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Security issuance and the business cycle

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Abstract

We use a simple model of investment and external finance to analyze the relationship among the issuance of securities, financial market valuations and, alternatively, aggregate investment or cash flows. We find that issuance is driven by market valuations, and does not influence aggregate investment, whereas investment has a negative impact on equity issuance. Moreover, we obtain widespread evidence that equity and debt are complementary sources of finance, and that positive shocks to cash flows are associated with larger issuance of debt.

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1 - Introduction

The large swings in the volume of shares and debt issued in primary markets have been the subject of a significant body of empirical studies. Scholars have proposed a number of different explanations, based on changing business conditions (e.g. P*á*stor and Veronesi 2005), investor sentiments (e.g. Derrien and Kecskes 2009) and asymmetric information between owners and outside investors (e.g. Dittmar and Thakor 2007). These studies have made use of micro level data to test the different hypotheses, while a parallel strand of the literature has focused on aggregate issuance. Baker and Wurgler (2000), for example, find that the share of equity issuance, calculated as a fraction of the total issuance of securities, is a predictor of stock market returns, and suggest that corporations are capable to effectively time the market, as the relationship between the equity share of issuance and investment is insignificant. Lowry (2003) finds empirical support for the capital demand and the investor sentiment hypotheses, as the volume of IPOs grows with that of future sales and it is a strong predictor of lower future returns, while Ivanov and Lewis (2008) obtain similar results by studying the number of IPOs. More recently, studies based on aggregate data have emphasized that macroeconomic factors are an important driving force of security issuance. In particular, Lamont and Stein (2006) suggest that equity issuance is substantially more sensitive to aggregate stock prices than firm-level prices. Moreover, Dittmar and Dittmar (2008) find that trends in equity issuance are largely explained by the business cycle. They find that GDP growth is associated with declining equity issuance, and they suggest that in the early stage of the cycle cash flows are limited, while investment opportunities are plentiful, an vice-versa in later stages. Finally, McLean (2011) finds that precautionary savings are an important factor driving share issuance, as the amount of resources kept in cash by industrial corporations is explained by both cash flows and equity issuance.

We develop a simple investment model where financial frictions are explicitly taken into account to derive a rigorous formulation of the linkage among investment, security market valuations and security issuance. The resulting Tobin's q expression provides a useful framework that we employ to analyze the impact of the business cycle on debt and equity issuance. In line with recent studies, we find that the issuance of securities is largely driven by market prices of securities. Our results also suggest that investment negatively affects equity issuance, in line with the findings of McLean (2011) that equity issuance is driven by the need to have a buffer of cash on top of the investment needs. Secondly, we obtain widespread evidence that equity and debt are complementary sources of finance and they are both strongly pro-cyclical (see, e.g., Covas and Den Haan 2011). The similar behavior of debt and equity issuance supports the hypothesis that the impact of secondary stock markets on primary placements is largely due to the forward looking nature of stock prices, as they anticipate future business conditions. Thirdly, we find that debt issuance does not substitute internal finance when a negative shock reduces cash flows. Thus, a substantial amount of debt must be set aside in good times in order to build up reserves of liquid securities available in periods of financial distress.

2 - The Model

Investment can be financed either internally, by means of current cash-flows, or externally, by issuing debt or equity. Thus, over time, the following constraint holds:

$$P_t^I I_t = EF_t + \alpha CF_t, \tag{1}$$

where $CF_t = P_t^Y F(K_t, N_t) - w_t N_t$ defines current cash flows, α is the share of cash flows that is not distributed to liability holders, I_t is real investment, K_t is the stock of capital, N_t and w_t are, respectively, the quantity and price of variable inputs, P_t^Y the price of output, P_t^I the price of investment goods and $F(K_t, N_t)$ is a standard production function.[1] EF_t is the flow of external finance that we assume equal to the sum of debt and equity issuance. The expression above can be rewritten in real terms as:

$$I_t = E_t + \alpha[R_t F(K_t, N_t) - W_t N_t], \tag{2}$$

where $E_t = \frac{EF_t}{P_t^I}$, $R_t = \frac{P_t^Y}{P_t^I}$, and $W_t = \frac{w_t}{P_t^I}$.

With constant returns to scale for capital and labor, and linear cost functions for external finance, the Lagrangian becomes the following:

$$\ell = \sum_{t=0}^{\infty} \beta^t \Big\{ \Big[P_t^Y \Big(F(K_t, N_t) - \psi(I_t, K_t) - \phi(E_t, K_t) \Big) - w_t N_t - P_t^I I_t - P_t^E E_t \Big] + \\ - \lambda_t \Big[K_t - K_{t-1}(1-\delta) - I_t \Big] - \mu_t \Big[E_t - I_t + \alpha \Big(R_t F(K_t, N_t) - w_t N_t \Big) \Big] \Big\} \tag{3}$$

where $\psi(I_t, K_t)$ and $\phi(E_t, K_t)$ are adjustment cost functions and P_t^E is the nominal cost of external finance. From Eq.(3) we can work out an expression for the measure of the average q :

$$Qn_{t+j} = \frac{\lambda_{t+j} - P_{t+j}^I - P_{t+j}^E}{P_{t+j}^Y} = \frac{\frac{S_{t+j} + B_{t+j}}{K_{t+j}} - P_{t+j}^I - P_{t+j}^E}{P_{t+j}^Y} = \varpi + \tau \frac{I_{t+j}}{K_{t+j}} + \gamma \frac{E_{t+j}}{K_{t+j}} \tag{4}$$

where ϖ is a constant term. Eq. (4) shows that the return of the investment of a dollar in additional capital, as measured by Qn_{t+j}, depends on I_{t+j}/K_{t+j} and an additional term in external finance. The above expression, however, does not imply any causal relationship, so that the Tobin's q may

[1] We implicitly assume that a fixed share $1-\alpha$ of cash flows is distributed to shareholders.

be used as a theory of investment or, alternatively, as a theory of security issuance. Furthermore, after substituting the constraint of Eq. (2), the above solution can also be written as a relationship between *Qn*, external finance, and cash flows:

$$Qn_{t+j} = \theta + \zeta \frac{CF_{t+j}}{K_{t+j}} + \vartheta \frac{E_{t+j}}{K_{t+j}}. \tag{5}$$

A simple extension of the above model implies the assumption that investment expenditure is financed out of both current and past retained cash flows:

$$P_t^I I_t = EF_t + \sum_{i=0}^{n} \alpha CF_{t-i}. \tag{6}$$

This simple modification would imply the relevance of lagged values of cash flows and the persistence of the series.[2] Eqs.(4) and (5) are the two baseline relationships that we consider for the empirical analysis of Section 4.

3 - Dataset and Estimation Technique

Quarterly aggregate series for investment, debt and shares issuance of all non-farm, non-financial corporations for the US economy span from 1973:03 to 2004:Q4 and are taken from the Flow of Funds Accounts, maintained by the FED. Following Hall (2001), we construct the Tobin's *q* by including both debt and equity and by capitalizing forward the value of aggregate investment minus depreciation. We calculate the value of CF_{t+j}/K_{t+j} by using the net value added before investment spending for the numerator and we label this variable as CASH. All variables are deflated by using the deflator for fixed investment. Data on net value added and the deflator are taken from the NIPA dataset of the Bureau of Economic Analysis. We use the Barclays Corporate Bond Index as a measure of the real price of external finance $\frac{P_t^E}{P_t^Y}$. We employ standard VAR techniques that yield consistent estimates even though some of the variables are non-stationary, as both Qn and CASH are I(1) processes.[3]

[2] For example, when the cash flows of two periods only are relevant then Eq.(4) becomes:

$$\frac{E_{t+j}}{K_{t+j}} = b_0 + b_1 Qn_{t+j} + b_2 \frac{CF_{t+j}}{K_{t+j}} + \\ + \sum_{i=1}^{n} b_{i+2} \frac{E_{t+j-i}}{K_{t+j-i}} + \sum_{k=0}^{n} b_{n+2+k} \frac{I_{t+j-i}}{K_{t+j-i}} + b_{2n+3} \frac{CF_{t+j-n-1}}{K_{t+j-n-1}}. \tag{7}$$

[3] Following Lutkepohl and Kratzig (2004), we carry out Granger causality tests in presence of series I(1) by esti-

4 - Results

4.1 - Debt and equity

We initially estimate a VAR model, where we analyze the amount of finance raised by means of primary placements of shares (SHARES), and the change in the value of net debt liabilities (DDEBT) together with Qn and INV. Empirical results are set out in Tables 1 and 2.

Table 1: Causality tests among Qn, INV, DDEBT and SHARES.

	Null hypothesis: $\gamma_{ij}(L) = 0$ for $i \neq j$			
	Qn	INV	DDEBT	SHARES
Qn	–	0.0539	0.0062	0.000
INV	0.0183	–	0.8113	0.0125
DDEBT	0.5243	0.9372	–	0.4991
SHARES	0.1273	0.9398	0.0499	–

Notes: Sample period spans from 1970:Q1 to 2004:Q4. P-values for the null hypothesis that $x_{1,t}$ does not Granger-cause $x_{2,t}$. The ”dependent” variables $x_{2,t}$ are reported in the first column while the variables $x_{1,t}$ appear in the first row of the table.

We first obtain the standard result that Qn Granger causes INV and vice versa. Moreover, in line with the literature, we find that Qn innovations explain a large share of the forecasting error variance of SHARES, that Qn Granger-causes SHARES at standard significance levels and that positive Qn shocks have a strong positive impact on share issuance. A similar pattern of results holds for the issuance of debt.

The new evidence that we obtain is that investment affects equity issuance, while the reverse does not hold. The null that INV does not Granger-cause SHARES is, in fact, soundly rejected, and positive investment shocks have a significant *negative* impact on issuance. The Granger causality tests and the variance decomposition, as well as the impulse response functions (IRFs) of Fig. 1 suggest also that both equity issuance and changes in the stock of debt have no significant impact

mating a VAR with an additional lag, and conducting a Wald test in which the last lag is omitted.

Table 2: Forecasting error decomposition for Qn, INV, DDEBT and SHARES.

T		Qn	INV	DDEBT	SHARES
2	Qn	95.97	2.533	5.620	33.48
	INV	3.97	97.38	0.730	0.783
	DDEBT	0.000	0.062	93.50	0.288
	SHARES	0.050	0.022	0.137	65.44
4	Qn	93.80	10.93	10.49	42.90
	INV	5.42	88.30	1.450	2.512
	DDEBT	0.239	0.020	86.67	0.453
	SHARES	0.515	0.739	1.384	54.12
8	Qn	86.9	22.28	11.40	46.54
	INV	6.92	75.45	3.535	5.005
	DDEBT	1.270	0.231	83.79	1.160
	SHARES	4.853	2.032	1.259	47.28
16	Qn	75.70	28.02	10.68	53.68
	INV	13.43	68.32	5.934	7.533
	DDEBT	2.390	1.619	81.99	2.272
	SHARES	8.360	2.028	1.387	36.51

Notes: Sample period spans from 1970:Q1 to 2004:Q4. Proportion of forecasting error variance at horizons 2, 4, 8 and 16 quarters. The ”dependent” variables are reported in the first column while the ”explanatory” variables appear in the first row of the table. For each panel the figures reported in the columns sum up to 100 percent.

on aggregate investment. Thus, not only share issuance is not employed to finance investment, but the impulse response functions suggest that investment reduces the issuance of shares two quarters after the shock. This result is consistent with those of previous studies showing that the rate of economic activity is an important determinant of security issuance, where current or future cash flows are used as a proxy for business conditions. The same result is also in line with the findings of McLean (2011) that equity issuance is driven by precautionary motives rather than undertaken to finance investment expenditure.[4]

Table 1 also shows that both Qn and SHARES Granger-cause DDEBT, while the impulse response functions of Fig. 2 highlight that shocks to SHARES have a significant *positive* impact on both DDEBT and Qn. Share and debt issuance are thus complements.

4.2 - Macroeconomic Determinants of External Finance

[4]Our results are consistent with the evidence from firm-level studies. Lyandres et al. (2008), in particular, find strong evidence suggesting that the typical underperformance of issuers is due to the fact that issuers invest more than non-issuers.

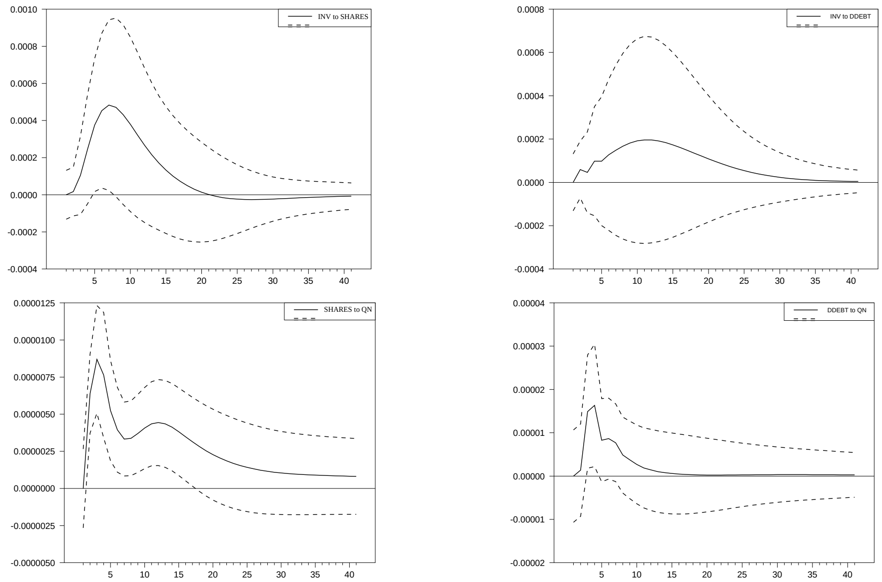

Figure 1: IRFs of INV to one S.D. SHARES innovations, of INV to DDEBT, of SHARES to Qn and of DDEBT to Qn.

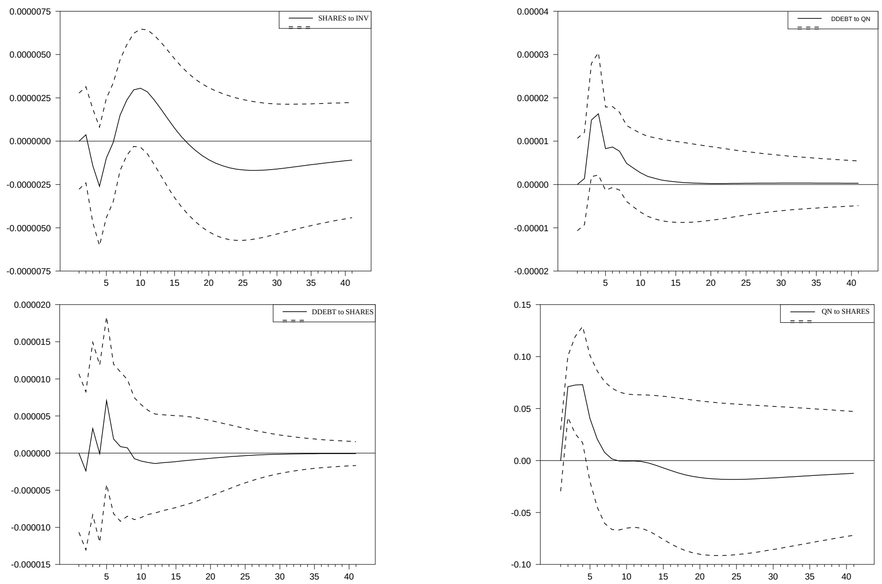

Figure 2: IRFs of SHARES to one S.D. INV innovations, of DDEBT to Qn, of DDEBT to SHARES and of Qn to SHARES.

We now investigate whether a similar pattern of results can be obtained when the dynamics of investment is replaced by that of cash flows. We thus study if cash flows are an important channel of transmission of the impact of macroeconomic factors and cyclical fluctuations on external finance. The null hypotheses that Qn does not Granger-cause CASH, DDEBT and SHARES, reported in Table 3, are soundly rejected at standard significance levels. CASH, on the contrary, does not Granger-cause neither Qn nor SHARES, while it Granger-causes DDEBT at standard significance levels. Similarly, Table 4 shows that Qn explains a large share of the forecasting error variance of CASH, SHARES and DDEBT, whereas the importance of CASH is much smaller. Moreover, none of the above variables plays a significant role in explaining the forecasting error variance of Qn. These results support the view of the Tobin's *q* as a leading (forward looking) indicator.

The impulse response functions of Fig.3 indicate that positive shocks on Qn have a positive and statistically significant impact on issuance of both debt and shares, supporting our previous conclusion that the two sources of external finance are complements. Positive shocks on CASH, on the contrary, appear to have negligible impact on the issuance of shares, whereas they have a positive and significant impact on that of debt.[5]

Overall, these results highlight that Qn is the main driving force influencing the amount of external finance raised by industrial firms in the U.S.. This evidence is particularly strong in the case of share issuance, since Qn shocks explain a very large share of the forecasting error variance of SHARES. The above result is in line with the findings of Lamont and Stein (2006) that equity issuance of existing firms is very sensitive to aggregate stock prices. Moreover, Qn shocks have a similar impact on debt issuance, as bonds have become a major source of funding for industrial firms. Interestingly, positive shocks to cash flows are associated with *larger* issuance of debt. Although the finding that debt is pro-cyclical is not surprising, a striking implication is that debt issuance does not substitute internal finance when a negative shock reduces cash flows.

[5] Moreover, shocks on Qn have positive, statistically significant impacts on CASH (not displayed).

Table 3: Causality tests among Qn, CASH, DDEBT and SHARES.

	Null hypothesis: $\gamma_{ij}(L) = 0$ for $i \neq j$			
	Qn	CASH	DDEBT	SHARES
Qn	–	0.0040	0.0017	0.0002
CASH	0.7322	–	0.0134	0.3607
DDEBT	0.7079	0.1139	–	0.6780
SHARES	0.2928	0.2684	0.0961	–

Notes: See Table 1.

Table 4: Forecasting error decomposition for Qn, CASH, DDEBT and SHARES.

T		Qn	CASH	DDEBT	SHARES
2	Qn	99.69	11.52	7.494	41.75
	CASH	0.098	87.71	0.317	3.869
	DDEBT	0.095	0.039	92.10	0.006
	SHARES	0.109	0.723	0.085	54.37
4	Qn	99.22	23.98	13.80	51.89
	CASH	0.101	75.44	4.449	5.356
	DDEBT	0.472	0.182	79.29	0.661
	SHARES	0.202	0.386	2.444	42.08
8	Qn	95.61	31.95	19.72	60.04
	CASH	2.231	67.13	4.553	4.639
	DDEBT	1.428	0.243	70.84	1.941
	SHARES	0.727	0.666	4.868	33.37
16	Qn	88.87	35.00	19.36	65.42
	CASH	7.683	63.25	4.381	5.420
	DDEBT	2.489	0.725	70.04	2.987
	SHARES	0.951	1.017	6.204	26.16

Notes: See Table 2.

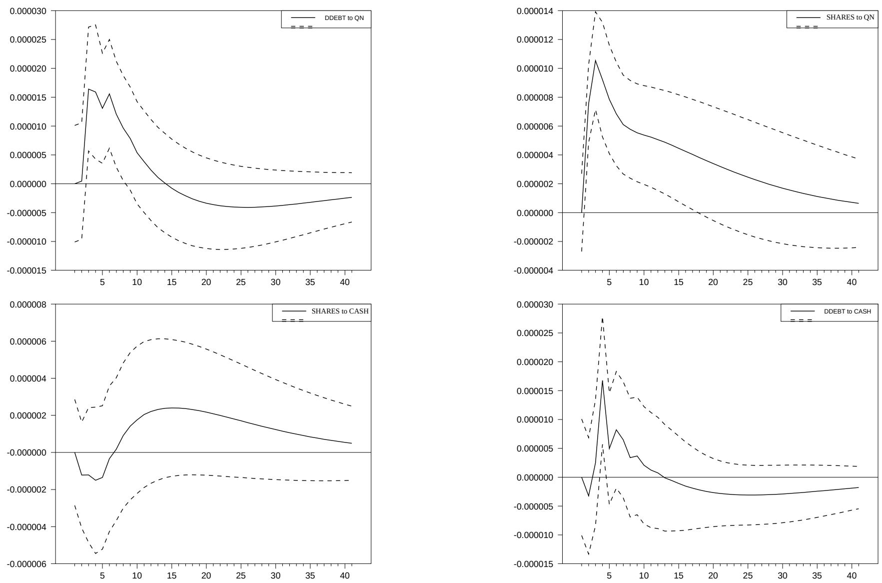

Figure 3: IRFs of DDEBT to one S.D. Qn innovations, of SHARES to Qn, of SHARES to CASH and of DDEBT to CASH.

5 - Conclusions

Security market prices, as captured by the Tobin's *q*, are the main driving force behind the issuance of equity, as they explain an extremely large share of the forecasting error variance of issuance. More surprisingly, they play a similar role also for the issuance of debt. Thus, the Tobin's *q* provides a good theory of security issuance.

External finance plays an insignificant role in the dynamics of aggregate investment. Furthermore, we also find evidence that investment shocks yield a *negative* impact on share issuance. Given that marginal productivity declines following large investments, at the aggregate level, periods of large industrial investment are associated with lower average prices of securities, as the marginal productivity of capital declines, and lower issuance of equity.

Finally, we find that positive shocks to cash flows are associated with *larger* issuance of debt, suggesting that firms do not use debt as a buffer to absorb shocks to cash flows. On the contrary, as debt is strongly pro-cyclical, current cash flows, and expected cash flows, as measured by the Tobin's *q*, are the fundamental driving forces of leverage. Given that issuance of both equity and debt is strongly pro-cyclical, but it has no impact on investment, our results suggest that issuance contributes to raise a buffer of liquid securities during the expansionary phase of the business cycle.

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