mean difference is statistically significant with a t-value of 3.65. Similarly, the hot-debt market effect on the amount of debt issued can be attributed to differing characteristics of hot- and cold-debt issuing firms. To examine whether hot-debt market issuance, *HOTD*, and its interaction with the adverse selection costs of equity measure, *SYNCH*, have a net positive effect on leverage, we estimate regression (4), which controls for various determinants of debt issuance:

$$\begin{aligned} Y_t = {} & c_0 + c_1 HOTD + c_2 HOTD \times SYNCH_{t-1} + c_3 D/A_{t-1} + c_4 M/B_{t-1} \\ & + c_5 RE/A_{t-1} + c_6 EBITDA/A_{t-1} + c_7 SIZE_{t-1} + c_8 PPE/A_{t-1} \\ & + c_9 R\&D/A_{t-1} + c_{10} RDD/A_{t-1} + c_{11} INV/A_{t-1} + c_{12} DIV/E_{t-1} \\ & + c_{13} Cash/A_{t-1} + c_{14} OCON_{t-1} + c_{15} D\text{-}OCON_{t-1} + \varepsilon_t \end{aligned} \tag{4}$$

The dependent variable Y_t is the change in book leverage, $(D/A_t - D/A_{t-1})$, from pre- to debt-issue year t. The set of control variables is the same as in equation (3). Panel B of Table 7 reports the regression results. These results confirm the previous difference with respect to the change in book leverage between hot- and cold-debt firms, even after controlling for several other effects. The hot-debt issuance effect, *HOTD*, on the change in book leverage is 1.89 percentage points and is statistically significant (t-value of 6.05). Interestingly, the coefficient of the hot-market effect (*HOTD*), 1.89, is consistent with the mean difference in the change in book leverage between hot- (1.77%) and cold-debt (0.52%) issuing firms, as shown in panel A. Therefore, the hot-market effect measure is exogenous and orthogonal to the control variables. As expected, the coefficient of the interaction term is positive and statistically significant (with t-value of 5.59) illustrating that the hot-debt market effect is larger for firms with higher information asymmetries. This is consistent with our previous findings and in line with the prediction of the adverse selection hypothesis.

Following Baker and Wurgler (2002), we decompose the change in leverage to changes in equity issue, e/A_t, retained earnings, $\Delta RE/A_t$, and the residual change in leverage, $E_{t-1}(1/A_t - 1/A_{t-1})$, which depends on total growth in assets from the combination of equity issues, debt issues and newly retained earnings. The change in leverage, then, takes the following form:

$$\begin{aligned} Y_t &= -e/A_t - \Delta RE/A_t + E_{t-1}(1/A_t - 1/A_{t-1}) \\ &= -e/A_t - \Delta RE/A_t + (E/A)_{t-1}(\Delta Cash + \Delta Other\,Assets)/A_t \end{aligned} \tag{5}$$

As before, Y_t stands for the change in book leverage, $(D/A_t - D/A_{t-1})$. The term $-e/A_t$ represents the negative of net equity issues in year t and should be noted that it is not equivalent to the *Proceeds*/A_t variable in Table 5. That is, this term represents equity capital, following from equity issues, that is used to pay down debt. Because new equity capital tends to add to total assets, the reduction in leverage is less likely to be one-for-one. The $-\Delta RE/A_t$ measures the change in retained earnings. Newly retained earnings add to equity capital and, therefore, reduce leverage. The term $E_{t-1}(1/A_t - 1/A_{t-1})$ captures the effect on leverage through firm growth in assets, which can be decomposed into the change in cash and the change in other assets. If hot-debt issuers raise more

Table 7

The short-term effect of hot-debt market issuance on capital structure

This table reports the effect of debt issuance on firms' book leverage in the debt-issue year and the decomposed factors of changes in book leverage. *Panel A* presents mean values for hot- and cold-debt market firms and *t*-statistics of their differences, based on one-tailed mean difference tests with unequal variances. Panels B1 and B2 present coefficients of the following regression:

$$Y_t = c_0 + c_1 HOTD + c_2 HOTD \times SYNCH_{t-1} + c_3 D/A_{t-1} + c_4 M/B_{t-1} + c_5 RE/A_{t-1} + c_6 EBITDA/A_{t-1} + c_7 SIZE_{t-1} + c_8 PPE/A_{t-1} + c_9 R\&D/A_{t-1} + c_{10} RDD/A_{t-1} + c_{11} INV/A_{t-1} + c_{12} DIV/E_{t-1} + c_{13} Cash/A_{t-1} + c_{14} OCON_{t-1} + c_{15} D\text{-}OCON_{t-1} + \varepsilon_t$$

The dependent variable Y_t is the change in book leverage ($D/A_t - D/A_{t-1}$) in the debt-issue year, net equity issues (e/A_t), the change in cash ($cash/A_t$), the change in retained earnings (re/A_t), and the level of debt ratios (D_t/A_t) at the end of the issue year, respectively. The hot (cold) markets are defined as the months with a cumulative debt issue volume that fit into the top (bottom) 30%. The dummy variable *Hot-cold (HOTD)* takes the value of 1 when the debt issue takes place during a hot-market period, and zero in a cold-market period. *SYNCH* denotes the synchronicity of the equity prices to the market (i.e., indicates the amount of firm-specific information is used by investors to value equity). *SYNCH1,* is the stock's beta (β), which measures the responsiveness of the stock's return to market-wide information (market returns). *SYNCH2*, is the stock price synchronicity based on logit-transformation of R^2, i.e. $\ln(R^2/(1 - R^2))$ (we only report results of specification involving *SYNCH1* for reasons of brevity, but available upon request).The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), cash (*CASH/A*) ownership concentration (*OCON*) and the dummy variable of ownership concentration (*D-OCON*). The dummy variable *RDD* and *D-OCON* take the value of 1 when R&D expense and ownership concentration information are missing in COMPUSTAT, respectively. Apart from the dummy variables and SIZE, all variables are expressed in percentage terms.

	$D/A_t - D/A_{t-1}$	e/A_t	$cash/A_t$	re/A_t	D_t/A_t
Panel A: Mean Values					
Hot	1.77	0.33	0.24	−0.44	62.83
Cold	0.52	2.64	0.56	−0.25	59.37
t-value (difference)	[3.65]	[−6.49]	[−2.09]	[−1.15]	[5.81]

Panel B: Regression	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*	*c*	*t-value*
HOTD	1.896	[6.05]	−2.713	[−6.8]	−0.249	[−1.54]	−0.566	[−3]	1.911	[5.97]
HOTD × *SYNCH1*	1.536	[5.59]	−1.486	[−4.25]	0.180	[1.27]	0.318	[1.93]	1.519	[5.41]
D/A_{t-1}	−0.165	[−19]	0.016	[1.46]	0.001	[0.315]	0.003	[0.638]	0.833	[93.5]
M/B_{t-1}	0.005	[2.21]	0.017	[6.45]	0.003	[2.56]	−0.003	[−2.76]	0.004	[2]
RE/A_{t-1}	0.048	[2.86]	−0.643	[−30.4]	0.001	[0.135]	−0.379	[−37.9]	0.051	[2.97]
$EBITDA/A_{t-1}$	−0.048	[−2.08]	0.069	[2.32]	−0.031	[−2.56]	0.019	[1.39]	−0.038	[−1.6]
$SIZE_{t-1}$	−0.372	[−4.82]	−0.639	[−6.51]	−0.369	[−9.25]	0.011	[0.23]	−0.328	[−4.16]
PPE/A_{t-1}	−0.050	[−8.21]	0.014	[1.8]	−0.015	[−4.62]	−0.006	[−1.53]	−0.047	[−7.55]
$R\&D/A_{t-1}$	−0.216	[−3.03]	0.014	[0.155]	0.070	[1.91]	0.024	[0.562]	−0.214	[−2.95]
RDD_{t-1}	−1.128	[−3.14]	2.241	[4.9]	−0.476	[−2.56]	−0.404	[−1.87]	−1.071	[−2.92]
INV/A_{t-1}	0.106	[5.77]	−0.018	[−0.777]	0.017	[1.79]	0.025	[2.26]	0.069	[3.66]
DIV/E_{t-1}	0.017	[0.751]	−0.092	[−3.17]	−0.031	[−2.6]	−0.015	[−1.08]	0.012	[0.532]
$CASH/A_{t-1}$	0.158	[6.61]	0.030	[0.981]	−0.241	[−19.4]	−0.074	[−5.16]	0.162	[6.64]
$OCON_{t-1}$	−0.003	[−1.01]	0.004	[1.34]	0.002	[1.47]	−0.001	[−0.537]	−0.002	[−0.86]
$D\text{-}OCON_{t-1}$	−0.510	[−1.44]	0.358	[0.793]	0.246	[1.34]	−0.171	[−0.8]	−0.558	[−1.54]
$AdjR^2$	0.156		0.250		0.111		0.297		0.752	
No. of Observations	3786		3786		3786		3786		3786	

debt capital than they need, then debt proceeds are more likely to boost their cash and short-term investments than their long-term assets.

Columns 2–4 of Table 7 report results on the components of $D/A_t - D/A_{t-1}$, as shown in equation (5). Panel A shows the mean values of hot- and cold-debt issuing firms for the components of changes in leverage in accord with equation (5), respectively. Panel B reports regression results from estimating equation (4). The only difference between these regressions, reported in columns 2–4 of Table 5, and the regression in column 1 of Table 7 relates to the dependant variable. The four new dependant variables correspond to the right-hand side terms of equation (5). Not surprisingly, the net equity issuance in the debt issue year, $-e/A_t$, as shown in Panel A, is considerably lower for hot-debt issuers. The difference in the mean of net equity issues between hot- and cold-debt market firms is −2.31% (0.33 vs. 2.64) and is highly significant at conventional levels (t-value of −6.49). That is, during the debt-issue year the net equity issuance of hot-debt issuers is 2.31 percentage points lower than that of cold-debt issuers. The net equity issuance, *e/A*, during the debt-issue year has a more negligible impact on the change in cash, *cash/A*, of hot-debt firms (0.24%) in contrast to the change of cold-debt firms (0.56%). The hot-debt issue effect on the change in cash, *cash/A*, for hot-debt firms is significantly less (−0.32 with a t-value of −2.09) than that of cold-debt firms. The mean difference with respect to the change in long-term assets, measured by the change in retained earnings, indicates that hot-debt firms are less profitable than cold-debt firms and those assets are not influenced by the issuance of debt during hot or cold markets. However, it suggests that the lower profitability of hot-debt firms results in a negative, but negligible hot-debt issuance effect on retained earnings during the debt-issue year.

The regression coefficient of the hot-debt market dummy, reported in column 2 of Panel B, confirms that hot-debt firms raise significantly less equity and more debt than cold-debt firms in the debt-issue year. The magnitude of the coefficient (−2.71%, t-value of −6.80) is very close to the mean difference of equity changes (2.31%) in Panel A. Therefore, the hot market effect captures the intention of market timing and is orthogonal to other control variables in determining the changes of equity. In addition, we find that the magnitude of this coefficient (−2.71%) 'is larger than the difference of change in leverage (−1.25%) shown in the column 1 of Panel A, suggesting that the debt ratio increases of hot-market firms are less than the decreases in new equity. Consistent with our previous findings, hot market firms issue debt with the intention of repurchasing undervalue equity in order to restore equity value. The coefficients of the hot-debt market dummy in the net equity issues, *e/A*, (−2.71, t-value of −6.80) and retained earnings, *re/A*, (−0.57, t-value of −3.00) regressions are negative, suggesting that both new equity and retained earnings decline significantly more for hot- than for cold-debt market issuers, while debt ratios of hot-debt firms rise more than the debt ratios of cold-debt firms. Interestingly, the hot-debt issuance effect on leverage is not affected by changes in cash, retained earnings and long-term assets. The negative coefficient of the hot-cold dummy in the regression of retained earnings suggests that the hot-market firms do not appear to have good investment opportunities and, therefore, they should have a surplus in cash balances as a result of excessive debt issuance. Quite the opposite, the cash balances of hot-debt firms are lower (−0.32 with t-value of −2.09) than those of cold-debt firms. A plausible explanation for this is that hot-debt firms incur higher cash outflows due to higher costs resulting from their high debt ratios. This seems to be consistent with the view that hot-debt market issuers take advantage of hot-debt market conditions by raising capital in excess of their needs. Consistent with the evidence of Baker and Wurgler (2002), the positive and statically significant coefficient of the M/B

in the net equity issuance regression (0.017 with t-value of 6.45) indicates that equity issuance is driven by equity overvaluation considerations (market timing).

Finally, examination of post-issue leverage at debt-issue year end with respect to the hot-debt market issuance effect, as shown in column 5 of Panel A, indicates that the mean debt ratio is 3.46 percentage points higher (62.83% vs. 59.37%) for hot-debt firms compared with cold-debt firms and is highly significant (with a *t*-value of 5.81 in mean difference). Not surprisingly, the hot-debt issuance effect appears to have an impact on the capital structure of hot-debt issuers. The debt ratios at the hot-issue year-end of hot-debt market firms are higher than those of cold-debt firms by 1.91 percentage (*t*-value of 5.97) in Panels B. What is even more remarkable is that the coefficient of the interaction term *(HOTD* × *SYNCH1)* is 1.52 and statistically significant (with *t*-value of 5.41) implying that hot-debt issuers with adverse selection costs of equity, issue significantly more debt than cold-debt issuers.[24] This result, consistent with our previous evidence, provides additional support for the prediction of the adverse selection hypothesis which postulates that firms with information asymmetries are less likely to issue equity.

Therefore, if hot-debt issuing firms had been trying to maintain their capital structure at a target level, the coefficients of the hot-debt market dummy, *HOTD*, capturing the impact of the hot-debt market issuance effect on leverage changes, $D/A_t - D/A_{t-1}$, and post-issue debt ratio, D/A_t, should be zero, or negative for a leverage reversal (i.e., it is assumed that hot- and cold- market issuers do not, in general, differ in their target capital structure). However, the regression results show that the hot-market effect on leverage is positive, implying that hot-debt issuers experience significant capital structure deviations from their initial levels. Debt issuance during hot-debt market exacerbates the debt ratio differences between hot- and cold-debt issuers. What is even more important is that this effect is orthogonal to other control variables that may affect firm capital structure.

Overall, these findings provide supplemental support for the hot-debt issuance effect on firm leverage motivated by information asymmetry costs of equity considerations. Firms subject to adverse selection costs of equity appear to take advantage of hot-debt market windows to issue less information asymmetry-sensitive securities.

4.2. *The long-term effect of hot-debt market issuance on capital structure*

The previous analysis documents that hot-debt market issuance has a direct impact on firm capital structure in the short-run and that hot-market firms experience significant capital structure deviations from their initial levels. The main issue we address in this section relates to the key question of how persistent the hot-debt issuance effect on firm capital structure is. Specifically, we examine whether its impact is reversed subsequent to the debt-issue year. The motivation behind this investigation is the sharp contrast between the prediction of the tradeoff theory, which postulates that firms have an optimal capital structure and that their debt ratios adjust toward their optimal target range (see, Fama and French (2002), among others), and the empirical evidence of Baker and Wurgler (2002), which shows that firms time the equity market without rebalancing their capital structure toward an optimum level of leverage.

To address this persistence question, we now estimate (4) using the cumulative change in leverage, $D/A_t - D/A_{pre\text{-}debt\ issue}$ as dependent variable, which is defined as the change

[24] Similar results are obtained when the *SYNCH2* is used in the regressions.

in leverage from the year-end of the pre-debt issue year to year t after the issue year. To the extent that hot-debt issuance has a lasting effect on leverage, the cumulative change in leverage from its pre-debt issue level should continue to display the hot-debt market effect in subsequent years. Table 8 presents mean differences, in cumulative leverage changes and debt levels, between hot- and cold-firms and the corresponding regression results. As the mean difference values show, in Panel A, the cumulative change in leverage of hot- and cold-debt market firms is consistently and significantly different five years after the hot-debt issue year. Hot-debt issuers have significantly higher cumulative leverage than cold-debt issuers.

The regression results are consistent with the above pattern of mean value differences between hot- and cold-debt market firms. The *HOTD* dummy variable enters these regressions with a positive and significant coefficient. The significant coefficients of the hot-debt issuance dummy indicate that the hot-debt issuance effect persists five years after the debt-issue year. As the first column in Panel A of Table 8 illustrates, one year after the debt issue, the coefficient of the hot- debt issuance dummy is 1.28 with a *t*-value of 2.87. It is interesting to recall that the hot-debt issuance effect on the change in leverage during the debt issue year was 1.89, as reported in column 1 of Table 7. Hence, the cumulative change in leverage of 1.28 one year after the debt-issue year indicates that only a negligible portion of the hot-debt issuance effect has been reversed. The coefficients of the hot-debt issuance dummy, two and three years subsequent to the hot–debt-issue year are even larger (2.2 and 2.1, respectively). Moreover, the hot-debt issuance effect continues to persist five years after the hot-debt-issue year as well. In fact, the hot-debt dummy coefficients four and five years after the hot–debt-issue year, are 1.41% and 1.90%, respectively, and are larger than what is observed in the first year after the hot–debt-issue year (1.28). Thus, the hot-debt issuance effect appears to have a lasting impact on firm capital structure; this is inconsistent with the view that firms rebalance their capital structures toward an optimum level.

Since hot-debt market firms have higher pre-issue debt ratios than cold-debt market firms, as observed in Table 6, it can be argued that the persistence of the hot-debt issuance effect on leverage several years after the hot-debt-issue year may be driven by the higher pre-issue-year leverage of hot-market firms. Therefore, to examine the sensitivity of the previous results, we re-run regression (4) using year-end book leverage as the dependent variable instead. Panel B of Table 8 shows that five years after the hot-debt issue year, the mean debt leverage of hot-debt market issuing firms ranges from 62.91 to 63.40, while the corresponding mean leverage of cold-debt market firms ranges from 59.27 to 59.86 during the same period. This pattern in mean differences is consistent with that of Panel A. Controlling for other firm characteristics, the regression coefficient of the hot-debt issuance dummy confirms the prior regression results, suggesting that the leverage of hot-debt market firms continues to exceed that of cold-debt market firms even five years later. Hence, the persistence of the hot-debt issuance effect documented earlier is unlikely to be influenced by the higher pre-issue-year change in leverage of hot-debt market firms.

4.3. *Capital structure rebalancing*

The empirical results thus far show that after the hot-debt issuance effect has triggered a considerably larger increase in leverage for hot-debt market issuers, it persists. The non-transitory nature of the hot-debt issuance effect shows that the book leverage of

Table 8

The long-term effect of hot-debt market issuance on capital structure

This table reports the long-term persistence of hot-debt market issuance effect on firm book leverage and regression results using the regression specification (3) with dependent variables the cumulative change in leverage and the level of debt ratio. Panel A presents the cumulative change of debt ratios, $D/A_t - D/A_{pre\text{-}issue}$, for 5 years after the issuance year, and Panel B presents the levels of debt ratios, D/A_t, for the same post-issue period, respectively. In each panel, the differences in mean values of the hot- and cold-market firms are presented with *t*-statistics for their differences, based on one-tailed mean difference tests with unequal variances.

The hot (cold) markets are defined as the months with a cumulative debt issue volume fitted into the top (bottom) 30%. The dummy variable Hot-cold (HOTD) takes the value of 1 when the debt issue takes place during a hot-market period, and zero for the cold-market period. The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), and cash (*CASH/A*). The dummy variable *RDD* takes the value of 1 when the research and development expense information is missing in COMPUSTAT. Apart from the dummy variables and *SIZE*, all variables are expressed in percentage terms. In this table, only the coefficients of the hot-cold dummy variable are reported, for reasons of brevity.

Event Time	Issue year + 1	Issue year + 2	Issue year + 3	Issue year + 4	Issue year + 5
Number of obs.	3665	3534	3428	3331	3241
Panel A: Cumulative changes in debt ratios			$D/A_t - D/A_{pre\text{-}issue}$		
Mean Value Differences					
Hot	2.01	2.60	2.94	2.96	3.02
Cold	1.14	1.04	1.41	1.39	0.93
t-value (difference)	[2.19]	[3.18]	[2.27]	[2.01]	[2.26]
Regression					
HOTD	1.282	2.203	2.116	1.412	1.903
t-value	[2.87]	[4.27]	[3.27]	[1.93]	[2.38]
Panel B: The level of debt ratios			D/A_t		
Mean Value Differences					
Hot-market Firms	62.91	63.26	63.40	63.32	63.09
Cold-market Firms	59.69	59.56	59.83	59.86	59.27
t-value (difference)	[5.16]	[5.43]	[4.41]	[3.84]	[3.80]
Regression					
HOTD	0.896	1.974	1.853	1.201	1.535
t-value	[1.23]	[2.61]	[2.22]	[1.34]	[1.65]

hot-debt issuers continues to exceed that of their cold-debt counterparts more than 5 years after the debt-issue year. This is reflected in both the cumulative changes and year-end levels of the book leverage ratios. The persistence of the hot-debt issuance effect is consistent with the findings of Baker and Wurgler (2002), who report that historical efforts to time equity issuance with high market valuations have a persistent impact on capital structures. Todd (2007) documents that, due to financial openness and development, corporate debt ratios in 34 emerging markets persistently increased during the period from 1980 to 2004, although part of debt ratio increases were offset by the growth of equity. In agreement with Baker and Wurgler (2002), Todd's (2007) international evidence suggests that the continuing improvement of macroeconomic conditions tend to raise the overall firm leverage towards one direction persistently. Our findings, however, suggest that firms resort to debt capital markets when their equity falls out of favour as a consequence of high and lasting adverse selection costs. That is, debt issuance is preferred when equity becomes costly due to adverse selection costs. This is in contradiction with the view of Loughran and Ritter (1995) who argue that there is very little time variation in adverse selection costs. Leary and Roberts (2005) attribute the persistent effect of shocks on leverage, observed in previous studies, to adjustment costs rather than indifference toward capital structure. Accounting for adjustment costs, they find that firms tend to rebalance their leverage over the next two to four years after the issue year. Therefore, if hot-debt market firms do not engage in active rebalancing, the hot-debt issuance effect will have a lasting impact on their capital structure. Our evidence shows that the rebalancing process starts five years after the debt-issue year.

Restoring capital structure to its optimum level by reducing leverage is a more likely corporate strategy than pursuing less effective strategies such as changes in retained earnings or resorting to short-term commercial paper. The persistence of the hot-debt issuance effect, however, could come from recapitalisation attempts if hot-debt market firms believe that debt market conditions are favourable. If this is what causes persistence, the difference in leverage between hot- and cold-debt firms will become more pronounced. While we have already shown that the difference in the cumulative change in book leverage between hot- and cold-debt market issuers exists in the long run, it is necessary to examine whether the non-transitory nature of the hot-debt issuance effect is linked to the differing firm financing strategies. To address this issue, we first split the difference in leverage into newly issued debt, d/A_t, and equity, e/A_t, and examine independently their relationship with the hot-debt issuance dummy during the post–hot-issue period by estimating (1) using them as separate dependent variables. Specifically, the dependent variable d/A_t (or e/A_t), is the newly issued debt (equity) in year t after the hot–debt-issue year. Rebalancing would naturally lead to a reversal, as hot-debt market firms would strive to reduce external debt financing, after a short period of time, to maintain an optimum capital structure. However, the results, reported in Table 9, show that the external financing patterns of hot- and cold-debt issuing firms five years after the debt-issue year do not differ dramatically. Contrary to the conventional view that firms follow a dynamic rebalancing strategy aiming to reverse capital structure deviations from an optimal target range, we find that hot-debt market firms do not deploy reversed external financing strategies to reduce higher leverage ratios caused by hot-debt issuing. The absence of reversal financing lasts for several years after the post–debt-issue year. This result gains support from both mean values of the new debt (equity) issues and the regression coefficients of the hot-debt issuance dummy, controlling for

Table 9

Reversal of the hot-debt market issuance effect on capital structure

This table reports external financing activity of debt issuers in post-issue years. Panel A presents mean values of the annual net debt issues, d/A_t, for five years after the hot debt issuance. Panel B presents mean values of net equity issues, e/A_t, in the five years after hot debt issuance. In each panel, differences in mean values of hot and cold-market firms are presented with *t*-statistics for their differences, based on one-tailed mean difference tests with unequal variances. Regression coefficients for the *HOTD* are reported by estimating (1) using d/A_t and e/A_t as dependent variables.

Hot (cold) markets are defined as months with a cumulative debt issue volume fitted into the top (bottom) 30%. The dummy variable Hot-cold (*HOTD*) takes the value of 1 when the debt issue takes place during a hot-market period, and zero for the cold-market period. The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), and cash (*CASH/A*). The dummy variable *RDD* takes the value of 1 when the research and development expense information is missing in COMPUSTAT. Apart from the dummy variables and *SIZE*, all variables are expressed in percentage terms. In this table, only the coefficients of the hot-cold dummy variable are reported, for reasons of brevity.

Event time	Issue year +1	Issue year +2	Issue year +3	Issue year +4	Issue year +5
Number of obs.	3665	3534	3428	3331	3241
Panel A			Net Debt Issues (d/A_t)		
Mean Values					
Hot	0.28	0.67	0.37	0.16	0.25
Cold	0.44	−0.05	0.72	0.17	0.20
t-value (difference)	[−0.64]	[2.59]	[−0.85]	[−0.01]	[0.11]
Regression					
HOTD	0.232	1.116	0.357	−0.041	0.236
t-value	[0.75]	[3.76]	[0.9]	[−0.09]	[0.6]
Panel B			Net Equity Issues (e/A_t)		
Mean Values					
Hot	0.40	0.04	−0.05	0.69	0.55
Cold	1.28	0.83	−0.62	0.16	−0.01
t-value (difference)	[−2.23]	[−1.86]	[1.09]	[0.57]	[0.68]
Regression					
HOTD	−1.464	−1.497	−0.569	−0.105	−0.183
t-value	[−3.7]	[−3.88]	[−1.3]	[−0.08]	[−0.14]

several firm characteristics.[25] Therefore, consistent with our previous findings, hot-debt market issuers do not attempt to rebalance their capital structures to an optimal leverage target. In contrast, they issue more debt and less equity after the hot-debt issuance year.

The above pattern is confirmed in Figure 2, which exhibits changes in firms' capital structure and financing activities five years after the issue year. The cumulative change

[25] For the sake of brevity, regression results for the control variables are not reported here, but are available upon request.

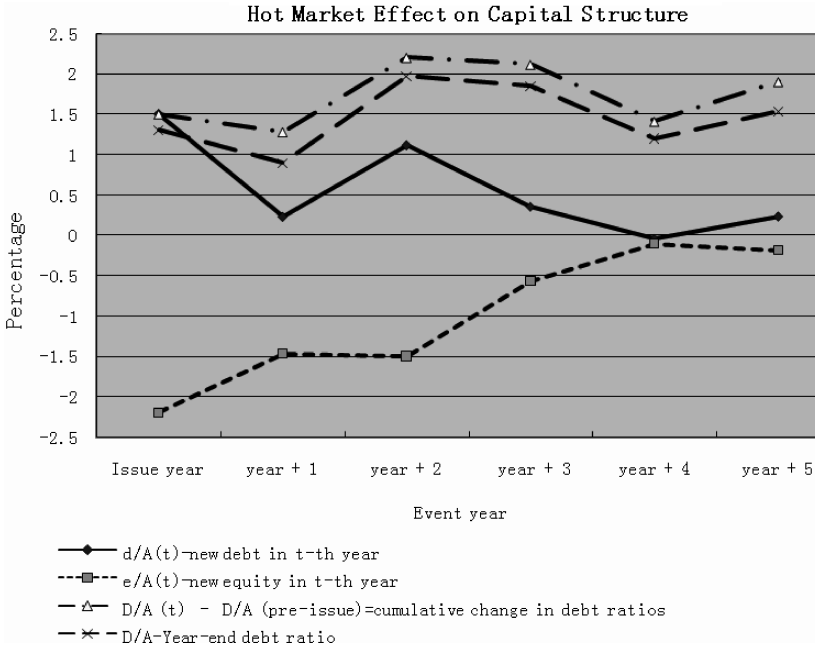

Fig. 2. Long-term effects of hot-debt market issuance on capital structure

This figure exhibits the long-term effect of hot-market issues on capital structure. It plots the difference between hot- and cold-market issuers with respect to changes in leverage. The dash-point line shows cumulative change in debt ratios ((D/A_t) – D/A)) after the hot-market issue-year. The wide dash line shows levels of debt ratios (D/A_t) after the hot-market issue-year. The solid line shows annual new debt issuance (d/A_t) after the hot-market issue-year. The point line shows annual new equity issuance (e/A_t) after the hot-market issue-year.

in book leverage (dash-point line ($D/A_t - D/A_{t\text{-pre-issue}}$)) and level of debt (wide dash line (D/A_t)) ratios are consistently higher for hot-debt market firms after five years. Moreover, hot-debt market firms do not appear to reverse their capital structures by issuing less (more) debt (equity). In short, the persistence of the hot-debt issuance effect documented in this study suggests that hot-debt issuers do not seem to rebalance their capital structure to an optimal leverage target.

5. Robustness Checks

The above analysis presents evidence consistent with the view that corporate hot-debt issuance has a lasting impact on firm capital structure. In this section, we conduct several robustness tests to assess the sensitivity of our persistence results.

5.1. *Alternative hot-debt market issuance measure*

The hot-debt issuance dummy, the key measure in this analysis, could be largely responsible for the previous results on the capital structure persistence phenomenon of hot-debt market firms. Specifically, the definition of hot- and cold-markets used for the construction of the hot-debt issuance dummy could bias the results because it focuses

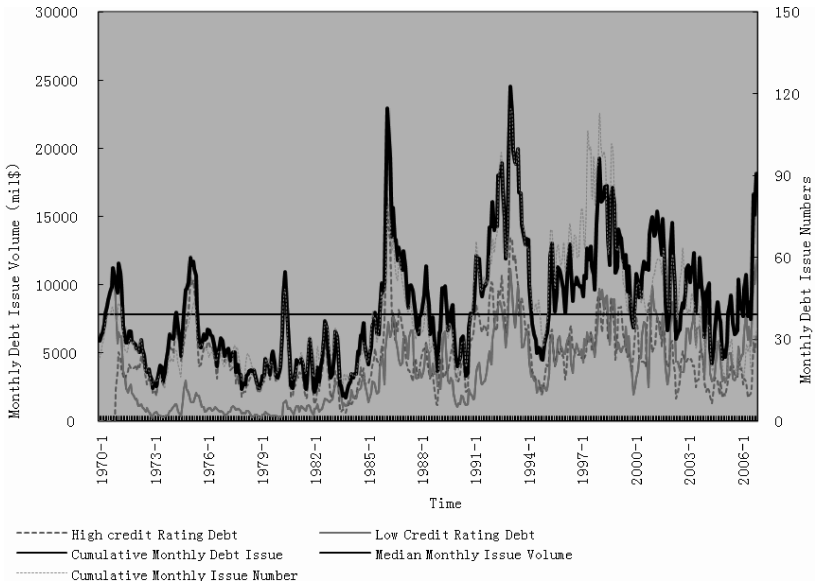

Fig. 3. Alternative hot-debt market issuance measure

Figure 3 plots the cumulative monthly issue volume and deals of corporate debt issues, and high-investment grade debt (A-grade or above of Moody's rating) and low-investment grade debt (below A-grade of Moody's rating) monthly issue volume for the period January 1970 – December 2006 in constant dollars measured as of 1 December 2006. The monthly volume and deal numbers of debt issues are adjusted by a 3-month detrended moving average to smooth out seasonal variations. The horizontal solid lines denotes the median monthly debt issue volume, measured as of 1 December 2006 across the sample period, which is used to define the hot- and cold-debt market as the alternative measure.

mainly on extreme hot- and cold-issuers. Since it is rather difficult to categorise hot- and cold-debt market conditions with precision, especially for months with a neutral level of debt issue volume, previous studies have employed different measures. Helwege and Liang (2004) define a hot-market month as one in which the volume of debt issues exceeds the top quartile, while Alti (2006) uses the median of the monthly debt issue volume to classify hot- and cold- markets.

To check the robustness of our empirical results, we replicated our tests using the median of monthly debt issuance instead of the top (bottom) 30% used thus far, to categorise a market as hot (cold). Hence, this procedure takes into account all the debt issues that occurred during the entire sample period.[26] In contrast to the previous sample, which consists of 3,978 (3,089 hot issues and 889 cold issues) observations, the new tests are based on the whole sample consisting of 6,110 observations. This sample includes debt issues that occurred during neutral months. This difference should yield somewhat smaller hot-debt issuance dummy coefficients. Figure 3 plots the detrended monthly moving average volume of debt issues, detrended monthly moving average number of debt issue deals, with the horizontal line illustrating the median in constant dollars as of December 2006. This figure demonstrates that hot- and cold-months differ considerably in terms of debt volume. This pattern is also confirmed by the monthly number of debt

[26] Alti (2006) uses a similar metric.

issue deals. For each test, the short-term impact of market timing on leverage is examined by using the pre-issue book leverage (i.e., hot issue proceeds over assets, and post-issue leverage), while the long-term impact is investigated by focusing on cumulative changes in debt ratios, levels of book leverage, and new debt and equity issuances in the five years after the hot-debt market issue year.

Table 10 reports the new regression coefficients of the hot-cold issuance dummy variable.[27] The regression results are both qualitatively and quantitatively consistent with our previous findings. The short-term effect of hot-debt issuance on book leverage confirms that the difference in proceeds to total assets is significantly larger for hot-debt than for cold-debt market firms. In addition, these results show that the pre-issue debt ratios, D/A_{t-1}, do not differ between the hot- and cold-debt issuing firms. However, the change in debt ratios, $D/A_t - D/A_{t-1}$, and post-issue year-end debt ratios, D/A_t, increase significantly due to hot-debt issuance. The investment rates and profitability for hot- and cold-issuers, not reported here, exhibit similar patterns to those observed previously. While hot-debt market issuers are not more profitable, their investment rates are considerably lower than those of cold-debt market issuers.

We now turn to the long-term impact of hot-debt issuance on book leverage. As expected, the coefficients of the hot-cold dummy, in absolute values, are generally smaller than their counterparts in the previous analysis. However, what is noteworthy is that the *HOTD* coefficients, which measure the impact of hot-debt issuance on capital structure changes, exhibit a very similar pattern to the previous results in terms of magnitude and significance. For example, the dummy coefficients of the cumulative changes in leverage are 1.15, 1.69, 1.71, 1.21 and 1.10, respectively from one to five-years after the debt-issue year, while the corresponding coefficients, reported in Table 8, are 1.28, 2.20, 2.12, 1.41 and 1.90. The coefficients of the other dependent variables are also very comparable to our earlier results.

As Figure 4 illustrates, the changes in debt ratios remain positive and significant five years after the hot-debt issue year. Furthermore, the leverage of hot-debt market firms remains higher than that of cold-debt market firms throughout the post-debt issue five-year period. Third, as before, the post-issue financing activities of hot-debt issuers indicate that they tend not to increase their equity issues, in an attempt to reverse the high leverage resulting from their hot debt issuance activity. On the contrary, they issue more debt and less equity during the five-year post–hot-issue period. Consequently, using an alternative hot-debt market issuance measure, the supplemental evidence continues to show that the hot-debt issuance effect persists five years after the debt-issue year. Hence, the lasting nature of the hot-debt issuance effect on capital structure suggests that our previous results are not sensitive to the hot-debt issuance measure used.

5.2. *Structural shifts in the debt market*

A close look at Figures 1 and 3 reveals that most of the hot months coincide with the post-early-1980s period, while the pre-early-1980s period can be regarded as a cold market. The volume of debt issues and the number of deals is considerably higher after early-1980s. In the early 1980s, however, the USA experienced a regime shift in its monetary policy, better known as the 'Volcker experiment,' when the Federal Reserve

[27] Regression coefficients for the control variables are not reported here, but are available upon request.

Table 10

Hot-debt market issuance effects on capital structure: full sample

This table reports the short- and long-term effects of hot-debt market issues on capital structure using the entire sample of more than 6,000 observations. The hot (cold) markets are defined as those months with a cumulative debt issue volume larger (smaller) than the median (instead of the top or bottom 30%) monthly issue volume over the January 1970 – December 2000 period. Only the coefficients of the hot-cold dummy, *HOTD,* are reported, by estimating regression specification (3).

The short-term effects of hot-debt market issuance on capital structure are examined by the ratio of hot debt issues over total assets ($Proceeds/A_t$), pre-issue debt ratio (D/A_{t-1}), change in debt ratios ($D/A_t - D/A_{t-1}$) and post-issue debt ratios (D/A_t). The long-term effects of hot-debt market issuance on capital structure are examined by cumulative change in debt ratios ($d/A(t - pre)$), annual new debt issues (d/A), annual new equity issues (e/A), and levels of year-end book debt ratios (D/A) five years after the hot debt issue-year.

Short-term effect	Proceeds/Asset(t)		D/A(t−1)		D/A(t) − D/A(t − 1)		D/A(t)			
HOTD	1.960	[8.11]	0.276	[0.545]	1.105	[4.15]	1.255	[2.5]		
Number of obs.	6049		6110		6049		6049			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
Number of obs.	5860		5650		5479		5309		5153	
d/A (t − pre)										
HOTD	1.152	[3.37]	1.691	[4.35]	1.707	[3.68]	1.213	[2.42]	1.107	[1.93]
d/A (t)										
HOTD	0.298	[1.27]	0.681	[2.99]	0.260	[0.91]	−0.061	[−0.21]	0.058	[0.16]
e/A (t)										
HOTD	−0.857	[−2.89]	−0.906	[−2.89]	−0.360	[−1.11]	−0.263	[−0.34]	−0.124	[−0.15]
D/A (t)										
HOTD	0.856	[1.64]	1.405	[2.6]	1.488	[2.53]	0.961	[1.55]	0.866	[1.32]

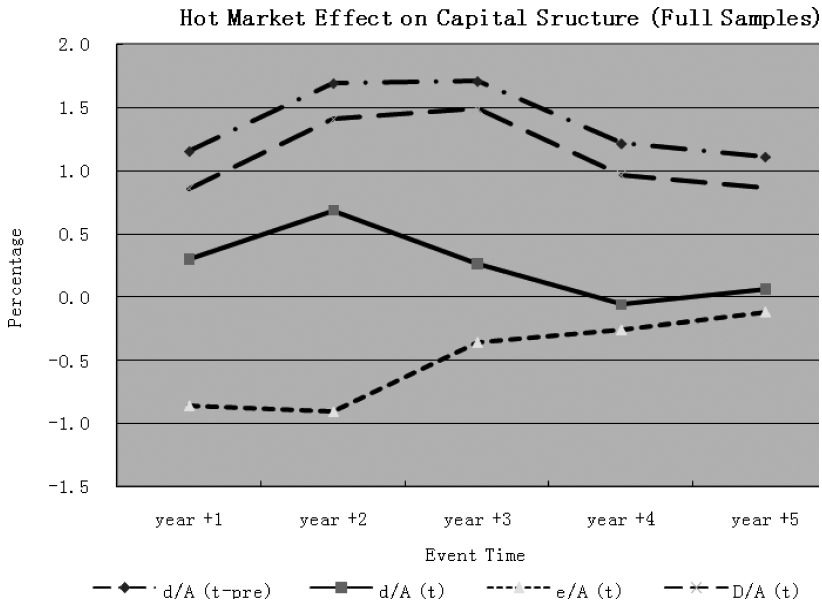

Fig. 4. Long-term effects of hot-debt market issuance on capital structure: full sample

This figure exhibits the long-term effect of hot-market issues on capital structure. It plots the difference between the hot- and cold-market issuers with respect to changes in leverage. Hot- (cold) market issuers are defined firms with aggregate debt issue volume larger (smaller) than the median over the 1970–2000 period. The dash-point line shows cumulative change in debt ratios $((D/A_t) - D/A))$ after the hot-market issue-year. The wide dash line shows levels of debt ratios (D/A_t) after the hot-market issue-year. The solid line shows annual new debt issuance (d/A_t) after the hot-market issue-year. The point line shows annual new equity issuance (e/A_t) after the hot-market issue-year.

began a zero inflation policy and a fiscal policy to combat inflation (Butler *et al*., 2006, p. 1739). Consequently, the hot-debt issuance market dummy may be biased by various characteristics of US regulatory changes and debt market conditions. Although a full investigation of the history, causes and consequences of monetary and fiscal policy and their impact on US interest rates is beyond the scope of this study, we address the sensitivity of our results with respect to the regime shifts in monetary and fiscal policies that occurred in the early 1980s.

In addition, it worth pointing out that the post-1982 period coincides with the emergence of the junk bond market. Hence, it is likely that firms issuing debt in hot-debt market periods are of different risk class (i.e., low investment grade firms). However, the issuers' characteristics, reported in Panel A of Table 4, show that hot-debt issuers have, on average, higher credit ratings and lower bankruptcy rates than their cold-debt counterparts. Specifically, more than 83% (68%) of hot (cold) issuers are classified as high investment grade firms and they have a lower bankruptcy rate (9.76%) than cold issuers (18.41%). Figures 1 and 3 also illustrate that hot-debt periods do not necessarily coincide with below investment grade issue volume peaks. Therefore, any differences that might emerge between the pre- and post-1982 period would be difficult to be reconciled with issuers' risk class characteristic differences.

To address this issue, we split the sample into two subperiods: one preceding 1982 and one beginning at 1982, when the Federal Reserve Bank embarked on a zero rate of

inflation target and, as a result, the debt market experienced a regime shift.[28] We then sorted all debt issues into hot- and cold-debt market periods by defining hot (cold) months as those with a cumulative volume of debt issues larger (smaller) than the median for each subperiod. We replicate this analysis in the preceding section and report the results in Table 11. In general, we find that the short- and long-term effects of hot-debt issuance on capital structure are qualitatively consistent with the previous findings. However, we find that the short-term hot-debt issuance effect is somewhat more pronounced in the post-1982 than in the pre-1982 period. Specifically, the percentage difference between hot issue proceeds over total assets of hot- and cold-issuers is even higher after 1982 (5.17% vs. 2.08%). This is also the case for the change in book leverage (2.48% vs. 0.53%) and level of debt ratio (5.34% vs. 0.65%) in the hot issue year. The pre-issue debt ratio of hot issuers is significantly higher than that of cold-issuers in the post-1982 period (with a *t*-value of 6.23), which may potentially reflect the cumulative impact of the hot-debt issuance effect is enlarged over time. Interestingly, high pre-issue leverage does not seem to deter hot-market issuers from further timing the debt market and issuing more debt.

Turning to the long-term results, we find that the hot-market effect is more pronounced in the post-1982 period. Figure 5 illustrates this pattern graphically. The hot-market effect is more evident in the post-1982 period, most likely due to favourable debt market conditions resulting from structural shifts in monetary and fiscal policies (i.e., low interest rates and inflation), as firms are more likely to time debt markets under these circumstances. Hot-market firms issue more debt and less equity than cold-market firms, both before and after the 1982 debt market shift year. Overall, the hot-cold dummy captures the general pattern of debt market timing regardless of the different market conditions resulting from the 1982 structural shift.

5.3. *Additional robustness checks: industry, m/b, p/e, size and debt credit adjustment costs*

Tables 12 and 13 present additional robustness tests. The first test concerns the sensitivity of our results to industry characteristics. To perform this test we use the Fama-French 12-industry classification. The second test addresses whether our previous findings are sensitive to the equity valuation of debt issuing firms. Hot-debt issuance and the resulting capital structure effects may potentially differ for high versus low market-to-book firms. To conduct this test, firms with a market-to-book ratio above (below) the sample mean are classified into the high (low) M/B portfolio. We also check the sensitivity of our results by splitting the sample into high versus low price-to-earnings firms. For this test, firms with a P/E on a given month above (below) the top (bottom) 30% of the previous 5 years' detrended S&P P/E ratio are classified into the high (low) P/E portfolio. The fourth robustness question relates to firm size: do the immediate and long-term effects of hot-debt market issuance differ for small versus large capitalisation firms? Finally, we examine the impact of adjustment costs on our empirical results. Specifically, we investigate whether the persistence of the hot-debt issue effect on leverage is influenced

[28] Federal Reserve data shows that the yield rates on 10-year constant maturity Treasury bonds and BAA corporate bonds reached their highest points (13.70% and 16.04% in 1981, and 13% and 16.11% in 1982) of the past three decades in 1981 and 1982 (see, the Saint Louis FRED database of the Federal Reverse Bank).

Table 11

Hot-debt market issuance effects on capital structure in the pre- and post-1982 structural shift periods

This table reports the short- and long-term effects of hot-debt market issues on capital structure before and after the 1982 structural regime shift in the debt market, using the entire sample of more than 6,000 observations. The hot (cold) markets are defined as those months with a cumulative debt issue volume larger (smaller) than the median (instead of the top or bottom 30%) monthly issue volume of each subperiod. Only the coefficients of the hot-cold dummy, *HOTD,* are reported by estimating regression specification (3).

The short-term effects of hot-debt market issuance on capital structure are examined by the ratio of hot-debt issues over total assets ($Proceeds/A_t$), pre-issue debt ratio (D/A_{t-1}), change in debt ratios ($D/A_t - D/A_{t-1}$) and post-issue debt ratios (D/A_t). The long-term effects of hot-debt market issuance on capital structure are examined via the cumulative change in debt ratios (*d/A(t-pre)*), annual new debt issues (*d/A*), annual new equity issues (*e/A*), and the levels of year-end book debt ratios (*D/A*) five years after the hot-debt issue-year.

1970–81										
Short-term effect	Proceeds/Asset(t)		D/A (t − 1)		D/A(t) − D/A(t − 1)		D/A(t)			
HOTD	2.08	[5.51]	−0.691	[−0.99]	0.530	[1.8]	0.646	[2.03]		
Number of obs.	1357		1363		1357		1357			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
Number of obs.	1349		1327		1312		1293		1279	
	HOTD	t	HOTD	t	HOTD	t	HOTD	t	HOTD	t
d/A (t-pre)	0.577	[1.16]	0.341	[0.69]	1.539	[2.65]	1.395	[0.69]	1.536	[0.82]
d/A (t)	0.395	[0.95]	0.188	[0.58]	0.899	[2.8]	0.400	[1.07]	0.175	[0.36]
e/A (t)	−0.063	[−0.12]	−0.075	[−0.17]	−1.046	[−2.36]	−0.709	[−1.39]	−0.152	[−0.24]
D/A (t)	−0.194	[−0.28]	−0.362	[−0.54]	0.996	[1.36]	0.647	[0.8]	1.136	[1.27]

1982–2000										
Short-term effect	Proceeds/Asset(t)		D/A (t − 1)		D/A(t) − D/A(t − 1)		D/A(t)			
HOTD	5.17	[20.2]	3.469	[6.23]	2.477	[8.17]	5.343	[9.72]		
Number of obs.	4692		4747		4692		4692			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
Number of obs.	4511		4323		4167		4016		3874	
	HOTD	t	HOTD	t	HOTD	t	HOTD	t	HOTD	t
d/A (t-pre)	2.368	[6.16]	2.465	[5.51]	3.277	[6.06]	3.529	[5.86]	2.952	[4.39]
d/A (t)	0.222	[0.86]	0.210	[0.8]	0.514	[1.52]	0.692	[1.92]	0.008	[−0.02]
e/A (t)	−0.063	[−0.12]	−0.075	[−0.17]	−1.046	[−2.36]	−0.709	[−1.39]	−0.152	[−0.24]
D/A (t)	4.435	[7.65]	4.450	[7.26]	5.341	[7.9]	5.597	[7.76]	4.696	[6.1]

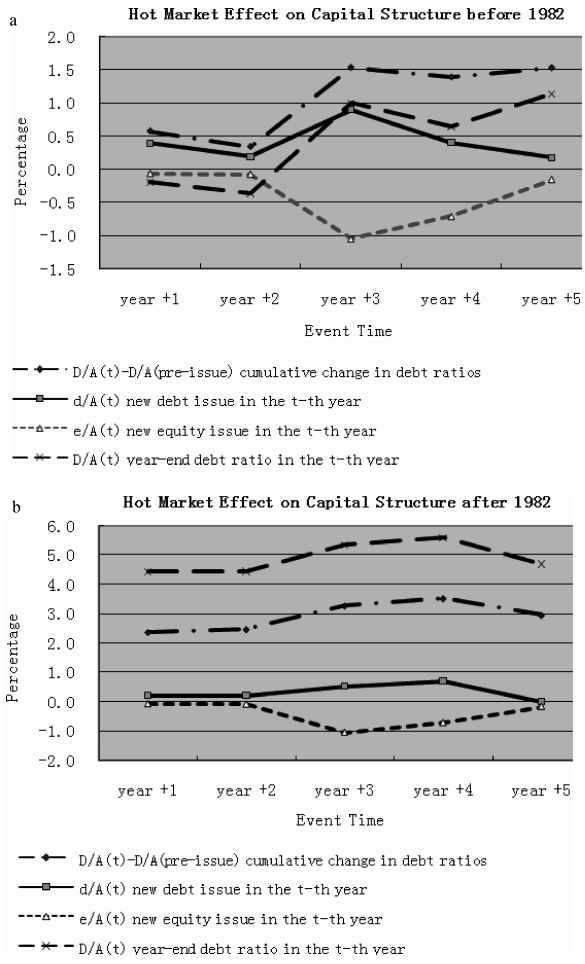

Fig. 5. Long-term effects of hot-debt market issuance on capital structure in the pre- and post-1982 structural shift periods

Figures 5a and 5b exhibit the long-term effect of hot-market issuance on capital structure before and after the 1982 structural regime shift in the debt market, respectively. They plot the difference between hot- and cold-market issuers with respect to changes in leverage. The dash-point line shows cumulative change in debt ratios ($D/A_t - D/A_{pre\text{-}issue}$) after the hot-market issue-year. The wide dash line shows levels of debt ratios (D/A_t) after the hot-market issue-year. The solid line shows annual new debt issuance (d/A_t) after the hot-market issue-year. The point line shows annual new equity issuance (e/A_t) after the hot-market issue-year.

by adjustment costs. Leary and Roberts (2005) argue that shocks to capital structure are more likely to persist (i.e., deviate from an optimal leverage range) when firms experience high adjustment costs. In other words, firms with high (low) adjustment costs are expected to exhibit high (low) persistence in their leverage because it would be more (less) costly to adjust leverage increases induced by hot-debt market issuance efforts. To address this issue, we split the sample into high- and low-adjustment cost firms based on their debt credit ratings. Debt with an equal or above A-grade of Standard &

Table 12

A robustness test by industry

This table reports the additional robustness check on all variables by industry using the Fama-French 12 industry classification. *Panel A* presents summary statistics by industry for the three main dependent variables. Panel B presents coefficients of the regression specification (3), accounting for industry characteristics, *INDDUMMY*.

The dependent variable Y_t is total debt issue proceeds over total assets at the fiscal year-end (Proceeds/At, and Proceeds/At−1), pre-issue leverage ratio (D/A_{t-1}), and the issue leverage ratio (D/A_t), respectively. The hot (cold) markets are defined as those months with a cumulative debt issue volume fitted into the top or bottom 30%. The dummy variable *Hot-cold (HOTD)* takes the value of 1 when the debt issue takes place during a hot-market period, and zero for the cold-market period. The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), and cash (*CASH/A*). The dummy variable *RDD* takes the value of 1 when the research and development expense information is missing in COMPUSTAT. Apart from the dummy variables and *SIZE*, all variables are expressed in percentage terms. The *INDDUMMY* refers to industry dummies defined as in Fama French.

Panel A. Summary statistics of dependent variables

		Proceeds/At−1		D/At−1		D/At	
Industry	N	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
1	269	1.81	[1.18]	0.34	[0.143]	−1.02	[−0.707]
2	109	1.37	[0.514]	−2.71	[−0.613]	3.14	[1.22]
3	423	3.74	[1.92]	0.03	[0.0164]	1.73	[1.89]
4	212	−2.22	[−0.951]	0.88	[0.325]	−2.37	[−1.9]
5	172	−1.56	[−1.27]	6.05	[2.22]	2.39	[1.72]
6	155	−1.63	[−0.897]	0.73	[0.212]	−0.39	[−0.204]
7	237	12.09	[1.62]	−0.17	[−0.0761]	5.25	[3.55]
8	1142	5.81	[6.71]	−5.15	[−11.9]	−0.05	[−0.186]
9	339	4.14	[2.08]	−2.37	[−2.36]	2.32	[2.6]
10	117	18.42	[4.41]	3.46	[0.874]	3.69	[1.43]
11	664	7.02	[6.17]	6.57	[4]	1.64	[2.93]

Table 12
Continued.

Panel B. Regression coefficients of the main variables

	Proceeds/At − 1		D/At − 1		D/At		EBITDA/At		EBITDA/At+1		INV/At		INV/At+1	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
HOTD	4.29	[6.25]	−1.22	[−2.31]	1.14	[4.5]	0.08	[0.563]	0.75	[4.03]	−0.96	[−6.31]	−1.27	[−7.1]
Dt−1/At−1	0.03	[1.33]	–	–	0.81	[104]	0.02	[4.27]	0.02	[2.93]	0.01	[2.98]	0.03	[4.82]
M/B	0.02	[3.66]	0.01	[1.64]	0.01	[3.19]	0.01	[5.6]	0.01	[3.88]	0.00	[0.766]	0.00	[1.35]
RE/A	−0.03	[−0.637]	−0.31	[−10]	0.05	[3.45]	−0.05	[−5.3]	−0.01	[−0.65]	0.00	[0.207]	−0.01	[−1.28]
EBITDA/A	−0.25	[−4.53]	−0.56	[−13.6]	−0.08	[−4]	0.73	[62.3]	0.62	[40.7]	0.12	[9.99]	0.12	[8.11]
SIZE	−6.39	[−34.2]	0.47	[3.28]	−0.40	[−5.76]	0.04	[1.13]	0.23	[4.54]	−0.18	[−4.4]	−0.33	[−6.73]
PPE/A	−0.10	[−6.05]	−0.21	[−17.1]	−0.04	[−6.41]	0.01	[3.74]	0.03	[6.26]	0.02	[5.85]	0.04	[9.75]
R&D/A	−0.30	[−1.49]	−0.65	[−4.21]	−0.29	[−3.98]	0.04	[0.897]	−0.05	[−0.896]	−0.09	[−1.94]	−0.08	[−1.62]
RDD	0.21	[0.201]	1.18	[1.49]	−0.10	[−0.266]	0.03	[0.143]	−0.14	[−0.481]	0.09	[0.38]	−0.03	[−0.123]
INV/A	0.17	[3.58]	0.28	[7.84]	0.10	[5.38]	−0.01	[−1.21]	0.00	[−0.238]	0.77	[7.5]	0.57	[5.5]
DIV/E	−0.02	[−0.386]	0.45	[10.5]	0.06	[2.8]	0.05	[3.99]	0.06	[3.67]	−0.03	[−2.2]	−0.03	[−2.06]
CASH/A	0.33	[5.63]	−0.36	[−7.97]	0.17	[7.84]	−0.06	[−5.09]	−0.07	[−4.21]	0.07	[5.54]	0.07	[4.43]
Industry Dummies														
NoDur	4.15	[3.14]	−6.35	[−6.26]	0.73	[1.5]	0.96	[3.44]	1.56	[4.31]	−1.12	[−3.81]	−1.31	[−3.77]
Durbl	7.21	[3.76]	1.85	[1.25]	3.67	[5.15]	−0.18	[−0.44]	0.21	[0.402]	−0.70	[−1.63]	−0.83	[−1.63]
Mabuf	5.87	[4.78]	−4.22	[−4.47]	1.57	[3.45]	−0.06	[−0.227]	0.02	[0.0647]	−1.09	[−4]	−1.35	[−4.16]
Enrgy	4.74	[3.47]	−5.25	[−5]	−0.78	[−1.54]	0.50	[1.71]	1.03	[2.7]	−0.85	[−2.78]	−0.04	[−0.117]
Chems	4.85	[2.96]	−2.51	[−1.99]	1.98	[3.25]	0.24	[0.692]	1.22	[2.74]	−1.10	[−3.01]	−1.12	[−2.63]
BusEq	6.05	[3.25]	−0.63	[−0.442]	2.25	[3.26]	0.49	[1.25]	0.99	[1.93]	−0.44	[−1.07]	−0.26	[−0.524]
Telcm	12.03	[9.25]	−6.49	[−6.51]	0.91	[1.86]	1.22	[4.39]	1.67	[4.5]	−0.62	[−2.12]	−0.41	[−1.15]
Utils	−1.98	[−2.03]	−2.00	[−2.66]	0.55	[1.53]	−0.72	[−3.49]	−0.86	[−3.22]	−1.13	[−5.2]	−1.94	[−7.54]
Shops	7.03	[6.02]	−2.83	[−3.15]	0.39	[0.905]	0.26	[1.06]	0.37	[1.17]	−0.67	[−2.56]	−0.77	[−2.54]
Hlth	3.31	[1.74]	−3.83	[−2.62]	0.12	[0.173]	0.87	[2.16]	1.59	[3.07]	−0.79	[−1.89]	−1.10	[−2.21]
AdjR^2	0.31		0.20		0.79		0.66		0.49		0.72		0.57	

Table 13

Additional robustness tests: market-to-book, price-to-earnings, size and debt credit ratings

This table reports the coefficients of the hot-cold dummy in regressions of the form that reflect the short- and long-term effects of hot-debt market issues on capital structure, for high- and low-B/M, Small- and Large- Size, High- and Low-Credit Rating debt issuing firms. Hot (cold) markets are defined as those months with a cumulative debt issue volume fitted into the top (bottom) 30%. The dummy variable Hot-cold (HOTD) takes the value of 1 when the debt issue takes place during a hot-market period, and zero otherwise. Only coefficients of the hot-cold dummy, HOTD, are reported, by estimating regression specification (3).

Panel A presents results for High- and Low-market-to-book (M/B) portfolios based on the sample mean of the B/M ratio. Firms with an M/B ratio above (below) the mean are classified into the high (low) M/B portfolio. Panel B presents results for High- and Low-price-to-earnings (P/E) debt issuers. Firms with a P/E on a given month above (below) the top (bottom) 30% of the previous 5-year detrended S&P P/E ratio are classified into the high (low) P/E portfolio. Panel C presents results for Small- and Large-SIZE portfolios based on the sample mean of capitalisation. Firms with a capitalisation above (below) the mean are classified into the large (small)-size portfolio. Panel D presents results for High- and Low-credit rating debt issuers. Firms with a debt credit rating equal or above BBB in Standard & Poors, or equal or above Baa in Moody's are classified into the high credit rating portfolio, while firms with a debt credit rating below BBB in Standard & Poors, or below Baa in Moody's are classified into the low credit rating portfolio. The short-term effects of debt market timing on capital structure are examined by the ratio of hot debt issues over total assets (Proceeds/A_t), pre-issue debt ratio (D/A_{t-1}), change in debt ratios ($D/A_t - D/A_{t-1}$) and post-issue debt ratios (D/A_t). The long-term effects of debt market timing on capital structure are reported using only the cumulative change in debt ratios (d/A(t-pre)), for the sake of brevity. In brackets, t-values are reported.

Panel A: Market-to-book

High M/B	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	2.13	[3.28]	0.87	[0.553]	1.91	[2.63]	1.91	[2.63]		
N	1961		1984		1961		1961			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	1.25	[1.31]	1.90	[1.77]	1.79	[1.39]	0.46	[0.317]	−0.45	[−0.602]
N	1882		1804		1742		1693		1644	

Table 13
Continued.

Panel A: Market-to-book (Continued)

Low M/B	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	2.94	[8.26]	1.33	[2.34]	1.34	[4.05]	1.34	[4.05]		
N	1962		1984		1962		1962			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	1.48	[3.65]	2.23	[4.42]	2.08	[3.02]	2.32	[2.83]	2.64	[3.00]
N	1909		1843		1792		1734		1683	

Panel B: Price-to-earnings ratio

High P/E Ratio	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	1.86	[2.87]	0.77	[0.63]	2.66	[1.43]	3.43	[2.45]		
N	1558		1579		1579		1579			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	0.57	[1.66]	1.75	[1.82]	1.09	[0.96]	0.65	[1.14]	1.39	[0.88]
N	1501		1447		1405		1360		1337	

HOTD	2.34	[4.04]	0.59	[0.40]	5.00	[2.64]	5.58	[4.31]		
N	1098		1108		1090		1090			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	1.84	[2.2]	2.4	[2.39]	2.52	[2.25]	1.57	[1.92]	2.1	[2.29]
N	1060		1027		994		960		922	
Panel C: Firm size										
Small Size	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	4.23	[7.98]	−0.98	[−0.97]	1.87	[3.39]	1.65	[3.27]		
N	1962		1962		1962		1962			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	0.16	[0.35]	−0.44	[−0.77]	−0.42	[−0.50]	−0.98	[−0.94]	−2.39	[−2.06]
N	1895		1824		1767		1714		1664	
Large Size	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	0.64	[2.61]	2.80	[2.65]	1.05	[2.33]	1.20	[2.68]		
N	1961		1961		1961		1961			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	−0.72	[−1.69]	−1.97	[−3.06]	−2.53	[−3.38]	−2.30	[−2.60]	−2.39	[−2.33]
N	1894		1823		1767		1713		1663	

Table 13
Continued.

Panel D: Debt credit ratings

High credit-quality issuers	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	−0.08	[−0.23]	−0.66	[−0.79]	3.72	[2.62]	3.10	[2.72]		
N	1302		1313		1299		1299			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	0.39	[0.71]	1.22	[2.19]	1.67	[2.79]	1.87	[2.59]	1.48	[1.80]
N	1268		1237		1209		1182		1158	
Low credit-quality issuers	Proceeds/Asset(t)		D/A (t − 1)		D/A (t) − D/A (t − 1)		D/A (t)			
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value		
HOTD	11.96	[7.18]	4.70	[1.52]	2.19	[0.56]	6.88	[2.76]		
N	455		462		461		461			
	d/A (pre to year +1)		d/A (pre to year +2)		d/A (pre to year +3)		d/A (pre to year +4)		d/A (pre to year +5)	
HOTD	4.18	[1.84]	4.60	[1.77]	3.27	[0.99]	0.77	[0.20]	3.90	[0.80]
N	423		394		366		343		310	

Poors credit rating, or equal or above A-grade of Moody's are classified in the high-credit rating portfolio, otherwise in the low-credit rating portfolio.

These results are reported in Tables 12 and 13. The difference in debt issuance between hot- and cold-debt market firms remains essentially the same in magnitude and statistical significance after controlling for industry characteristics, M/B, P/E and Size effects. Controlling for industry effects, as shown in Panel B of Table 12, the hot-market dummy continues to be statistically significant, implying that the hot-debt market effect is not sensitive to industry differences. When we split the sample into high- and low-M/B debt issuers, the results, reported in Panel A of Table 13, show that both high- and low-M/B firms attempt to take advantage of hot-debt market conditions. However, the coefficient of the hot-market dummy appears to be greater in magnitude and significance for low than for high M/B firms, suggesting that firms with overvalued equity are more prone to equity issuance. Moreover, the evidence reveals that the hot-debt market issuance effect on leverage appears to be more persistent in low than in high market-to-book firms. To the extent that low M/B firms are less flexible in adjusting to deteriorating economic conditions than high M/B firms, that rigidity is likely to raise the cost of equity, which may explain why they favour debt to equity financing. The hot-debt issuance effect on the capital structure of low M/B firms persists more than five years after the debt-issue year, while there is no sign of significant persistence in high M/B firms. This implies that high M/B firms tend to rebalance their leverage to stay within an optimal range. The lack of persistence in high M/B firms, consistent with the prediction of the Hennessy and Whited (2004) model, also suggests that these firms tend to finance growth with equity to avoid financial distress. Not surprisingly, as shown in Panel B, high (low) price-to-earnings firms behave like high (low) market-to-book firms. The results in Panel C show that both small and large capitalisation firms exhibit substantial hot-debt market issuance habits, but the impact of hot-debt issuance on leverage is more persistent in large firms. Jointly, these results appear to suggest that high M/B, high P/E and small capitalisation firms find equity (debt) financing more (less) attractive and are more likely to rebalance their leverage to stay within an optimal range.

Panel D presents results for high- and low-adjustment cost firms based on their debt credit ratings. These results are at variance with the evidence of Leary and Roberts (2005), which shows that firms with high credit ratings exhibit longer lasting and greater persistence than their low-credit counterparts. It is interesting to note, however, that the difference in persistence between low- and high-adjustment cost firms can be attributed to the small number of observations in the sample of low credit rating firms. This sample consists of more than three times fewer observations than the sample of high credit rating firms. Finally, we address the issues mentioned above by replicating the analysis using the alternative hot-market measure and tax rates that might have motivated debt financing. These tests, designed primarily to detect the sensitivity of our results, produced evidence consistent with our previous findings.[29]

[29] For the sake of brevity, these results are not reported, but they are available upon request. While including tax-related variables in the analysis seems sensible, Gordon (2001, 2002) lays out the limitations in doing so, which may explain why most studies on the debt-equity choice usually do not use tax variables. Nevertheless, inclusion of marginal tax rates in the regressions performed poorly and did not change the results. This is probably because tax rates have not varied much in our sample period. Since the focus of this study is on market timing, we decided not to report them, but they are available upon request.

6. Conclusion

This study examines the motives of debt issuance during hot-debt market periods and its impact of hot-debt issuance on capital structure. Specifically, we investigate the role that capital market conditions and adverse selection costs of equity play on the financing decision of the firm during hot-debt market periods. While we find that hot-debt issuance is linked to perceived favourable market conditions, our findings also suggest that firms issuing debt during hot-debt market periods are subject to higher adverse selection costs of equity than their cold-debt issuing counterparts. This evidence suggests than when a particular firm characteristic is of major concern to investors (i.e., equity due to adverse selection costs) firms endowed with that characteristic engage in debt financing, especially when debt market conditions are perceived as favourable.

Using alternative hot-debt market issuance measures and controlling for other effects, we show that the impact of hot-debt issuance on corporate debt financing is substantial. We find that hot-debt market firms, identified as firms issuing debt when the debt market is hot, with high adverse selection costs issue significantly more debt than do cold-debt market firms. The hot-debt market issuance effect is documented in terms of both cumulative change in leverage and aggregate level of debt-issue volume, regardless of the hot-debt market benchmark used. Hot-debt market firms experience a significantly larger increase in leverage ratios in the debt-issue year, despite the fact that they do not have smaller debt ratios than cold-debt market firms in the pre-debt-issue year. Moreover, the excess debt issuance of hot-debt market issuers is not induced by profitability, growth, or investment opportunities considerations. Post-issue leverage ratios of hot-debt issuers are significantly higher than those of their cold-debt counterparts. Interestingly, credit ratings indicate that hot-market firms are not riskier than cold-market firms. Hence, firms' debt issuance differences between cold- and hot-debt market periods do not reflect differences between investment-grade and below investment-grade issuers.

Furthermore, we find that the cumulative change in book leverage of hot-debt market firms persists for more than five years after the hot-debt issue year. Hot-debt market firms do not attempt to reverse their high leverage resulting from hot-debt market issuance. This financing behaviour is inconsistent with the trade-off theory of capital structure. The immediate and long-term impact of hot-debt market issuance on capital structure is reliably positive and is not sensitive to firm- and industry-level characteristics. Finally, our results are robust to several checks, inclusive of an alternative hot-debt market measure, structural shifts in the debt market, industry, book-to-market, size, tax rates, and adjustment costs based on debt credit ratings. Overall, the evidence indicates that hot-debt market issuance plays an important role in shaping firm financing policy not only in the short run, but also in the long run.

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