BI Norwegian Business School - campus Oslo

GRA 19502

Master Thesis

Component of continuous assessment: Thesis Master of Science

Capital Structure and IPO Market Timing in the U.S. High-Tech Industry

ID number: 0896087, 0991263

Start: 02.03.2017 09.00

Finish: 01.09.2017 12.00

0896087 Fredrik Bjørkman
0991263 Francesco Paolo Forina

Master Thesis

BI Norwegian Business School

Capital Structure and IPO Market Timing in the U.S. High-Tech Industry

GRA 19502 Master Thesis

Supervisor:
Bogdan Stacescu

Hand-in date:
01.09.2017

Campus:
BI Oslo, Nydalen

Programme:
Master of Science in Business
Major in Finance

Acknowledgments

We express our profound gratitude to the people who have been involved in the work of this thesis. Firstly, we would like to thank our supervisor Bogdan Stacescu for excellent guidance and help when we needed it. Last but not least we would like to thank our families for all the support and encouragement along the way.

Table of Content

List of equations, figures and tables

Abstract

The scope of this master thesis is to understand what drives the decision by American firms to raise capital through initial public offerings. In particular we assess whether American technology firms try to time the IPO market when they decide to raise capital by testing the market timing theory of capital structure. Our findings do not provide significant evidence to support the theory, however tech firms show a stronger tendency to attempt to time markets compared to the overall sample. We conclude that market timing, as defined by Alti (2006), is not the only motivation driving financing decisions of high-tech companies.

1. Introduction

High-tech firms are characterized by high research and development expense, which in turn leads to a low predictability of the outcome and thus a low profitability in the years preceding the IPO. This leads to difficulties in raising debt financing and a lower leverage, as well as to the issuance of preferred stocks as an alternative. Given these premises, technology start-ups are most likely to attempt to time the IPO markets to issue equity to get better financing conditions. In order to verify this claim, we have developed this master thesis by testing for the first time the market timing theory of capital structure, as formulated by Alti (2006), on an American high-tech firms sample. According to the theory, hot-market IPO firms issue substantially more equity and lower their leverage ratios by more than cold-market firms; at the end of the second year following the IPO, the impact of market timing on leverage completely vanishes. Hot-market firms issue equity in hot months, defined as those that are above the median in the distribution of the monthly moving average IPO volume.

Nonetheless, unlike previous literature, we adopt a different definition of leverage: preferred stocks are treated as a component of equity rather than debt, as suggested by Dudley and James (2013). The rationale behind is that, even though preferred shares are probably more similar to debt than to common stock for public companies due to the constant associated dividend rate, this is not the case for high-tech start-ups. These companies issue preferred shares in the context of staged financing, such that capital is provided sequentially conditional on performance since the previous stage. Staged financing often involves the use of convertible claims, hence providing investors with a liquidation preference. As a consequence, we find more correct to treat preferred stocks as equity and change the definition of leverage.

Considering the new definition, we have decided to test the market timing theory around IPOs on an overall sample of American firms before focusing on the high-tech sub-sample. As a final step, we find relevant to split the sample around the dot-com bubble to analyse the impact of this event on the IPO market. Finally, as opposed to previous studies, we add two additional variables to control for the credit market conditions, as we suspect that timing attempts might be influenced by risk aversion and cost of capital.

2. Literature Review

2.1 Summary of the main Capital Structure Theories

Capital structure is a highly discussed and controversial topic in the financial literature and it has the objective to describe how a company sets its financing policy, balancing the relationship between debt and equity. The literature in the field is built around three main competing theories that have tried to explain the managers' financing choices.

Modigliani and Miller (1963) have first introduced the Trade-off Theory, which attempts to explain that firms can trade-off debt- and equity-financing by balancing the costs (i.e. financial distress, asymmetric information and asset substitution) and the benefits (i.e. the tax shield of debt and the separation of ownership and control) associated with these two sources of capital.
Myers and Majluf (1984) have later proposed the Pecking Order theory which is based on the existence of asymmetric information and asserts that companies prioritize their source of financing by the associated cost and choose the alternative with the lowest flotation costs; as a consequence, companies would always finance activities starting with internal resources, then advance to low-risk debt, riskier debt and finally financing by issuing equity.

The market timing theory presented by Baker and Wurgler (2002) suggests that a company's current capital structure is strongly related to historical market values and that it is consequently the cumulative outcome of past attempts to time the equity market. Considering the short-term persistence shown in Baker and Wurgler (2000), the share of equity issues in total new equity and debt issues is a strong predictor of U.S. stock market returns as firms issue relatively more equity than debt just before periods of low market returns. Therefore, managers are able to identify windows of opportunity during which equity issuance is less costly due to mispricing, increasing the value of the firm for existing shareholders by lowering the overall cost of capital of the firm at the expense of new shareholders. These findings provide evidence against semi-strong form efficiency in the capital markets, thus exposing it to the criticism of the supporters of this hypothesis.

2.2 Criticism against the market timing theory

While the evidence to the market timing theory seems to hold in the short-term, some studies have raised doubts against to the long-term effects described by Baker and Wurgler (2002). With regards to a sample of sole IPOs, Alti (2006) confirms the hypothesis that firms attempt to time markets in their equity issuances, however he also shows that at the end of the second year following the IPO, the impact of market timing on leverage completely vanishes; also Guney and Iqbal-Hussain (2010) have tested the theory on the U.K. IPOs market and found that even though firms time their equity issues to exploit opportunities in favourable equity markets, this effect is temporary in nature and does not influence leverage levels in the long run.

Nonetheless, there are doubts whether market timing would even suffice as a stand-alone theory in explaining financing behaviour or would rather act as a bridge in closing the gaps existing in the current framework; Myers (2001) supports this point of view by suggesting that currently there is no universal theory to explain capital structure and there is no reason to expect one.

In a more recent study Dudley and James (2013) investigated the relationship between pre-IPO financing and the magnitude and persistence of leverage changes associated with IPOs. They found that prior findings of transitory declines in leverage during “hot-issue” markets are sensitive to the role of preferred stock in the leverage definition, to the sample period and to the sample selection criteria. In particular, the combination of negative book equity and the classification of preferred stock as debt applied by Baker and Wurgler (2002) and Alti (2006) results in many firms with preferred stock having leverage ratios that fall outside the unit interval; excluding these leads to an IPO firms sample that is skewed towards older and more profitable firms which are more reliant on debt financing. Additionally, the authors found that when accounting for the credit market conditions the market timing effects lose significance. Considering that this paper is still unpublished and that its findings would be ground-breaking for the research on the topic, we believe it is safer not to give its conclusions for granted and run further test on the overall sample before focusing on technology firms.

2.3 Theoretical framework for this investigation

As a consequence, we have identified the need to conduct a further investigation of the market timing theory and for this master thesis we have based our analysis on the contribution by Alti (2006), whose work is an attempt to identify market-timing effects on capital structure by showing transitory declines in leverage during hot-issue markets. In the same way, we define hot-issue markets as periods with greater than the median IPO activity; the underlying assumptions are that issuers regard hot markets as windows of opportunity with a temporarily low cost of equity capital and thus should react by issuing more equity than they would otherwise do, while cold-market IPOs are likely to keep their equity issues to a necessary minimum, as market conditions are less favourable than average. Quantifying market timing attempts as such has the advantage of not picking up firm-level characteristics and thus building the timing measure as a function of market conditions, as opposed to the use of the market-to-book ratio adopted by Baker and Wurgler (2002).

Nevertheless, also the work of Alti (2006) has received criticism and led us to a deeper analysis of the causes of such discrepancies. While the author assumes that preferred stock is probably more similar to debt than to common stock due to the constant dividend rate associated with preferred stock of public companies (Ross, Westerfield and Jaffe, 2010), our research is partially based on the findings by Dudley and James (2013), who documented that IPO firms with preferred stock differed in terms of their debt capacity from publicly traded firms with preferred stock. Indeed, because of mandatory conversion features of preferred shares, over 90% of firms with pre-IPO preferred shares convert their preferred shares into equity at the time they go public (Kaplan and Stromberg 2003); additionally, most IPO firms with preferred stock have negative values of book equity. Consequentially, the authors criticize the common practice of most studies of capital structure around IPOs to consider preferred stocks as debt and to exclude firms with leverage outside the unit interval, as in Alti (2006) and Baker and Wurgler (2002). The argument is that, while this methodology is of little consequence for empirical studies of established publicly traded firms, it has a significant effect on the composition of the sample of IPO firms because of the different nature of preferred stock as it excludes young technology start-ups with low profitability and leverage that are mainly backed by institutional investors.

2.4 Motivation to investigate the technology sub-sample

We have decided to focus our work on the application of the market timing theory on two sub-samples related to technology firms because these are the young firms that rely on staged financing prior to going public (Dudley and James, 2013) excluded in the sample considered by Alti (2006). Additionally, new technology-based firms demonstrate different financing patterns than firms that are not technology-based; entrepreneurs from these firms are both willing and able to raise substantial amounts of capital from external sources even during the start-up year (Coleman and Robb, 2012). As a consequence, we expect the market timing theory to be a strong predictor for the financing decisions of high-tech firms.

First, due to the high amount of cash reserves accumulated and the lower need for tangible investments, firms with a high level of research and development expense are characterized by lower levels of leverage (Aghion, Bond, Klemm and Marinescu, 2004) and would thus be expected to attempt to time markets more significantly without being strongly influenced by aggregate variables such as credit market conditions; second, according to Ritter and Welch (2002), the increase in the percentage of technology firms over time is mirrored in the number of firms with negative earnings in the 12 months prior to going public and it has reached its peak during the dot-com bubble. These two features make high-tech firms representative of the firms excluded by Alti (2006) and more reliant on market timing attempts to receive favourable financing conditions.

Finally, considering that our sample is centred around the dot-com bubble of 2000, the observations about technology firms allow us to test the market timing theory before and after an event that has shocked the IPO market, changing the average first-day returns (Loughran and Ritter, 2004) and the IPOs volume (Ritter, 2016). Indeed, the results by Ljungqvist and Wilhelm (2003) suggest that the anomalous pricing behaviour observed during the dot-com bubble followed from incentives created by unique firm characteristics; hence the market timing theory should still hold when controlling for these characteristics.

3. Theory

3.1 Theoretical background

Despite its relatively recent formulation, the market timing theory has rapidly gained consensus and interest in the capital structure literature. The reason is that it presents a simple and intuitive explanation to equity issuances: firms tend to time their financing decisions by issuing shares when their market values are high and to repurchase them when their market values are low. Baker and Wurgler (2002) claimed that there is no optimal capital structure and that its outcome is just the cumulative outcome of past attempts to time the equity market; they also considered the market timing theory of capital structure to have substantial explanatory power.

Alti (2006) also showed that current capital structure is strongly related to historical market values; however, immediately after going public, hot-market firms increase their leverage ratios by issuing more debt and less equity relative to cold market firms. According to the author, at the end of the second year following the IPO, the impact of market timing on leverage completely vanishes.

Dudley and James (2013) have instead raised concerns against the theory, particularly with regards to the treatment of preferred stock when focusing only on IPOs among all the equity issuances. Considering this item as a debt claim in the definition of leverage and restricting leverage to be in the unit interval, as done in the previous studies about capital structure around IPOs, excludes a large fraction of firms that have preferred shares. Indeed, the practice of treating preferred stock as debt is not innocuous for companies going public as almost all venture capital-backed IPOs have large amounts of convertible preferred stock outstanding prior to the IPO which often has a mandatory conversion feature conditional on going public, making preferred stock more similar to equity rather than debt. Since these firms have a history of losses prior to going public, treating preferred shares as debt and restricting leverage to be in the unit interval biases the sample of firms going public towards more mature firms that have greater debt capacity. In this way, the market timing attempts by the firms in the sample are most likely to be influenced by the credit market conditions, distorting the rationale behind the market timing theory.

3.2 Research question and main tested hypothesis

For these reasons, we have adopted the leverage definition by Dudley and James (2013) in order to include preferred stock among the debt claims and then focus on the main research question:

"Do tech firms attempt to time the IPO market when they decide to go public?"

The proposed hypothesis starts by validating the market timing theory as formulated by Alti (2006) given the different treatment of preferred stock in the leverage definition (Hypothesis 1 and Hypothesis 2); Hypothesis 3 is a test of the theory on a sample composed by high-tech firms only; finally Hypothesis 4 is a test on the two sub-periods preceding and following the dot-com bubble, both for the overall sample and the technology sub-sample.

Hypothesis 1

The first hypothesis aims at validating the main assumption behind market timing theory on the considered sample and given the new definition of leverage: firms would issue equity when managers believe that market conditions are relatively favourable. A direct implication of this assumption asserts that if firms issue equity when the IPO markets are hot, they would also sell more equity and thus be able to raise more capital relative to when markets are cold.

H_1: Firms time their Initial Public Offering to exploit opportunities in favourable equity markets.

Hypothesis 2

The second hypothesis aims at studying the short-term impact of the market timing attempts on the firms' capital structure, analysing the change in leverage from the year preceding the IPO to the issuance year first and then to the following five years; this choice of a five-year horizon covers the work by Huang and Ritter (2009), which found that firms adjust toward target leverage at a moderate speed, with a half-life of 3.7 years for book leverage, and by Alti (2006), who found that reversal of the hot-market effect is complete as of IPO+2.

H_2: Hot market firms have significantly lower levels of leverage during the IPO and subsequent years.

Hypothesis 3

On average high-tech firms have a lower level of leverage (Aghion, Bond, Klemm and Marinescu, 2004) and are usually unprofitable in the year anticipating the IPO (Ritter and Welch, 2002); as a consequence, they should have a significantly different relationship between aggregated issuance volumes and timing attempts. Due to their characteristics, technology companies are expected to support the market timing theory more strongly when compared to the overall sample and thus time the markets more significantly, raise more proceeds at the issuance and finally have a more pronounced short-term effect on the capital structure.

H_3: The market timing attempts and their consequences are more evident in the technology IPOs when compared to the whole IPOs sample.

Hypothesis 4

Considering the dot-com bubble of the 2000 as a breaking-point in the IPO sample due to the consequential changes in volume (Ritter, 2016) and average first-day return (Loughran and Ritter, 2004), as well as in the credit market conditions, it is important to test and compare the market timing theory in the two sub-samples preceding and following this event; indeed, as highlighted in section 5, the number of IPOs has consequently decreased after the dot-com bubble and this might impact the significance of the market timing theory. Given that hot markets are defined as those with an issuance volume above the median of the overall sample, the hot market dummy variable might be compromised when looking at the overall sample: the model is expected to be valid at least in the two sub-samples 1982-1999 and 2000-2016

H_4: The market timing theory holds on the two sub-samples preceding and following the dot-com bubble.

4. Methodology

4.1 Choice of IPOs as major financing event

Differently from the original sample of all equity issuances considered by Baker and Wurgler (2002), we have adopted the Alti (2006) methodology, who claimed that the IPO market is a natural laboratory to analyse market timing for a number of reasons and justifies the decision to exclude other forms of equity issuance. First of all, going public is perhaps the most important financing event in the life of a public firm and the payoff from correctly timing the IPO is potentially quite high. Second, investors face more uncertainty and a higher degree of asymmetric information when valuing IPO firms compared to more mature public companies, offering room for misvaluation, the root of timing considerations. Third, timing attempts are more apparent in the IPO market. As a consequence, cycles in IPO volume are much more pronounced and pervasive than cycles for other types of financing activity (Ibbotson, Sindelar & Ritter, 1994); hence, the IPO sample is likely to be highly revealing of short-term market timing attempts that are distinct from long-range financing policy requirements.

4.2 Hypothesis 1

Our first hypothesis is based around the theory that firms issue equity when managers believe the market conditions are relatively favourable. In order to test this, we have to examine the difference in the amount of capital raised by hot and cold market firms. To investigate this difference, we run a regression in the cross-section of IPOs, where t is the IPO year and the firms' characteristics are included as dependent variables to control for their discrepancies. The dependent variable Y_t assumes the values of $Proceeds^P/A_t$, defined as the IPO proceeds from the sale of primary shares divided by IPO year-end total assets, and $Proceeds^T/A_t$, defined as the total IPO proceeds divided by IPO year-end total assets; both variables are regressed since some of the shares sold at the IPO are secondary shares held by insiders and $Proceeds^T/A_t$ may thus capture an aspect of market timing that $Proceeds^P/A_t$ may not reflect. The regression is the following:

$$Y_t = \alpha + \beta_1 HOT + \beta_2 \frac{M}{B}_t + \beta_3 \frac{EBITDA}{A}_{t-1} + \beta_4 SIZE_{t-1} + \beta_5 \frac{PPE}{A}_{t-1} + \beta_6 \frac{R\&D}{A}_{t-1} + \beta_7 RDD_{t-1} + \beta_8 \frac{D}{A}_{t-1} + \varepsilon_t$$

Equation 1

where the variables are described in detail in section 5. By running this regression, we want to see if there is an indication that firms attempt to time the market and if firms tend to raise more proceeds when they go public in hot markets compared to cold; these two results are indicated by the significance and the sign of the coefficient β_1 of the hot market dummy variable. This will indicate that firms exploit a window of opportunity to raise capital, thus showing that market timing is the motivation behind an IPO rather than financing and investing needs.

4.3 Hypothesis 2

The second hypothesis tests the persistence of timing attempts on the firms' capital structure in the short-term. The change in capital structure is defined as the difference in book leverage (D/A) between the pre-IPO and the following years and it is represented by this regression equation, which considers the market timing dummy variable (HOT) while controlling for other firm characteristics:

$$\frac{D}{A}_t - \frac{D}{A}_{PRE-IPO} = \alpha + \beta_1 HOT + \beta_2 \frac{M}{B}_t + \beta_3 \frac{EBITDA}{A}_{t-1} + \beta_4 SIZE_{t-1} + \beta_5 \frac{PPE}{A}_{t-1} + \beta_6 \frac{R\&D}{A}_{t-1} + \beta_7 RDD_{t-1} + \beta_8 \frac{D}{A}_{PRE-IPO} + \varepsilon_t$$

Equation 2

The main hypothesis is verified by analysing the sign and testing the significance of the coefficient β_1 from t=IPO to t=IPO+5, thus looking at the relationship between the change in capital structure and the hot market dummy variable up to two years after the IPO.

4.4 Hypothesis 3 and hypothesis 4

With regards to the third and fourth hypothesis we use the same methodology from equations 1 and 2 to test the market timing theory on different datasets: the technology firms, the 1982-1999 and 2000-2016 sub-samples.

4.5 Further control variables

Apart from the firm characteristics independent variables presented in this section and described in detail in section 5, all the regressions are estimated including one industry-fixed effects and two credit market control variables.

5. Data

5.1 Chosen sample

The study looks at market timing among the U.S. IPO events, combining the data strictly related to the deals with the information coming from the balance sheets of the firms; the deal data are sourced from the Thomson Reuters Securities Data Company (SDC) Platinum database, while the accounting items are downloaded from the CRSP (The Center for Research in Security Prices) database. The data is consequently defined as a panel and the initial sample consists of all the IPOs that took place in the U.S. between January 1, 1982 and December 31, 2016. The 35-year length chosen for the sample should include a sufficient number of observations and, on a practical ground, it allows to consider several events such as the first tech IPOs (including Microsoft in 1986), the dot-com bubble of the early 2000s, the financial crisis of 2008 with the resulting credit crunch and finally the large Internet and Software IPOs of the current decade.

The database is then restricted to exclude spinoffs, unit offers, American Depositary Receipts and financial firms with SIC codes between 6000 and 6999. Firms which did not have an IPO in the sample period or for which no match has been found between the two databases have been excluded, together with firms for which more than 1 IPO has been found in the period, either because the company went IPO more than once or because of database errors. Firms with book values of assets below $10 million in 2016 dollars at the end of the IPO year and firms for which COMPUSTAT data are not available for the last fiscal year before the IPO are further excluded from the sample. Firms are included in the sample until the first year in which they exit COMPUSTAT; thus, the data end with fiscal year 2016. Finally, firm-year observations that were empty or duplicates have been dropped. These steps lead to a sample of 2,911 firms going IPO.

5.2 Independent variables definitions

The choice of the independent variables comes from Baker and Wurgler (2002), which synthesized the works by Rajan and Zingales (1995) and Fama and French (2000); the definitions of the variables are as follows. Book debt (D) is defined as total liabilities minus deferred taxes and convertible debt, while book equity (E) is total assets minus book debt; as previously stated we follow the methodology from Dudley and James (2013), hence we treat preferred stock as equity. Book leverage (D/A) is then defined as book debt divided by total assets; firm-year observations such that book leverage exceeds 100% are dropped only if they do not have preferred stock in their pre-IPO capital structure. Market-to-book ratio (M/B) is book debt plus market equity (common shares outstanding times share price) divided by total assets; observations for which M/B exceeds 10.0 are dropped from the sample as in Baker and Wurgler (2002) and Alti (2006).
Net debt issues (d/A) is the change in book debt, net equity issues (e/A) is the change in book equity minus the change in retained earnings and newly retained earnings (RE/A) is the change in retained earnings. Profitability is measured by EBITDA/A, which is earnings before interest, taxes and depreciation. SIZE is the logarithm of net sales in millions of 2016 dollars. Asset tangibility (PPE/A) is defined as net plant, property, and equipment. R&D/A is research and development expense (replaced by zero when missing); in regression analyses below, a dummy variable RDD takes the value of one when the R&D expense is missing. INV/A denotes capital expenditures. DIV/E is common dividends divided by year-end book equity. CASH/A is defined as 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 normalized by fiscal year-end total assets and firm-year observations for which d/A, e/A, RE/A, EBITDA/A, INV/A, or DIV/E exceed 100% in absolute value are dropped from the sample.

Table I summarizes firm characteristics and financing decisions in the pre-IPO and IPO years, where the IPO year is defined as the fiscal year in which the

Table 1

Summary Statistics of Firm Characteristics and Financing Decisions at pre-IPO and IPO years

The table reports the means and standard deviations of the firm characteristics. All variables except N, M/B and SIZE are expressed in percentage terms.

	Pre-IPO		IPO Year	
	Overall Sample	*Tech Firms Sub-Sample*	*Overall Sample*	*Tech Firms Sub-Sample*
N	2,345	789	2,420	810
D/A	60.44	55.99	36.27	29.78
	(36.96)	(33.02)	(22.94)	(19.70)
M/B	2.14	2.64	2.80	3.44
	(1.47)	(1.48)	(1.73)	(1.92)
d/A	13.88	16.30	2.12	3.37
	(21.97)	(21.84)	(18.48)	(15.22)
e/A	18.60	21.41	45.40	51.37
	(28.06)	(28.47)	(27.86)	(26.57)
ΔRE/A	-10.94	-12.02	-2.76	-1.91
	(29.73)	(31.36)	(19.17)	(21.32)
EBITDA/A	2.07	0.56	6.77	6.06
	(44.21)	(43.50)	(19.68)	(19.23)
SIZE	4.32	3.80	4.69	4.32
	(1.96)	(1.64)	(1.78)	(1.36)
PPE/A	25.05	17.04	21.05	12.19
	(22.96)	(14.35)	(22.20)	(12.85)
R&D/A	13.73	20.09	6.63	10.40
	(27.55)	(18.58)	(10.26)	(9.33)
INV/A	8.87	8.03	7.73	5.99
	(10.43)	(7.54)	(9.93)	(6.34)
DIV/E	2.60	0.57	2.76	1.52
	(18.16)	(25.59)	(10.55)	(7.32)
CASH/A	22.74	28.14	35.41	46.81
	(25.88)	(23.41)	(29.83)	(25.61)

IPO takes place; all variables except M/B and SIZE are expressed in percentage terms. These first summary statistics are partially consistent with the findings in previous studies. Book leverage declines substantially in the IPO year, while the market-to-book ratio increases. Contrarily to what found by Jain and Kini (1994), profitability increases in the IPO year together with the size. Asset tangibility, the research and development and the capital expenses decrease in the first year, while dividends slightly increase. Finally, cash balances increase with the infusion of new capital in the IPO year.

With regards to the technology firms sub-sample, leverage, profitability and size are constantly lower than the overall sample, while the R&D expense and the market-to-book ratio are higher, consistent with the theoretical background previously described. The asset tangibility, the capital expenditure and the dividends are lower, while cash and short-term investments are higher, consistent with the premises made in section 2.

5.3 Definition of hot and cold markets

The definition of hot and cold markets is taken from the work of Alti (2006) and based on the monthly IPO volume, that is the number of issuances. This choice is based on the findings by Helwege and Liang (2004), which suggested that hot markets are not driven primarily by changes in adverse selection costs, managerial opportunism or technological innovations, but more likely reflect greater investor optimism; the advantage is of not picking up firm-level characteristics, such that the timing measure is instead a function of market conditions.

Specifically, starting from the SDC Premium sample before the imposition of COMPUSTAT data requirements we have computed the number of IPOs for each month between January 1982 and December 2016; then we have taken a 3-month centred moving average of the number of IPOs for each month to smooth out seasonal variation. Hot (cold) months are finally defined as those that are above (below) the median in the distribution of the detrended monthly moving average IPO volume across all the months in the sample. For each IPO in the sample, the dummy variable HOT takes the value of one if the firm goes public in a hot month, and zero otherwise. Assuming the validity of the variable HOT as a good measure of hot and cold markets is crucial to study the market timing theory and thus measure the firms' market timing attempts.

Figure 1 plots the monthly moving average IPO volume from 1982 to 2016 and the horizontal line is the median at 21. As the figure illustrates, hot and cold months differ in terms of the number of IPOs. In the main sample of 2,911 IPOs, 2,066 occur in hot months (71% of the sample) and 845 IPOs (29% of the sample) take place in cold months; for what it concerns the tech firms sub-sample of 988 IPOs, 783 occur in hot months (79% of the sample) and 205 (21% of the sample) in cold months.

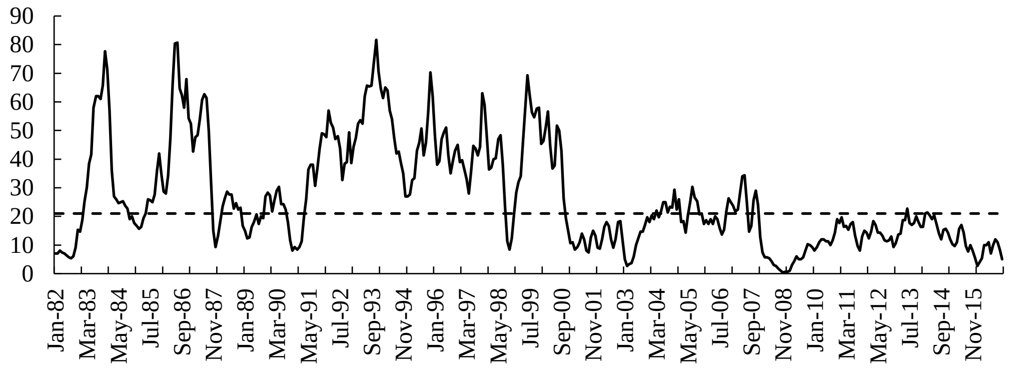

Figure 1. Time series of the monthly moving average IPO volume

5.4 Further control variables

As described in section 4, three additional control conditions have been added to the regressions. The first variable concerns the industry-fixed effects and it is defined by the first three digits of the SIC codes; this one is applied in all the regressions and is used to control for the differences across industries. The other two variables (SPREAD & YIELD) come from the intuition by Dudley and James (2013) and represent the difference between 30-year Baa-rated and Aaa-rated bonds yields provided by Moody's measured at the end of the month preceding the IPO and the 30-year Aaa-rated bond yield measured at the end of the month preceding the IPO. The first one assesses the difference in long-term borrowing costs between low- and high- quality bond issuers, thus measuring the investors' risk aversion; the second one represents the cost of borrowing for top-rated firms, a measure of the attractiveness of debt.

Observing Figure 2 we can notice the relationships between the number of IPOs and the two control variables: a negative correlation with the credit market spread and a positive correlation with the top-rated debt yield, pointing out how the investors' risk aversion decreases while the cost of debt increases the number of IPOs in the market.

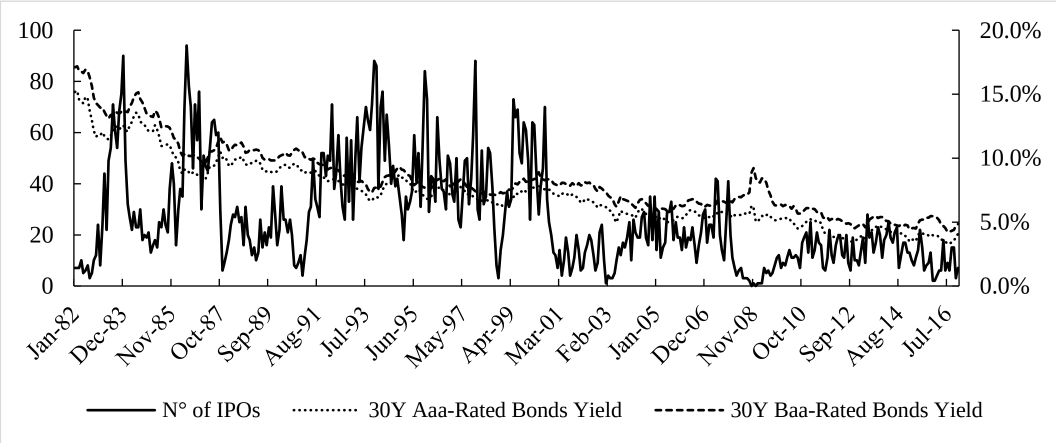

Figure 2. Time series of the monthly number of IPOs and of the 30-year Baa- and Aaa-rated bonds monthly yields

6. Analysis

6.1 Hypothesis 1: Market timing attempts and capital structure

The first hypothesis to be tested is whether firms time their Initial Public Offering to exploit opportunities in favourable equity markets and thus raise a higher amount of capital when issuing shares in hot markets conditions.
Before testing the validity of the market timing theory, in Panel A of Table II we present the summary statistics for the dependent variables $Proceeds^T/A_t$ and $Proceeds^P/A_t$ in hot and cold markets, where the values in parentheses represent the robust t-statistics. Regardless of the variable, firms tend to raise a significantly higher amount of equity in hot markets: 6.10% of the total proceeds (1% significance level) and 3.82% of the primary proceeds (5% significance level) more than cold-markets firms.

Panel B of Table II contains the results from the regressions described in section 4. The first thing we notice is that the hot market dummy variable (HOT) has a positive but non-significant coefficient, which assumes a lower value when regressed against $Proceeds^P/A_t$. On the other hand, the market-to-book ratio is a strong predictor of the raised capital as it is significant in both regressions. With regards to the coefficients on the firm-specific characteristics: profitability is significant only when regressed against total proceeds, size has the most significant coefficient in the regression, asset tangibility is significant only when regressed against primary proceeds, research and development expense is significant in both regressions while the RDD dummy variable is not. The leverage in the pre-IPO year is a significant predictor only for the proceeds from the sale of primary shares. The risk aversion control variable (SPREAD) is not significant, while the cost of debt is significant only in the primary proceeds' regression. Finally, the model that regresses $Proceeds^P/A_t$ has a higher R^2 and hence have higher predictability.

Our results do not support the first hypothesis and they therefore provide evidence against the market timing theory presented by Alti (2006), as we have not found the coefficient on the HOT variable to be significant when controlling for industry fixed-effects, firm specific and credit market characteristics. Our findings could be explained by the fact that we have adopted the definition of leverage proposed by Dudley and James (2013) instead of treating preferred stock as debt and they are indeed aligned with the mentioned research. Apart from YIELD in the primary proceeds regression, we do not find the inclusion of the credit market control variables significantly relevant, suggesting that they do not influence the market timing attempts.

In Panel A of Table II we have found a significant difference in the amounts of proceedings raised during months with a high number of IPOs and months with a low number of issuances; this leads to a significant 3.23% difference in the mean leverage in the IPO year (unreported), below the significant difference of 5.65% in the same value in the pre-IPO year (unreported). Therefore, we find still relevant to study the relationship between the change in leverage in the short term and the hot market dummy variable, while controlling for industry fixed-effects, firms characteristics and credit market conditions.

Table 2

Market Timing Effects on the Issuance Activity

All regressions are estimated with industry-fixed effects defined by three-digit SIC codes. The constant term is not reported. Robust t-statistics are in parentheses. All variables are expressed in percentage terms.

	$Proceeds^T/A_t$	**$Proceeds^P/A_t$**
	Panel A: Mean Values	
Hot	59.24	50.28
Cold	53.14	46.46
t-value (difference)	(3.09)	(2.12)
	Panel B: Regression Analysis	
HOT	2.71	1.70
	(1.25)	(0.89)
M/B_t	2.81	1.30
	(6.28)	(3.30)
$EBITDA/A_{t-1}$	0.12	0.01
	(3.88)	(0.56)
$SIZE_{t-1}$	-7.32	-7.57
	(14.17)	(16.67)
PPE/A_{t-1}	-0.01	-0.04
	(0.26)	(3.29)
$R\&D/A_{t-1}$	0.23	0.17
	(4.00)	(3.29)
RDD_{t-1}	-3.39	-2.37
	(1.62)	(1.28)
D/A_{t-1}	0.03	0.05
	(1.17)	(2.54)
$SPREAD_t$	2.70	-1.66
	(0.95)	(0.66)
$YIELD_t$	-0.81	-1.21
	(1.60)	(2.72)
R^2	0.53	0.58
N	1,851	1,851

6.2 Hypothesis 2: The short-term effect of market timing on leverage changes

The question that the second hypothesis addresses concerns whether there is any difference in the change in leverage from the IPO year to the following years between hot and cold market firms.

Observing the mean values in Panel A of Table III we can see that the difference in the change in leverage from the pre-IPO year between hot and cold market firms is not significant in none of the following years. Contrarily to our hypothesis and to the findings by Alti (2006), one and two years after the IPO the change in leverage is higher for cold markets firms.

The regression analysis in Panel B of Table II suggests that the coefficient for the hot market dummy is not significant in any of the two years after the IPO; the years after IPO+2 are not reported because the significance of the variable HOT decreases over time. On one hand, the coefficient has a positive effect in all the years following the IPO, invalidating our hypothesis. On the other hand, the coefficient of the market-to-book ratio is statistically significant to forecast the decrease in leverage at least until year IPO+5 (unreported) and has a negative sign. The coefficients for the profitability and the size are significant in the considered years, where the former has a negative sign and the latter has a positive one. Asset tangibility is significant in the years IPO+1 and IPO+2, while the research and development expense is significant in years of IPO and IPO+2. Given the construction of the dependent variable, the book leverage is highly significant in all the years. Finally, the risk aversion control variable is not

Table 3

Short-Term Persistence of Market Timing on Capital Structure

All regressions are estimated with industry-fixed effects defined by three-digit SIC codes. The constant term is not reported. Robust t-statistics are in parentheses. All variables are expressed in percentage terms.

	$D/A_t - D/A_{PRE\text{-}IPO}$		
t	IPO	IPO+1	IPO+2
	Panel A: Mean Values		
Hot	-23.84	-20.83	-18.18
Cold	-23.24	-21.87	-18.81
t-value (diff.)	(0.34)	(0.53)	(0.63)
	Panel B: Regression Analysis		
HOT	0.37	0.98	0.27
	(0.34)	(0.78)	(0.20)
M/B_t	-1.32	-1.36	-1.20
	(5.78)	(4.88)	(3.55)
$EBITDA/A_{t-1}$	-0.12	-0.32	-0.45
	(8.16)	(9.77)	(13.50)
$SIZE_{t-1}$	4.11	4.51	4.89
	(15.63)	(13.46)	(12.99)
PPE/A_{t-1}	0.03	0.18	0.18
	(1.30)	(5.81)	(5.71)
$R\&D/A_{t-1}$	-0.25	-0.01	-0.12
	(8.39)	(0.19)	(2.17)
RDD_{t-1}	0.78	0.78	2.35
	(0.73)	(0.61)	(1.70)
$D/A_{PRE\text{-}IPO}$	-0.76	-0.78	-0.77
	(66.82)	(59.59)	(49.20)
$SPREAD_{IPO}$	1.20	0.22	1.11
	(0.82)	(0.13)	(0.61)
$YIELD_{IPO}$	0.21	0.76	1.02
	(0.82)	(2.46)	(3.04)
R^2	0.78	0.74	0.70
N	1,851	1,788	1,628

significant, while the cost of debt becomes a significant predictor from year IPO+1. R^2 is high in all the regressions, but it decreases over time.

Our findings reject also hypothesis 2 as they do not support the short-term effect on capital structure of market timing attempts: the HOT variable is not significant when controlling for industry fixed-effects, firms specific and credit markets characteristics. Among the control variables, the cost of debt seems to assume a significant role in capital structure decisions after the IPO year.

The explanation to our results might lie again in the different definition of leverage we have adopted to include firms with high level of preferred stock, in the additional controls we have added or simply in the different time period. Considering that we have found a significant negative effect on the profitability coefficient and on the research and development expense, it is still relevant to test the market timing theory on the technology sub-sample.

6.3 Hypothesis 3: Market timing attempts by technology firms

The third hypothesis aims at testing whether technology firms show more evident attempts to time markets when they decide to list their shares.
Panel A of Table IV shows that tech firms raise on average a significantly higher amount of capital in hot markets. When the average total proceeds are taken into account, tech firms going public in hot markets collect 12.06% more equity than those going public in cold markets; the difference is higher than what observed in the overall sample.

However, when the total and primary proceeds are regressed against the hot market dummy variable and the other control factors as in Panel B of Table IV, the timing effect loses its significance: indeed, the coefficient of the variable HOT is not significant. Also, the market-to-book ratio has lower significance compared to the overall sample regression in Table II, as it is significant only as a determinant of the total proceeds. The other variables have a similar explanatory power to the regressions on the overall sample; the only plausibly remarkable mention is for the SPREAD variable, which is significant when regressed against the total proceeds. Finally, R^2 is quite low in both regressions.
Table V reports the short-time persistence of market timing attempts on the capital structure of high-tech firms: as for the overall sample, the difference in the change in leverage between hot and cold markets is not significant in any of the

Table 4

Market Timing Effects on the Issuance Activity of High-Tech Firms

All regressions are estimated with industry-fixed effects defined by three-digit SIC codes. The constant term is not reported. Robust t-statistics are in parentheses. All variables are expressed in percentage terms.

	$Proceeds^T/A_t$	**$Proceeds^P/A_t$**
	Panel A: Mean Values	
Hot	68.95	57.02
Cold	56.89	49.15
t-value (difference)	(3.21)	(2.29)
	Panel B: Regression Analysis	
HOT	4.67	0.32
	(1.34)	(0.12)
M/B_t	1.36	0.65
	(2.20)	(1.37)
$EBITDA/A_{t-1}$	0.14	0.01
	(3.55)	(0.45)
$SIZE_{t-1}$	-9.34	-9.44
	(9.79)	(12.69)
PPE/A_{t-1}	0.03	-0.05
	(0.41)	(0.75)
$R\&D/A_{t-1}$	0.30	0.19
	(3.54)	(2.88)
RDD_{t-1}	-0.03	0.58
	(0.01)	(0.18)
D/A_{t-1}	0.07	0.12
	(1.93)	(3.97)
$SPREAD_t$	8.61	1.47
	(2.11)	(0.46)
$YIELD_t$	-1.43	-1.58
	(1.80)	(2.54)
R^2	0.27	0.36
N	633	633

considered years and, contrarily to our expectations, it has an ambiguous sign. The regressions in Panel B of Table V confirm that the hot market dummy variable is not a significant predictor of the changes in capital structure; nonetheless its coefficient has the expected sign in the case of technology firms, as opposed to the overall sample. Again, the years after IPO+2 are not reported because the significance of the variable HOT decreases over time. In the tech sub-sample case, the coefficient of the market-to-book ratio loses its significance already in year IPO+2, while the other firm specific characteristics do not show particular differences. With regards to the credit market control variables, only the cost of debt is significant in years IPO+1 and IPO+2. R^2 is high in all the regressions, but it decreases over time.

The results from the tests on the technology firms sub-sample do not support the significance of the two main concepts behind the market timing theory. First, while high-tech firms raise significantly higher proceeds in hot markets and this difference is clearly wider compared to the overall sample, the market timing effect is not significant when firm specific characteristics, industry-fixed effects and credit market conditions are also taken into account. Second, the difference short-term effect on the capital structure of technology firms is not statistically significant between hot and cold markets; nevertheless, in this sub-sample the coefficient on the hot dummy market variable assumes the predicted sign. Overall, Hypothesis 3 is not validated as the market timing theory is not proven to be significant in explaining the financing decisions of technology firms; however, considering that for the tech sub-sample we have found a higher difference in the capital raised in hot and cold markets and a correct sign for the coefficient of the hot market dummy, the intuition behind this hypothesis seems to be confirmed.

So far, our findings exclude a relationship between being in period with a number of initial public offerings above the median and firm financing decisions such as the amount of proceedings raised or the decrease in leverage in both the overall sample and the high-tech firms sub-sample. In order to have a final perspective on why our results differ from the findings by Alti (2006) we find relevant to test the market timing theory on two time sub-samples.

Table 5

Short-Term Persistence of Market Timing on High-Tech Firms

All regressions are estimated with industry-fixed effects defined by three-digit SIC codes. The constant term is not reported. Robust t-statistics are in parentheses. All variables are expressed in percentage terms.

	$D/A_t – D/A_{PRE-IPO}$		
t	IPO	IPO+1	IPO+2
	Panel A: Mean Values		
Hot	-25.89	-23.51	-20.40
Cold	-25.06	-25.95	-25.58
t-value (diff.)	(0.33)	(0.87)	(1.61)
	Panel B: Regression Analysis		
HOT	-1.84	-1.25	-0.59
	(1.13)	(0.66)	(0.27)
M/B_t	-0.92	-0.73	-0.40
	(3.23)	(2.10)	(0.93)
$EBITDA/A_{t-1}$	-0.10	-0.22	-0.33
	(5.52)	(5.14)	(7.37)
$SIZE_{t-1}$	3.49	3.58	4.49
	(7.82)	(5.95)	(6.88)
PPE/A_{t-1}	0.09	0.34	0.38
	(2.26)	(6.16)	(6.45)
$R\&D/A_{t-1}$	-0.23	0.08	-0.02
	(5.87)	(0.96)	(0.25)
RDD_{t-1}	0.65	7.49	10.28
	(0.34)	(3.06)	(3.59)
$D/A_{PRE-IPO}$	-0.73	-0.77	-0.81
	(40.18)	(36.80)	(33.89)
$SPREAD_{IPO}$	1.44	-1.15	0.41
	(0.75)	(0.49)	(0.16)
$YIELD_{IPO}$	0.32	0.97	1.07
	(0.85)	(2.13)	(2.11)
R^2	0.76	0.73	0.72
N	633	598	536

6.4 Hypothesis 4: Market timing attempts in different time periods

The fourth and last hypothesis consists of a test on the significance of the market timing theory on two time sub-samples going from 1982 to 1999 and from 2000 to 2016 respectively. The reason for this test is twofold: on one hand we isolate the part of our sample that matches the one used by Alti (2006), so that we can test the theory on this sub-sample given the different definition of leverage adopted, on the other hand we look at the relevance of market timing attempts after the dot-com bubble, an event that changed both the IPO and credit markets conditions.

The first thing we can notice from Panel A of Table VI is that the difference in raised capital between hot and cold markets is statistically significant only for the tech firms sub-sample in the period 1982-1999. On average, tech firms raised 18.98% higher total proceeds and 16.39% higher primary proceeds in hot markets. Nonetheless, the regressions in Panel B of Table VI confirm that the coefficient of the variable HOT is not significant in any of the regression in the considered time interval.

Looking at Panel C of Table VI, the difference in proceeds between hot and cold markets in the period 2000-2016 is statistically significant for both the overall sample and the tech sub-sample, assuming again a higher value for the latter. The regressions in Panel D of Table then provide the first evidence to the significance of the hot market dummy variable, but only when total proceeds is considered as dependent variable.

The mean values in Panel A of Table VII show that the difference in leverage change between hot and cold markets is significant at least until year IPO+2 for both samples in the period 1982-1999. However, the coefficient for the variable HOT in Panel B of Table VII is significant only for the high-tech sub-sample in the IPO year and loses its significance from the year afterwards.
From Panel C of Table VII we can see that the decrease in leverage change is not statistically different from hot to cold markets in any of the samples and in any of the considered years in the period ranging from 2000 to 2016. Also, observing Panel D of Table VII, we notice that the coefficient of the HOT variable is not significant in any of the regressions. The market timing theory proved to be valid only in the period 2000-2016, with no significant persistence over time; hence hypothesis 4 is also not verified.

Table 6

Market Timing Effects on the Issuance Activity in the periods 1982-1999 and 2000-2016

All regressions are estimated with industry-fixed effect. The constant term and the coefficients for the firm characteristics are not reported. Robust t-statistics are in parentheses. All variables are expressed in percentage terms.

	Overall Sample		*Tech Firms Sub-Sample*	
	$Proceeds^T/A_t$	**$Proceeds^P/A_t$**	**$Proceeds^T/A_t$**	**$Proceeds^P/A_t$**
	Panel A: Mean Values 1982-1999			
Hot	59.14	49.67	69.54	56.28
Cold	54.64	45.51	50.56	39.89
t-value (difference)	(0.54)	(0.51)	(2.77)	(2.98)
	Panel B: Regression Analysis 1982-1999			
HOT	6.74	6.26	10.48	7.89
	(1.20)	(1.25)	(1.45)	(1.41)
$SPREAD_t$	-9.05	-10.19	-6.52	-7.54
	(-1.64)	(2.08)	(0.94)	(1.40)
$YIELD_t$	1.16	0.10	2.23	0.95
	(1.04)	(0.10)	(1.50)	(0.82)
R^2	0.57	0.53	0.31	0.38
N	1,155	1,155	411	411
	Panel C: Mean Values 2000-2016			
Hot	59.60	52.68	66.91	59.54
Cold	53.00	46.55	57.71	50.33
t-value (difference)	(2.56)	(2.49)	(2.01)	(2.05)
	Panel D: Regression Analysis 2000-2016			
HOT	4.82	2.26	8.64	1.75
	(2.25)	(1.23)	(2.10)	(0.54)
$SPREAD_t$	4.53	0.59	3.52	-2.01
	(1.26)	(0.19)	(0.53)	(0.39)
$YIELD_t$	-0.53	-0.23	-1.38	-0.23
	(0.60)	(0.30)	(0.81)	(0.17)
R^2	0.52	0.57	0.32	0.45
N	696	696	222	222

Table 7

Short-Term Persistence in the periods 1982-1999 and 2000-2016

All regressions are estimated with industry-fixed effect. The constant term and the coefficients for the firm characteristics are not reported. Robust t-statistics are in parentheses. All variables are expressed in percentage terms.

	Overall Sample			*Tech Firms Sub-Sample*		
	D/A_t – $D/A_{PRE\text{-}IPO}$					
t	IPO	IPO+1	IPO+2	IPO	IPO+1	IPO+2
	Panel A: Mean Values 1982-1999					
Hot	-24.11	-21.14	-18.69	-24.94	-22.36	-19.94
Cold	-13.59	-11.56	-8.73	-6.06	-7.85	-5.42
t-value (diff.)	(2.95)	(2.95)	(2.38)	(3.97)	(4.08)	(3.44)
	Panel B: Regression Analysis 1982-1999					
HOT	-2.92	1.53	-2.86	-6.71	-1.30	-5.10
	(1.20)	(0.54)	(0.93)	(2.04)	(0.36)	(1.30)
$SPREAD_{IPO}$	4.57	1.96	5.81	6.24	-1.27	6.02
	(1.91)	(0.68)	(1.84)	(1.98)	(0.34)	(1.51)
$YIELD_{IPO}$	-0.66	-0.24	-0.69	-1.17	0.64	-0.34
	(1..36)	(0.40)	(1.03)	(1.73)	(0.80)	(0.39)
R^2	0.74	0.71	0.71	0.74	0.74	0.74
N	1,155	1,030	933	411	351	315
	Panel C: Mean Values 2000-2016					
Hot	-22.74	-19.89	-16.86	-29.51	-26.47	-21.40
Cold	-24.22	-22.99	-19.91	-27.63	-28.94	-28.94
t-value (diff.)	(0.62)	(1.24)	(1.32)	(0.53)	(0.66)	(1.83)
	Panel D: Regression Analysis 2000-2016					
HOT	0.02	0.40	-0.88	-2.33	-0.36	-1.75
	(0.01)	(0.24)	(0.49)	(1.12)	(0.15)	(0.62)
$SPREAD_{IPO}$	1.10	2.23	1.29	1.37	-0.70	-2.63
	(0.43)	(0.75)	(0.41)	(0.41)	(0.16)	(0.52)
$YIELD_{IPO}$	-0.79	-0.70	-0.36	-0.25	-1.36	0.02
	(1.27)	(0.98)	(0.47)	(0.30)	(1.23)	(0.02)
R^2	0.85	0.82	0.75	0.81	0.77	0.74
N	696	718	685	222	230	217

7. Conclusions

The results of our study do not provide any consistent evidence to support the market timing theory, in neither the overall sample nor in the technology sub-sample, hence rejecting the work by Alti (2006). After we have controlled for the credit market conditions and tested the theory on two time sub-samples, the most significant explanation to the discrepancy in results lies in the choice of the definition of leverage, which in our case considers preferred stocks as equity. This definition comes from the work by Dudley and James (2013), which also have not found any proof to the market timing theory.

The main finding of this work is that all our hypothesis about the market timing theory have been rejected, proving that it cannot predict the financing decisions of firms going public. Apart from the 2000-2016 sub-sample, we have not found evidence of timing attempts or persistence on capital structure in the overall and the high-tech subsamples. Hence firms do not seem to consistently attempt to time the markets to approve an initial public offering when other factors such as firm specific characteristics, industry-fixed effects and credit market conditions are taken into account.

Nonetheless we have constantly found a higher difference in raised proceeds between hot and cold markets and a higher and more significant coefficient for the hot market dummy variable in the high-tech sample, when compared to the overall sample. This finding seems to partially confirm our initial intuition: technology firms attempt to time the IPO markets when they decide to go public, or at least more than firms in other industries do; however, this effect is not reflected in the changes in capital structure over time.

The main conclusion we draw from our study is that attempting to time the market is not the only factor driving the choice to raise capital through an initial public offering by private firms, including technology start-ups. Therefore, considering the complexity of the topic, the market timing theory could not be sufficient as a unique explanation to financing decisions and the other theories might capture different perspectives of this managers' decision.

Considering our work, we would still encourage future research to analyse the market timing attempts by firms going IPO; the technology sample seems to highlight this as one of the industries with the most evident signs of market timing. We would also recommend to still keep the definition we have used to compute leverage but to try to explore new conceptualizations of the market timing variable in new potential studies; markets different from the American and financing decisions other than IPOs could also be considered to provide different perspectives on the topic.

8. Reference list

Aghion, P., Bond, S., Klemm, A. & Marinescu, I. (2004). “Technology and Financial Structure: Are Innovative Firms Different?”. *Journal of the European Economic Association,* 2(2-3): 277-288.

Alti, A. (2006). “How Persistent Is the Impact of Market Timing on Capital Structure?”. *The Journal of Finance*, Vol. LXI, No. 4: 1681-1710.

Baker, M. & Wurgler, J. (2000). “The Equity Share in New Issues and Aggregate Stock Returns”. *The Journal of Finance*, Vol. LV, No. 5: 2219-2258.

Baker, M. & Wurgler, J. (2002). “Market Timing and Capital Structure”. *The Journal of Finance*, Vol. LVII, No. 1: 1-32.

Coleman, S. & Robb, A. (2012). “Capital Structure Theory and New Technology Firms: is there a Match?”. *Management Research Review*.

Dudley, E. & James, C. (2013). “Capital-structure changes around IPOs”. *Unpublished working paper*.

Fama, E.F. & French, K.R. (2000). “Testing tradeoff and pecking order predictions about dividends and debt”. *Working paper*, University of Chicago.

Guney, Y. & Iqbal-Hussain, H. (2010). “Capital Structure and IPO Market Timing in the UK”. *Behavioural Finance Working Group Conference: Fairness, Trust and Emotions in Finance*: 1-34.

Helwege, J. & Liang, N. (2004). “Initial Public Offerings in Hot and Cold Markets”. *Journal of Financial and Quantitative Analysis*, Vol. 39, No. 3.

Huang, R. & Ritter, J.R. (2009). “Testing Theories of Capital Structure and Estimating the Speed of Adjustment”. *Journal of Financial and Quantitative Analysis*, Vol. 44, No. 2: 237-271.

Ibbotson, R.G., Sindelar, J.L. & Ritter, J.R. (1994). "The Market Problems with the Pricing of Initial Public Offerings". *Journal of Applied Corporate Finance*, Vol. 7, No. 1, 66-74.

Jain, B. A. and Kini, O. (1994). "The post-issue operating performance of IPO firms". *Journal of Finance*, No. 49: 1699–1726.

Kaplan, S.N. & Stromberg, P. (2003). "Financial contracting theory meets the real world: an empirical analysis of venture capital contracts." *Review of Economic Studies*, No. 70, 281-315.

Ljungqvist, A. & Wilhelm, W.J. Jr. (2003). "IPO Pricing in the Dot-Com Bubble". *The Journal of Finance,* Vol. 58, No. 2: 723-752.

Loughran, T. & Ritter, J.R. (2004). "Why Has IPO Underpricing Changed Over Time?". *Financial Management*, Autumn 2004: 5-37.

Modigliani, F. & Miller, M.H. (1963). "Corporate Income Taxes and the Cost of Capital: A Correction". *The American Economic Review*, Vol. 53, No. 3: 433-443.

Myers, S.C. & Majluf, N.S. (1984). "Corporate financing and investment decisions when firms have information that investors do no have". *Journal of Financial Economics*, Vol. 13, No. 2: 187-221.

Myers, S.C. (2001). "Capital Structure". *The Journal of Economic Perspectives*, Vol. 15, No. 2: 81-102.

Rajan, R.G. & Zingales, L. (1995). "What do we know about capital structure? Some evidence from international data". *Journal of Finance*, Vol. 50: 1421-1460.

Ritter, J.R. & Welch, I. (2002). "A Review of IPO Activity, Pricing, and Allocations". *The Journal of Finance*, Vol. LVII, No. 4: 1795-1828.

Ritter, J.R. (2016). “Initial Public Offerings: Updated Statistics”. Retrieved from https://site.warrington.ufl.edu.

Ross, S.A., Westerfield, R. and Jaffe J.F. (2010). *Corporate finance*, McGraw Hill/Irwin: 1003 pages.