Aggregate Investment, Tobin's q and External Finance[¤]

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January 2009

No 2009/01

Newcastle Discussion Papers in
Economics: ISSN 1361 - 1837

¤ We are grateful to Jacques Melitz, Massimo Giuliodori, Patrizio Tirelli and Luca Stanca for many useful comments and suggestions.

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Abstract

We suggest the possibility that the poor empirical performance of the Tobin's q model is due to a misspecification problem. The model, in fact, does not explicitly account for the role of external finance. We thus test the exogeneity of q with respect to investment, by looking for evidence that the availability of external finance affects the aggregate investment of non-financial corporations of the US. We do not find any empirical support for this hypothesis. Furthermore, we find that the amount of external finance raised does not depend on the need to finance investment. The Tobin's Q turns out to be a better theory of external finance than investment.

JEL classification: E22;

Keywords: Investment, Tobin's Q, Primary placements;

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*We are grateful to Jaques Mélitz, Massimo Giuliodori, Patrizio Tirelli, and Luca Stanca for many useful comments and suggestions.

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Introduction

The empirical evidence available on aggregate investment has provided very poor support for the Tobin's q theory. In particular, the extremely small coefficient values, typical of the regressions with aggregate data, imply extremely high values for the parameters of the adjustment cost function, and these values are considered to be highly implausible (see, for instance, Hall (2001)). This very poor performance has normally been explained as the result of an aggregation bias (Schaller (1990) and Gordon (1992)). However, by estimating directly the adjustment cost of different industries in the US, Hall (2004) has found that these adjustment costs are extremely small and not always statistically significant. Furthermore, the empirical estimates of the relationship between investment and Tobin's q normally display a high degree of serial correlation in the disturbance terms. Finally, for many measures of Tobin's q, unit-root tests cannot reject the null of non-stationarity, making these empirical results questionable.

We suggest the possibility that the poor empirical performance of the Tobin's q model is due to a misspecification of the model itself. The theory, in fact, necessarily implies a specific role for the financial variables of industrial firms, but these variables are not accounted for in the model. Although in presence of constant returns to scale and competitive markets the marginal productivity of investment is equal to the Tobin's q, this last differs from the Neoclassical Theory of investment in one important respect. The Tobin's q theory implies a causal relationship: financial market prices drive investment. The value of q is thus an exogenous variable with respect to investment. In the Neoclassical Theory, on the contrary, the variable q is not exogenous: the theory rather implies a bidirectional causality between investment and q. In this framework, financial market prices do not influence investment but, being forward looking, provide an *ex ante* valuation of the profitability of both the existent stock of capital and the investment opportunities available to entrepreneurs: the Tobin's q becomes a leading indicator of the profitability of current and future investments.

A problem with the Tobin's q is that although the theory implies a specific role for external finance, the basic specification of the theory does not account for it. In particular, if market prices of stocks and debt are relevant in order to finance investment, then the sums raised by either primary placements of shares, or debt issuance, or both, should influence the quantity of investment. In other words, when a measure of the Tobin's q is significant in a regression on investment, for a causal relationship between investment and market valuations to take place, some other conditions must hold. Firstly, the significance of the Tobin's q must be due to stock market valuations, rather than to the current marginal productivity of capital. Secondly, high stock prices must cause the issuance of new stock and/or new debt. Finally, the amount of finance raised by means of the issuance of new securities must influence investment. Blanchard et al. (1993), for instance, suggest that it is more rational for firms issuing new shares opportunistically, in order to take advantage of high stock prices, to invest the proceeds in bonds. In the absence of new investment opportunities, in fact, the investment in capital incurs in decreasing marginal returns, while the purchase of bonds does not.

The main aim of this paper is to test empirically the assumption that q is exogenous for investment, and thus financial markets prices directly affect aggregate investment, by developing a very simple model for investment model where external finance plays an explicit role. In particular, we suggest that when the cost of external finance is convex, it generates adjustment costs on the stock of capital besides those usually assumed. We then test different specifications of the model, by simultaneously estimating investment and external finance regressions. In this way we can analyze if industrial firms raise finance in order to finance investment, as normally assumed, or if, alternatively, they raise finance opportunistically when markets overestimate the value of their liabilities, thus exploiting information asymmetries between insiders and outsiders.

As suggested by Christopher A. Sims in his discussion of Morck et al. (1990), we choose to study the relationship between financial flows and real investment without taking any *a priori* stance on the causality relationships occurring among the variables under analysis. We construct a simple theoretical model which permits the choice of the macroeconomic variables at work on a theoretical ground. We thus estimate a simple system of two equations for investment and external finance, making use of three stage least square technique (3SLS). We then perform most of our analysis making use of Vector Auto-Regression (VAR) techniques; VARs, in fact, have two major advantages. First, all the variables can be treated as endogenous. Second, it becomes possible, under certain conditions, to model at the same time both stationary and non-stationary series.

We use aggregate data for the US economy that are available for a long time span, of more than thirty years. The analysis covers different business cycles, and this makes possible allows to capture the long-run dynamics of the variables. Moreover, since the analysis makes extensive use of Granger causality tests, which have low power, longer time-series enhance the statistical reliability of the tests. The obvious cost is the loss of cross-firms heterogeneity. We thus regard the empirical evidence provided by this study as complementary to that obtained by means of micro-level data, and we show that our results are compatible with these last.

We find strong evidence that adjustment costs on external finance are significant. Furthermore, we find that the significance of Tobin's q when regressed on investment is due to the current value of the marginal productivity of capital. We thus suggest that the standard Tobin's q model is misspecified. We find no evidence that the funds raised by means of primary placements impact on investment. We rather find that external finance, both share and debt issuance, is largely driven by our measure of Tobin's q, so that share and debt issuance are complements. The conclusion is thus that the Tobin's q theory of investment is not empirically supported. A static neoclassical model of investment has a much stronger empirical support. On the contrary, the basic specification of the Tobin's q model provides a good model of external finance that is empirically supported and in line with the firm-level evidence. Managers benefit from information that is not available to the market; they thus purchase own shares or reduce debt when outsiders underestimate the value of the firm, and issue shares and/or debt when outsiders overestimate the expected profits of the firm or the industry.

The paper is organized as follows: Section 1 develops the basic theoretical model of investment that we use. Section 2 describes the dataset and the econometric approach employed. Section 3 describes our empirical results and Section 4 presents our conclusions.

1 The model

The model we propose is a standard investment model where the cost of external finance is explicitly introduced in the analysis. We assume that investment can be financed either internally, using current cash-flows, or externally, issuing shares or debt.[1] Thus, over time, the manager must satisfy the following constraint:

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

where $CF_t = P_t^Y F(K_t, N_t) - w_t N_t$ defines the 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 the output and P_t^I the price of investment goods, EF_t is the flow of external finance, and $F(K_t, N_t)$ is a standard production function. 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 $W_t = \frac{w_t}{P_t^I}$. Our fundamental assumption, following Froot and Stein (1998), is that the recourse to external finance is costly, and that such cost is convex.[2] In conditions of limited and asymmetric information this is the case for debt, since bankruptcy risk rises with the amount of outstanding debt. Moreover, it is now well established that the demand curve for newly issued shares is downward sloping, because

[1] We are thus assuming that in the accounting of industrial firms capital adjustment costs affect depreciation rather than current period cash flows.

[2] See also Stein (1998), and Kashyap and Stein (1995).

markets assume that insiders issue shares only when the market overprices them. The empirical evidence available shows that large issues must imply a heavy discount, that is related to the size of the placement.[3] This implies that even the cost of equity issuance is convex. We thus assume that information costs generate adjustment costs, whose size is related to the ratio between the amount of external finance required during a time period, and the book value of the existing stock of capital. The convexity of the external finance cost function implicitly generates a source of adjustment costs on capital different from the one usually assumed (based on frictions of real origin). It is, in fact, more expensive to finance a rapid increase of the capital stock of the firm, than small and smooth incremental investment projects that increase only marginally the capital stock. The risk involved in financing the investment of an industrial firm, and consequently the cost of external finance, rises non-linearly as the amount of new finance required grows with respect to the value of the stock of capital. The value of existing capital, in fact, represents the collateral for the new finance raised. As such, it can be regarded as a cushion against potential defaults whose size is critical for the risk profile that outside investors face. In any other aspect, the model presents features in line with the standard literature. In particular, we assume constant returns to scale to capital and labor input in the production function. The Lagrangian of the problem is the following:

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

where $\psi(I_t, K_t)$ and $\phi(E_t, K_t)$ are adjustment cost functions.

[3] See Asquith and Mullins (1986). Additional evidence can be found in different papers and for countries different from the US, as discussed in Gilchrist et al. (2005).

The first order conditions for investment and external finance are:[4]

$$\frac{\partial \ell}{\partial I_{t+j}} = \beta^{t+j}\Big[-P^{I}_{t+j} - P^{Y}_{t+j}\psi'(I_{t+j}) + \lambda_{t+j} + \mu_{t+j}\Big] = 0, \quad (4)$$

$$\frac{\partial \ell}{\partial E_{t+j}} = \beta^{t+j}\Big[-P^{Y}_{t+j}\phi'(E_{t+j}) - P^{E}_{t+j} - \mu_{t+j}\Big] = 0. \quad (5)$$

Rearranging Eq. (5), we obtain that the Lagrange multiplier μ_{t+j} must be equal to the marginal cost of external finance, or the marginal benefits of cash payouts. Replacing this expression in the first order condition (4), we get:

$$P^{I}_{t+j} + P^{E}_{t+j} + P^{Y}_{t+j}\psi'(I_{t+j}) + P^{Y}_{t+j}\phi'(E_{t+j}) = \lambda_{t+j}. \quad (6)$$

This result shows that the value of the capital (the shadow value of investment) equals the marginal industrial adjustment cost plus the marginal adjustment cost of external finance. Hayashi (1982) has shown that the marginal and average Tobin's q are equal when returns to scale are constant. When this is the case, the parameter λ_{t+j}, measuring the marginal increase in value of the stock of capital, becomes equal to the Tobin's q: $\frac{S_{t+j}+B_{t+j}}{K_{t+j}}$, where S_{t+j} and B_{t+j} measure, respectively, the value of equity and debt of the firm. Specifying the adjustment cost functions $\psi(I_t, K_t)$ and $\phi(E_t, K_t)$, it becomes possible to express Eq. (6) in terms of observable variables. In order to obtain the equality of the marginal and average Tobin's q, both these functions must be linearly homogeneous, respectively in investment and capital, and in external finance and capital.[5] The equality between marginal and average Tobin's q, nevertheless, implies some further conditions: product and factor markets must be competitive, financial markets must be efficient, and the book value of

[4] Since the first order condition for capital is not employed in our calculations, we do not report it.

[5] A widely used specification of such a function is $\psi(I_t, K_t) = \frac{\alpha}{2}(\frac{I_t}{K_t} - v)I_t$, as in Hubbard et al. (1995). Analogously, we define the adjustment cost function for external finance as $\phi(E_t, K_t) = \frac{\gamma}{2}(\frac{E_t}{K_t} - w)E_t$.

capital should be a correct measure of capital. Any violation of these assumptions would invalidate the model. The assumption that markets are competitive and returns to scale are constant defines the zero-rent economy described by Hall (2001), the environment that we choose. Hall's result suggest that the implausibly large adjustment costs found in the data are the result of large measurement errors in the true value of capital, since the book value does not properly reflect the value of intangible capital goods. We suggest instead another possibility, that information costs are reflected in stock prices because they are an independent cause of the slowness of the adjustment of the stock of capital. The introduction of information costs, in fact, does not imply a violation of the further assumption that markets are efficient.

When these conditions hold, the first derivatives of both functions are linear in the ratios $\frac{I_t}{K_t}$ and $\frac{E_t}{K_t}$. Eq. (6), therefore, becomes:

$$P^I_{t+j} + P^E_{t+j} + P^Y_{t+j}\alpha\frac{I_{t+j}}{K_{t+j}} + P^Y_{t+j}\gamma\frac{E_{t+j}}{K_{t+j}} + P^Y_{t+j}k = \lambda_{t+j}, \tag{7}$$

where k is a constant. From Eq. (7) we obtain the expression for the measure of the average Q that we are going to construct:

$$Qn_{t+j} = \frac{\lambda_{t+j} - P^I_{t+j} - P^E_{t+j}}{P^Y_{t+j}} = \frac{\frac{S_{t+j}+B_{t+j}}{K_{t+j}} - P^I_{t+j} - P^E_{t+j}}{P^Y_{t+j}} = \alpha\frac{I_{t+j}}{K_{t+j}} + \gamma\frac{E_{t+j}}{K_{t+j}} + k. \tag{8}$$

This is the standard expression showing the marginal return, as measured by Q_{t+j}, of the investment of a dollar in additional capital of the firm. We only obtain an extra term in external finance: the return of the investment flow $\frac{I_{t+j}}{K_{t+j}}$ is measured by Q_{t+j} minus the cost of finance. Alternatively, in order to maintain the standard definition of Q, another term must be added to the solution, reflecting the value of the ratio between the price of external finance and the price of output:

$$Q_{t+j} = \frac{\lambda_{t+j} - P^I_{t+j}}{P^Y_{t+j}} = \frac{\frac{S_{t+j}+B_{t+j}}{K_{t+j}} - P^I_{t+j}}{P^Y_{t+j}} = \alpha\frac{I_{t+j}}{K_{t+j}} + \gamma\frac{E_{t+j}}{K_{t+j}} + \delta\frac{P^E_{t+j}}{P^Y_{t+j}} + k. \tag{9}$$

It is important, though, to observe that this solution does not imply a unique causal relationship: external finance may act as a constraint for investment, so that the former expression can be solved for the investment ratio; but alternatively, the amount of external finance raised can be studied as the dependent variable. If information costs are relevant, Tobin's q may be both a theory of investment, or a theory of external finance:[6]

$$\frac{I_{t+j}}{K_{t+j}} = a_0 + a_1 Q_{t+j} + a_2 \frac{E_{t+j}}{K_{t+j}} + a_3 \frac{P^E_{t+j}}{P^Y_{t+j}} + \varepsilon_t. \tag{10}$$

or

$$\frac{E_{t+j}}{K_{t+j}} = b_0 + b_1 Q_{t+j} + b_2 \frac{I_{t+j}}{K_{t+j}} + b_3 \frac{P^E_{t+j}}{P^Y_{t+j}} + \eta_t. \tag{11}$$

2 Dataset and Estimation Technique

We employ a database which consists of quarterly aggregate data from 1973:03 to 2004:Q4 for the US economy. The data are taken from the Flow of Funds Accounts maintained by the Federal Reserve Board, and they regard all non-farm, non-financial corporations. The only exceptions are the deflator used to actualize all the data, the net value added used to calculate the marginal productivity of capital, and the value of nominal GDP that are taken from the NIPA dataset of the Bureau of Economic Analysis.

We study financial flows measuring their relevance in relation to the value of the capital stock, as suggested by our model. Furthermore, following Hall (2001), we have considered the value of both equity and debt in defining the Tobin's q. We have not followed Hall (2001) in calculating the market value of debt liabilities so that, in our measure of the Tobin's q, equity is calculated at market value while debt is calculated at book value. How-

[6] This model suggests the specification of all variables in terms of a ratio with respect to a measure of the book value of capital. Measuring financial flows, such as equity issuance, as a ratio with respect to market capitalization, as common practice, has a noteworthy impact, because of the noise introduced by the variability of stock prices. The model can easily be specialized, differentiating between equity and debt, to take into account different slopes of the cost functions. The story remains the same, the firm in this case equates at the margin benefits or costs of different liabilities.

ever, since we are not interested in market values *per se*, this does not represent a problem. Furthermore, we show in an Addendum available from the authors that using Hall's (2001) data with debt at market value the results do not change significantly.

We obtain a measure for real capital, following Hall's (2001) procedure, by capitalizing forward the value of aggregate investment minus depreciation.[7] We calculate the marginal productivity of capital using the net value added before investment spending, which provides an exact measure for the marginal productivity of capital (MPK), given our assumptions. The variable INFLOWS measures the sum of all financial flows, given by the change in net liabilities outstanding, minus dividends, plus equity issuance. All variables are deflated using the deflator for fixed investment. Since the same deflator was used to proxy the price for investment, P_t^I does not appear as independent variable in our estimations. We have chosen the Lehman Brothers Corporate Bond Index as our measure of the real price of external finance $\frac{P_t^E}{P_t^Y}$. We make the strong assumption that the average cost of external finance for companies in the US is proxied by the cost of bond finance. The data for issuance include proceeds from IPOs, capital increases, private placements and convertible bonds, and are taken from the Statistical Supplement to the Federal Reserve Bulletin.

We develop a preliminary analysis by means of three stage least squares system estimation, to analyze the contemporaneous relationships among the variables. We have then chosen to carry out the analysis of the dynamic properties of the model employing standard VAR techniques, in order to account for the possible endogeneity among the variables. A further advantage of the VAR technique is that it can produce valid estimates even thought some of the variables considered in the analysis are non-stationary, as long as the system as a whole remains stable.[8] This is a relevant feature of our analysis, as some of the variables

[7] Assuming an annual depreciation rate of 10 percent, corresponding to a quarterly rate of 2.5996 per cent. The initial value (that is virtually irrelevant) is taken from Robert E. Hall's dataset. See Hall's web page at http://www.stanford.edu/ rehall/.

[8] More specifically, Sims et al. (1990) have shown that in VAR models which contain both stationary and non stationary series, the coefficients of stationary regressors will have normal asymptotic distributions while those of integrated regressors will have non normal asymptotic distribution, and

considered are stationary (such as investment or the different variables measuring financial flows), while others (Qn_t and MPK_t, shown in Fig.8, are not. In line with Gonzalo and Pitarakis (2004), who have shown that for VAR models that include three or more variables the AIC becomes, by far, the best performing lag length criterion, we employ this criterion to determine the lag length of our VARs . Moreover, the lag length selected by the Likelihood Ratio turns out to be, in most cases, in line with the AIC. Throughout the paper all the impulse response functions are generated using the Generalized Impulses Procedure, as described in Pesaran and Shin (1997). [9]

Having both stationary and non-stationary variables, we estimate the VAR models without first-differencing the non-stationary variables. The inclusion in our models of these variable in levels does not affect the overall stability of our VAR models and the reliability of our estimations. In fact, testing for the stability of VAR models, we find that their eigenvalues are well inside the unit circle. Besides, analysis of the residuals originated by the estimated VAR models shows that they are stationary. This, in turn, confirms further on that the systems under analysis are indeed stable. However, when we proceed to the interpretation of the impulse-response functions and the Granger-causality tests, the issue of non-stationarity in some variables must be taken into account, insofar some standard inferential results cannot be applied. Conventional Granger-causality tests are, in fact, no longer valid when an I(1) variable is used as a regressor. In this situation though, Lutkepohl and Kratzig (2004) show that Granger-causality tests can be performed by estimating a VAR with an additional lag, and conducting a Wald test ignoring the last redundant lag.[10] The only problem with this procedure is that, because of the redundant parameters, it is not fully efficient. Nevertheless, given the length of our database, we have a large number of degrees of freedom, so that the lack of power of the tests should not be a

Granger causality tests with non standard limiting distributions (see also Hamilton (1994), Lütkepohl (1993) and Canova (2007)). The stability of the VAR, in turn, is evaluated by computing the associated eigenvalues and checking that they fall within the unit circle.

[9]Different procedures for the impulse responses, however, produce outcomes that are virtually identical.

[10]See also Dolado and Lutkepohl (1996).

problem. A further great advantage of the dataset we use is that it should be subject to very small measurement errors, since the flow of funds data cover the whole population of US firms. This is particularly relevant in Granger-causality analysis, since errors in variables generate spurious causality.[11]

We introduce two dummy variables for the quarters 1979:Q3 and 1980:Q1. In the first quarter the adoption of the new operating procedures by the FED under Paul Volker produced a sharp reduction of commercial paper issuance that was entirely reversed two quarters afterwards. Moreover, we introduce a seasonal dummy for the third quarter of the year that turns out to be always significant for all the variables, including issuance. We test for the introduction of a deterministic trend, and it turns out to be not significant. Finally, we control our model augmenting the VAR systems with growth in real GDP and oil prices, and five and ten-years term spreads. None of these variables, however, has any significant impact on our results.

3 Results

3.1 Contemporaneous regressions

After defining the variables cost of external finance $CEF_{t+j} = \frac{P^E_{t+j}}{P^Y_{t+j}}$ $INV_{t+j} = \frac{I_{t+j}}{K_{t+j}}$ $CEF_{t+j} = \frac{P^E_{t+j}}{P^Y_{t+j}}$, $INV_{t+j} = \frac{I_{t+j}}{K_{t+j}}$ and $INFLOWS_{t+j}$, measuring the amount of external finance $\frac{E_{t+j}}{K_{t+j}}$, including capital raised in the stock market, and the increase in debt liabilities, we estimate Eqs. (10) and (11) as a system.[12] The empirical estimates are reported in Table 1. The two regressions are initially estimated without any lagged dependent variables. Then, in order to account for lagged dependent variables which might become significant, the two regressions are supplemented with lags of order one, two, and so fourth. Following this procedure it can be shown that Eq. (10) includes lagged dependent variables up to the

[11] See Sargent (1987).

[12] From now on we drop the time subscript for ease of notation.

third lag, while Eq. (11) includes lagged dependent variables up to the fourth lag.[13] The inclusion of lagged endogenous variables has a twofold valence. First, to be consistent (under the null that the parameters a_i and b_i are zero for i=1,..,3) with their stationary nature, investment and sources of external finance are allowed to evolve as mean reverting AR stochastic processes. Second, lagged dependent variables can capture the effects of omitted factors. In fact, it is plausible to think that the variables included in the two regressions are not the only macroeconomic determinants. Moreover, this specification of the model should ensure residuals not serially correlated.[14]

In order to take into account the problems of the potential endogeneity between INV, INFLOWS and CEF, we make use the lag of CEF and the inflation rate as instruments and we estimate the system with a three-stage least squares estimator;[15][16] We find that the cost of external finance is not statistically significant in any of the two regressions. More importantly, the coefficient of Q is statistically significant at the 5% level when regressed on inflows, while in the regression on investment it is significant at the 10% level only; moreover, the value of this last coefficient (a_1) is extremely small.[17] The strongly significant impact of Q on investment that is normally found vanishes when the lagged values of the dependent variable are included in the regression.

We have so far assumed the exogeneity of Q in both equations, in line with the Tobin's q theory. Overall these results provide poor support for the theory, since it requires a strongly significant and large value of the coefficient a_1 for the values of the adjustment cost function to be plausible. Interestingly, investment has a significant *negative* impact on inflows.

[13] When lagged dependent variables of order higher than three and four are included, the empirical results show that these terms are not statistically significant.

[14] The Box-Ljiung Q statistics at lags, 4, 8 and 12 show that the residuals are not serially correlated.

[15] Regressing CEF on CEF(-1) and inflation, we find an R^2 of 0.90 and both coefficients are strongly significant.

[16] However, similar results are obtained when empirical estimates of the two regressions are worked out by means of standard OLS.

[17] In the OLS regression the coefficient a_1 is not statistically significant at any level. However, if the lagged values of investment are included in the regression, the value of a_1, although small, becomes very close to the values that are normally reported in the literature.

Table 1: 3SLS estimates of Eqs. (10) and (11).

$INV_t = a_0 + a_1 Q_t + a_2 CEF_t + a_3 INFLOWS_t + \sum_{i=1}^{3} a_{i+3} INV_{t-i} + \varepsilon_t$								
a_0	a_1	a_2	a_3	a_4	a_5	a_6		R^2
0.003	0.0004	0.0002	-1.2461	1.2105	0.0270	-0.3286		0.954
(3.605)	(1.798)	(0.360)	(-1.045)	(14.46)	(0.199)	(-4.008)		
$Q(4)^{\dagger} = 3.922$ (0.417) $Q(8)^{\dagger} = 7.918$ (0.441) $Q(12)^{\dagger} = 10.72$ (0.553) $W^{\flat} = 14.11$ (0.079)								
$INFLOWS_t = b_0 + b_1 Q_t + b_2 CEF_t + b_3 INV_t + \sum_{i=1}^{4} b_{i+3} INFLOWS_{t-i} + \eta_t$								
b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	R^2
0.000	0.00006	0.0001	-0.0066	0.259	-0.035	0.228	0.228	0.413
(1.110)	(2.367)	(1.388)	(-2.169)	(2.991)	(-0.411)	(2.598)	(2.638)	
$Q(4)^{\dagger} = 1.256$ (0.869) $Q(8)^{\dagger} = 8.884$ (0.352) $Q(12)^{\dagger} = 10.03$ (0.613) $W^{\flat} = 22.30$ (0.005)								

Notes: empirical estimates worked out for the period 1973:Q2-2004:Q4. T-statistics in parenthesis.
† Ljung-Box Q-statistics of standardized errors at lags 4, 8 and 12. ♭ White Heteroscedasticity test.
P-values in parenthesis. ‡ R^2 calculated as 1-(sum of squared error/sum of squares deviation).

These empirical results, however, must be interpreted with caution as there is evidence of non stationarity for two of the variables included in the analysis. More specifically, for both Q and CEF the null of non stationarity cannot be rejected at 5 percent significance level. Thus, we proceed in the analysis by making use of VARs. As already explained, VARs can account for non stationarity in some of the variables included. Moreover, by using the VAR framework the assumption that Q is exogenous can be relaxed.

3.2 VAR analysis

We carry out empirical estimates of the model given by Eq. (9). A more completed model to estimated would be the model given by Eq. (10). However, empirical estimates of Eq. (10) carried out by means of VAR are not feasible, as the inclusion of the variable CEF makes the VAR system not stable. Nevertheless, all our results are virtually unchanged if Q is used instead of Qn; Qn in fact, tracks Q very closely. The Granger-causality test of Table 2 highlights that the null that Qn does not Granger-cause INV or INFLOWS is rejected at standard significance levels in both cases, but the rejection is stronger in the case of INFLOWS, where the null hypothesis is rejected at the one percent level. On the

Table 2: Causality tests among Qn, INV and INFLOWS.

	Null hypothesis: $\gamma_{ij}(L) = 0$ for $i \neq j$		
	Qn	INV	INFLOWS
Qn	–	0.026	0.000
INV	0.004	–	0.522
INFLOWS	0.4850	0.960	–

Test for null hypothesis that $x_{1,t}$ does not Granger-cause $x_{2,t}$. The "dependent" variables $x_{2,t}$ are reported in the columns while the variables $x_{1,t}$ appear in the rows of the table. We indicate with $\gamma_{ij}(L) = 0$ for $i \neq j$ the null hypothesis that the coefficients of the lagged "dependent" variables are equal to zero. The test is a Wald test, we report the P-values, computed using the κ^2 distribution with 4 degrees of freedom. When the "dependent" variable is I(1), the Wald test is conducted on a regression including one extra lag.

contrary, we find no evidence that INFLOWS Granger-cause any of the other variables, while the null that INV does not Granger-causes Qn is strongly rejected. This set of results seems to confirm that the specification of the basic model is correct, and that, in particular, the adjustment cost on external finance is significantly different from zero, since otherwise no variables should Granger-cause INFLOWS. Thus the Tobin's q is a good theory of external finance. On the contrary, we find no evidence that external finance is a relevant constraint on investment. Fig. 1 shows the impulse response functions originated by this VAR that are statistically significant. As expected, the response of INV to Qn is positive and strongly significant. It is more surprising though that the response of investment is extremely slow, so that the response peaks only after two years. This explains why basic static models perform so badly. The immediate impact, in fact, is very small and not statistically significant. The response of INFLOWS to Qn shocks is very similar, although the impact is somewhat anticipated with respect to that on INV. Investment shocks produce a negative response on Qn that is marginally significant after three quarters, suggesting that the decline in the marginal productivity of capital due to the larger capital stock is

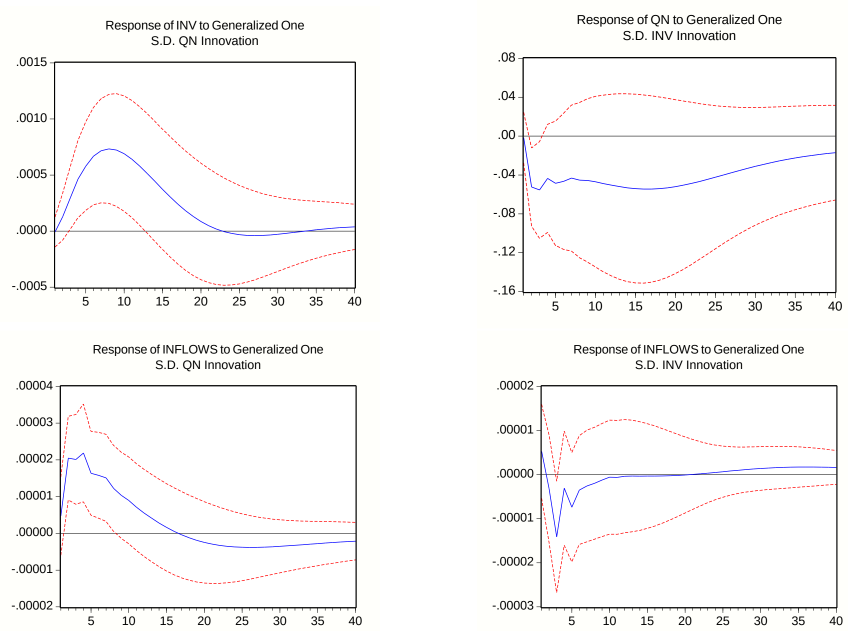

Figure 1: Impulse response functions of INFLOWS to a one-standard deviation shock on Qn and INV, and of INV to a one-standard deviation shock on Qn and vice-versa. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95 percent level.

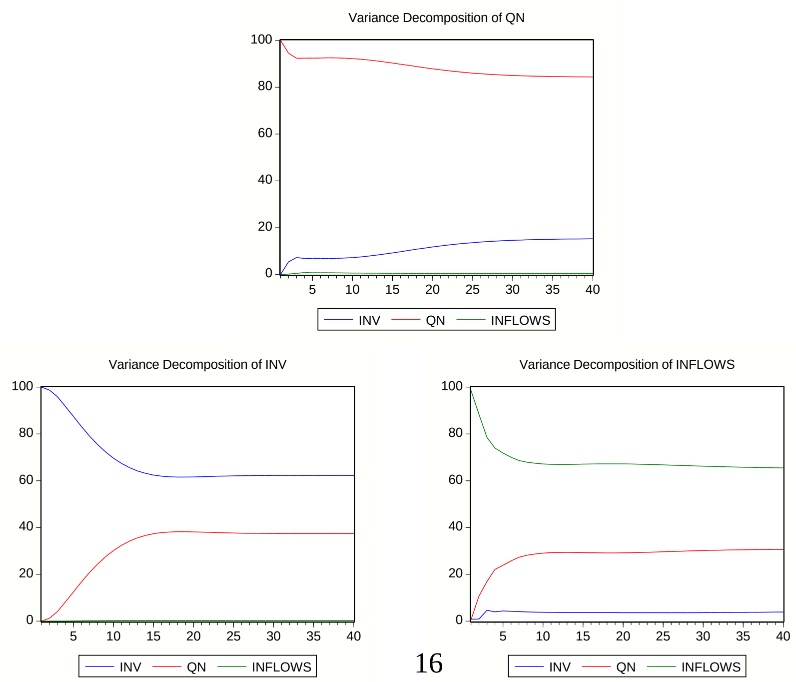

Figure 2: Forecast error variance decomposition of Qn, INV and INFLOWS at horizons up to ten years. The source of this forecast error is the variation in the current and future values of the innovations to each endogenous variable in the VAR. Vertical axis shows the percentage of the forecast variance due to each innovation, the sum adding up to 100. Cholesky ordering: Qn, INV, INFLOWS.

small and quickly reversed by productivity gains. Quites surprisingly, inflows respond negatively to investment shocks. This suggests that external finance not only does not constrain investment, but it does not even rise with investment. External finance is a lagged function of current and expected profitability of the stock of capital: larger flows of external finance follow higher current and expected profit margins.

Finally we decompose the variance of the three variables. It is important that the results are not affected at all by the ordering among the variables, suggesting that contemporaneous relationships do not play a relevant role. Qn innovations explain a large and statistically significant (i.e. 30.2 percent after 10 quarters and 37.4 percent after 40 quarters) share of the forecasting error variance of INV, and a statistically significant, and almost equally large (i.e. 29.1 percent after 10 quarters and 30.7 percent after 40 quarters) share of the forecasting error variance of INFLOWS. The forecasting error variance of Qn, on the contrary, is not significantly explained by the innovations of the other variables.

We now proceed to the estimation of a second VAR model, where instead of the variable INFLOWS, we specify two separate variables, the amount of finance raised by means of primary placements of shares (ISSUES) , and the change in the value of net debt liabilities (DDEBT) of the corporate non financial sector.[18] Fig. 3 shows, in fact, that ISSUES and DDEBT behave very differently. The two sources of finance are complementary (the correlation between the two series in our sample is, in fact, 0.21.) but DDEBT is much more volatile. Granger causality tests are reported in Table 3. This VAR suggests that primary placements of shares do not influence investment. The Granger causality tests of Table 3, the variance decomposition of Fig. 4, and the impulse response function of Fig. 5 show, in fact, that both equity issuance and changes in the stock of debt have no significant impact on aggregate investment.[19] These new results shed some light on the driving forces behind primary placements. Qn innovations explain a large (i.e. 60.72 percent after

[18]The lag length suggested by both the AIC and LR criterion for the VAR employed in this section is equal to 3.

[19]The impulse response function of INV to DDEBT shocks is not reported because it is never statistically significant.

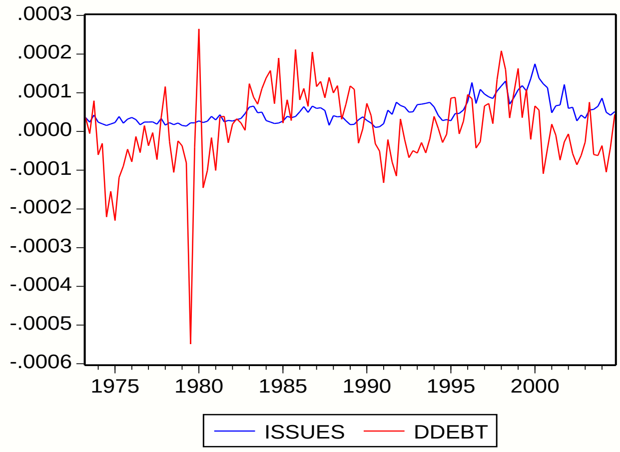

Figure 3: Time series plot of the variables ISSUES (gross issuance of stocks) and DDEBT (changes in the levels of debt) for the period 1970:Q1-2004:Q4.

10 periods and 63.3 percent after 40 periods) share of the forecasting error variance of ISSUES. Moreover, Qn Granger-causes ISSUES at standard significance levels. This confirms previous findings, as those of Welch (2004), that share issuance is strongly dependent on equity valuations. The new evidence that this analysis provides is that investment also affects equity issuance. The null that INV does not Granger-cause ISSUES is, in fact, soundly rejected. More surprising results emerge from the impulse response functions shown in Fig. 6. Positive Qn shocks have a strong positive impact on issuance, while positive investment shocks have a significant *negative* impact. Not only primary placements of shares are not employed to finance investment, but the impulse response functions suggest that investment reduces the issuance of shares, at least at the very short horizon, i.e. between the second and sixth quarter. These results imply that insiders issue shares when they judge that the market fully prices expected earnings, or, even better, when stock markets overprice the shares. This is in line with Pástor and Veronesi (2005) finding that IPOs are concentrated in waves. This happens because entrepreneurs choose the optimal timing for the IPOs, waiting for favorable market conditions such as low expected returns or high

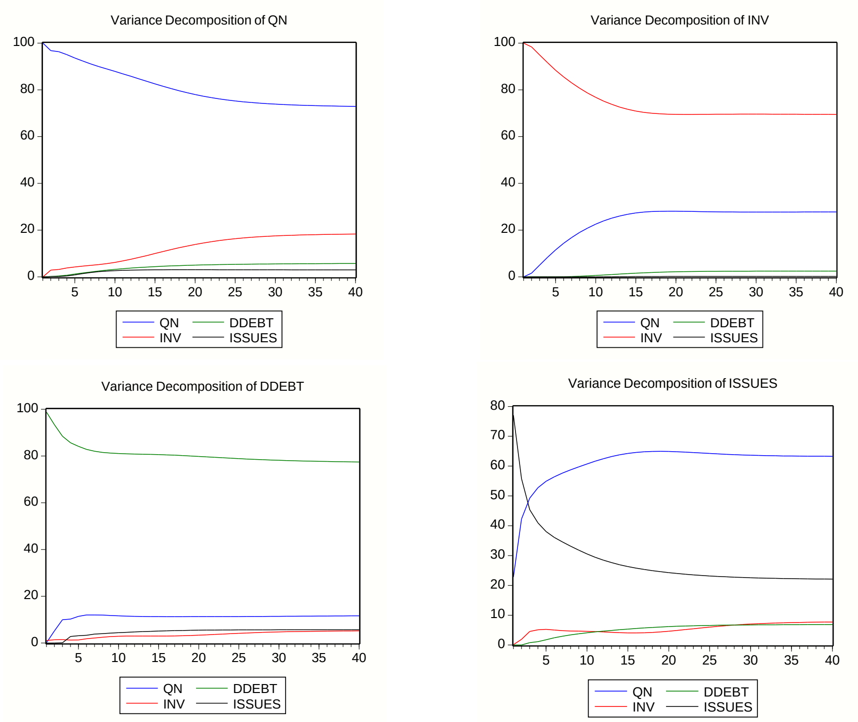

Figure 4: Forecast error variance decomposition of Qn, INV, ISSUES and DDEBT at horizons up to ten years. The source of this forecast error is the variation in the current and future values of the innovations to each endogenous variable in the VAR. Vertical axis shows the percentage of the forecast variance due to each innovation, the sum adding up to 100. Cholesky ordering: Qn, INV, DDEBT, ISSUES.

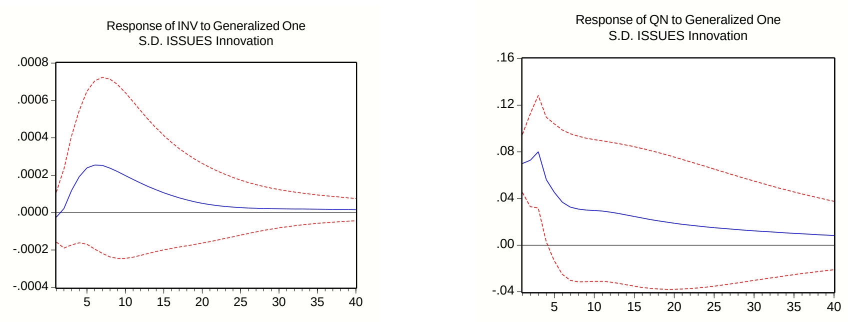

Figure 5: Impulse response of INV and Qn to a one-standard deviation shock on ISSUES. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95 percent level.

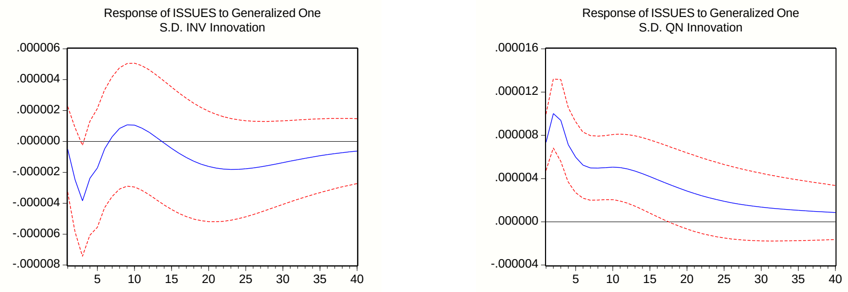

Figure 6: Impulse response of ISSUES to a one-standard deviation shock on INV and Qn. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95 percent level.

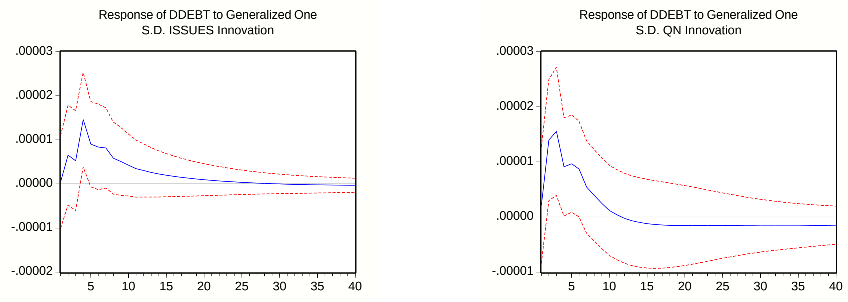

Figure 7: Impulse response of DDEBT to a one standard deviation shock on ISSUES and Qn. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95 percent level.

Table 3: Causality tests among Qn, INV, DDEBT and ISSUES

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

Test for null hypothesis that $x_{1,t}$ does not Granger-cause $x_{2,t}$. The "dependent" variables $x_{2,t}$ are reported in the columns while the variables $x_{1,t}$ appear in the rows of the table. We indicate with $\gamma_{ij}(L) = 0$ for $i \neq j$ the null hypothesis that the coefficients of the lagged "dependent" variables are equal to zero. The test is a Wald test, we report -values, computed using the κ^2 distribution with 4 degrees of freedom. When the "dependent" variable is I(1), the Wald test is conducted on a regression including one extra lag.

aggregate profitability, both implying high levels of Qn. Supporting empirical evidence is provided by Daniel and Titman (2006): they highlight that firms issuing shares substantially underperform the market during the following two years period. Lyandres et al. (2007) find strong evidence suggesting that the underperformance of issuers is due to the fact that issuers invest more than non-issuers. They thus interpret their results as supporting the implication of the Neoclassical Theory that investment reduces firm-level expected returns, because of decreasing marginal productivity, as shown by Cochrane (1991). In this light we interpret our second, more surprising result as suggesting that since the market anticipates that those firms that need to finance large investment will underperform, the *quantity* of cash that these firms raise in the market is lower the higher their investment needs. In other words, it will be easier to raise finance for those firms that need little additional investments and whose shares are accordingly priced at high price-earnings multiples. What we should expect is that, in general, firms are sold on the market at the end of the investment cycle, to reap the benefits of past successful investment. This is what our results highlight, and they follow closely those obtained by Pagano et al. (1998) on the market for IPOs in Italy.

Table 3 also shows that DDEBT is now Granger-caused by both Qn and ISSUES, while ISSUES are Granger-caused by Qn and INV. Moreover, the impulse response functions of Fig. 5 and Fig. 7 highlight that shocks on share issuance have a significant *positive* impact on both DDEBT and Qn. These results suggest that ISSUES and DDEBT are complements, and they both positively respond to shocks on Qn. Moreover, the impulse response function of Fig. 7 and the variance decomposition of Fig. 4 highlight that Qn shocks have strong positive impact on net debt issuance, explaining a large (14.2 % after 10 periods and 16.56 after 40 periods) and statistically significant share of its forecasting error variance. More surprisingly, even Qn responds to ISSUES shocks, even if this last variable explains a relatively modest share of the variance. Our hypothesis is that both variables react to the same underlying driving force, the profitability of firms. In this case ISSUES must rise when the stock market has an upward trend, as insiders try to anticipate the peak in stock market valuations, in line with the prediction of Pástor and Veronesi (2005) and Chemmanur and Fulghieri (1999).

3.3 Is the market a sideshow?

In order to evaluate to what extent current or future profitability drive investment and financial flows, in this section we replicate part of the analysis of the previous section, but making use of a different model of investment. In the reduced form that we have estimated in Eq.(8) we now substitute the value of current marginal productivity if capital (MPK) for that of Qn. This reduced form is easily obtained under a static investment model, assuming the presence of linearly additive convex (quadratic) costs on investment and external finance. Since we are studying aggregate investment, the convex costs can be considered as the consequence of the scarcity of the factors of production. In order to increase aggregate investment, resources previously devoted to other uses must be hired: this, in turn, results in higher input prices. Our aim is to isolate the role of current MPK from that of

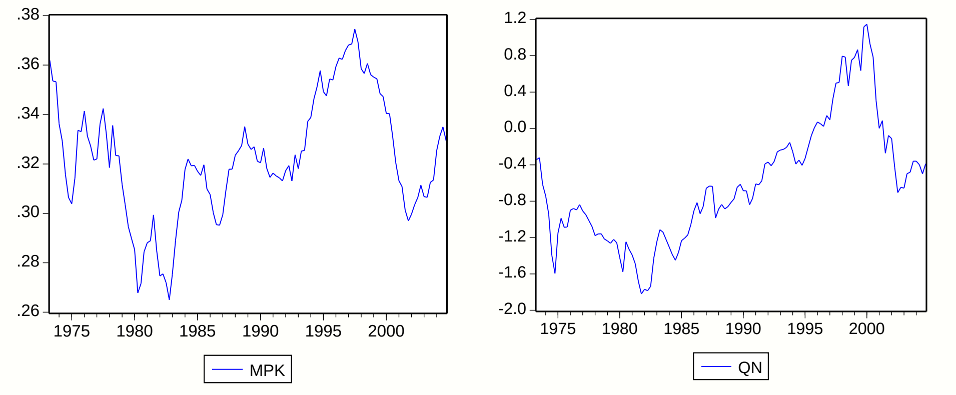

Figure 8: Values of marginal productivity of capital (MPK) and Qn for the period 1953:Q2-2004:Q4.

future values of MPK, as they are captured in the measure of Qn by the market value of firm liabilities. By studying the role of current MPK, we can thus understand whether the impact of Qn on investment and/or external finance is *not* driven by stock market valuations. Fig. 8, which depicts the stochastic properties of the two time series, shows that, except for the first five years, the series clearly co-move. We thus initially replicate the basic VAR analysis, replacing Qn with MPK , in order to isolate the impact of MPK from that of other components, stock prices in particular.[20] The Granger causality tests (not reported) produce results very similar to those of the baseline VAR, which includes Qn in place of MPK , the only difference being that there are even stronger rejections of the null hypotheses that MPK does not Granger-cause INV and vice versa. As the standard Neoclassical Theory suggests, bidirectional causality between the two variables occurs. Fig. 9 shows that investment shocks initially have a positive impact on MPK, while the response becomes negative and significant from the fifth quarter onward. MPK shocks have a strong and highly significant positive impact on investment that dies out only after more than 20 quarters. The variance decomposition of Fig. 10 shows that MPK explains a larger portion of the forecasting error variance of INV than Qn does. Likewise, INV explains a

[20]The lag length suggested by the AIC and LR criterion for the VAR employed in this section is equal to 4.

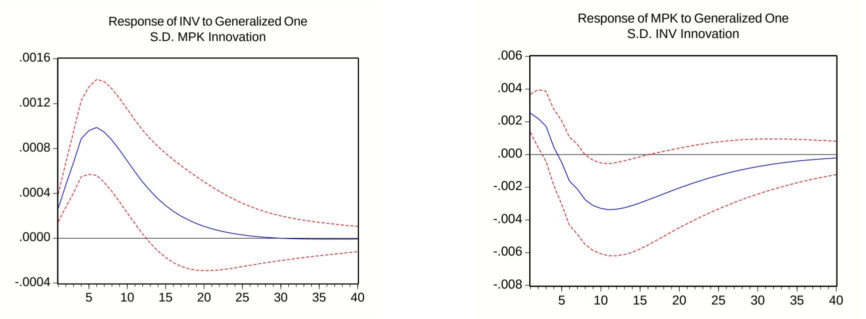

Figure 9: Impulse response functions of investment to MPK innovations and MPK to investment innovations. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95% level.

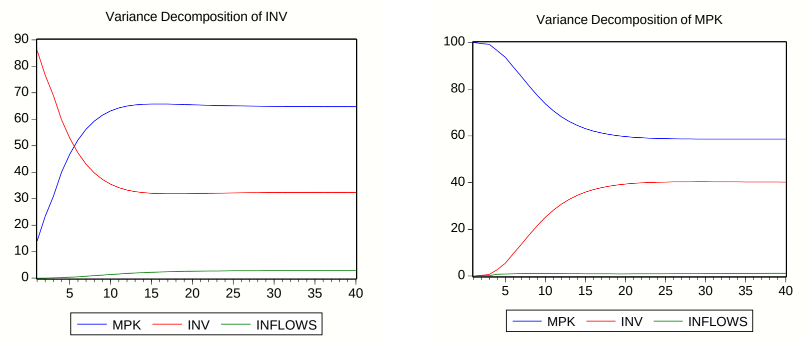

Figure 10: Forecast error variance decomposition of INV and MPK at horizons up to ten years. The source of this forecast error is the variation in the current and future values of the innovations to each endogenous variable in the VAR. Vertical axis shows the percentage of the forecast variance due to each innovation, the sum adding up to 100. Cholesky ordering: MPK, INV, INFLOWS.

larger portion of the forecasting error variance of MPK than Qn, confirming that MPK has a stronger positive impact on investment than Qn, and the impact of investment on MPK is much stronger than that on Qn.[21] More specifically, MPK innovations explain 63.2 percent of the forecasting error variance of INV after 10 periods and 64.8 percent after 40 periods, while INV innovations explain 35.5 percent after 10 periods and 32.42 percent after 40 periods, of the forecasting error variance of MPK.[22]

Once again, the forecasting variance of INFLOWS is not explained neither by investment nor by the marginal productivity of capital.[23] Moreover, consistently with the previous results, investment and INFLOWS turn out to be totally unrelated. These results suggest that the correlation between Qn and investment is, to a large extent, driven by the variability of current values of the marginal productivity of capital, rather than by its expected future values captured by stock market valuations.

Finally we estimate a VAR model which includes MPK, INV, DDEBT and ISSUES. Comparing the new Granger causality tests of Table 4 with those of Table 3 we can observe that the null that MPK does not Granger-cause INV is now soundly rejected, since the p-value is equal to 0.010.[24] This indicates that the impact of Qn on investment is largely driven by MPK, rather than by stock prices. The second striking difference between the two VARs regards ISSUES: while the null that Qn does not Granger-cause ISSUES is rejected at standard significance levels, the null that MPK does not Granger-cause ISSUES is never rejected. Moreover, the impulse response function of Fig. 11 confirms that the impact of MPK shocks on ISSUES is never significant at conventional significance levels. This suggests that gross equity issuance is driven by stock market valuations, rather than

[21] Also in this case, however, the inclusion in our VAR model of an I(1) variable does not impair the stability of the model itself. The eigenvalues of the system fall within the unit circle and the residuals turn out to be stationary. This time we have chosen to have MPK first in the Choleski decomposition, but even in this case the ordering chosen does not affect the results substantially.

[22] In the baseline VAR estimated in Section 3.2 Qn innovations explain 30.2 percent after 10 periods and 37.4 percent after 40 periods of the forecasting error variance of INV.

[23] To save space the relative diagram is not reported.

[24] Table 3 Highlights that the null that Qn does not Granger-cause INV is rejected only at 10 percent.

Table 4: Causality tests among MPK, INV, DDEBT and ISSUES

	Null hypothesis: $\gamma_{ij}(L) = 0$ for $i \neq j$			
	MPK	INV	DDEBT	ISSUES
MPK	–	0.0100	0.0001	0.8005
INV	0.0229	–	0.0467	0.0084
DDEBT	0.1124	0.7385	–	0.4732
ISSUES	0.1324	0.5069	0.6302	–

Test for null hypothesis that $x_{1,t}$ does not Granger-cause $x_{2,t}$. The ”dependent” variables $x_{2,t}$ are reported in the columns while the variables $x_{1,t}$ appear in the rows of the table. We indicate with $\gamma_{ij}(L) = 0$ for $i \neq j$ the null hypothesis that the coefficients of the lagged ”dependent” variables are equal to zero. The test is a Wald test, we report -values, computed using the κ^2 distribution with 4 degrees of freedom. When the ”dependent” variable is I(1), the Wald test is conducted on a regression including one extra lag.

by the current marginal productivity of capital. On the contrary, changes in the stock of debt are affected by the current period MPK . Fig. 11, in fact, shows that MPK shocks have a significant positive impact on DDEBT. Moreover, the null that MPK does not Granger-cause DDEBT is rejected at the 5 percent level, as it was the case for Qn. In the next section, though, we show that controlling for both Qn and MPK , the impact of MPK on DDEBT becomes insignificant. Overall these results confirm that stock market valuations drive share issuance, but have no relevant impact on investment.

3.4 Macroeconomic Determinants of External Finance

We now want to further inspect whether the actual driving force of external finance is the marginal productivity of capital or rather stock market valuations, or both. The issue is investigated by estimating a VAR model which includes Qn , MPK, DDEBTD and ISSUES .[25] By including both Qn and MPK in the analysis, we hope to capture the

[25]The lag length suggested by the AIC criterion for the VAR employed in this section is equal to 3. The LR criterion also supports this choice. Also in this case the inclusion of I(1) variables in

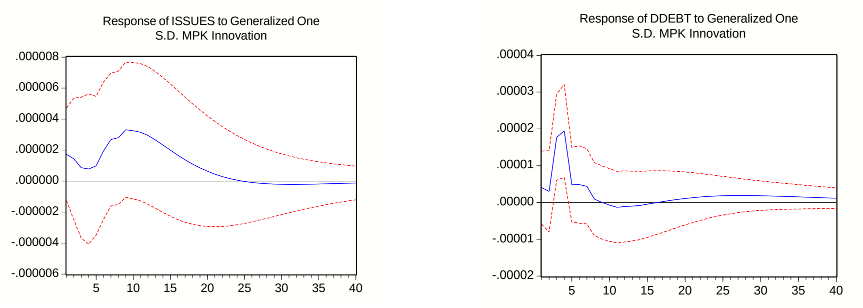

Figure 11: Impulse response functions of ISSUES and DDEBT to MPK innovations. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95 percent level.

impact of stock market valuations, after controlling for the effect of MPK. The Granger causality tests reported in Table 5 show that the null hypotheses that Qn does not Granger-cause MPK and external finance are soundly rejected at standard significance levels. On the other hand, MPK does not appear to Granger-cause neither Qn not ISSUES, while it appears to Granger-cause DDEBT at standard significance levels.

The variance decomposition set out in Fig. 12 shows that, as expected, Qn explains a large share of the forecasting error variance of MPK (respectively 65.58 percent and 62.01 percent after 10 and 40 quarters). Most importantly for our analysis, it also shows that the variance of external finance is largely explained by Qn , while the importance of MPK is negligible. This result is especially true for ISSUES, where Qn explains 62.27 percent and 66.42 percent of the forecasting error variance after, respectively, 10 and 40 quarters. With regard to DDEBT, Qn explains 19.75 percent and 22.21 percent of the forecasting error variance after 10 and 40 quarters, while the portion explained by MPK is, respectively, 4.43 and 5.59 percent. Moreover, as expected, none of the above variables

the VAR model does not affect the stability of the model. In fact, all the eigenvalues of the system fall within the unit circle. Notice that the ordering adopted for the Cholesky decomposition is Qn, MPK, DDEBTD and ISSUES. Moreover, autocorrelation functions as well as Lagrange Multiplier tests highlight weak presence of serial correlation in the residuals, suggesting that overall the model is well specified.

Table 5: Causality tests among Qn, MPK, DDEBT and ISSUES

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

Test for null hypothesis that $x_{1,t}$ does not Granger-cause $x_{2,t}$. The "dependent" variables $x_{2,t}$ are reported in the columns while the variables $x_{1,t}$ appear in the rows of the table. We indicate with $\gamma_{ij}(L) = 0$ for $i \neq j$ the null hypothesis that the coefficients of the lagged "dependent" variables are equal to zero. The test is a Wald test, we report P-values, computed using the κ^2 distribution with 4 degrees of freedom. When the "dependent" variable is I(1), the Wald test is conducted on a regression including one extra lag.

play a significant role in explaining the forecasting error variance of Qn. This, in turn, supports the view of the Tobin's q as a leading (forward looking) indicator. Overall, these results highlight that the driving force that affects external finance is given by stock market valuations, while the role reserved to the marginal productivity of capital turns out to be largely negligible. Such conclusion is also supported by the impulse-response functions reported in Fig. 13. In fact, positive shocks on Qn have positive and statistically significant impact on both the sources of external finance.[26] On the contrary, positive shocks on MPK appear to have negligible impact.[27]

[26] This, in turn, supports the conclusion that the two sources of external finance are complement.

[27] It can also be shown that shocks on Qn have positive and statistically significant impact on MPK. Such impulse response function is not reported to save space.

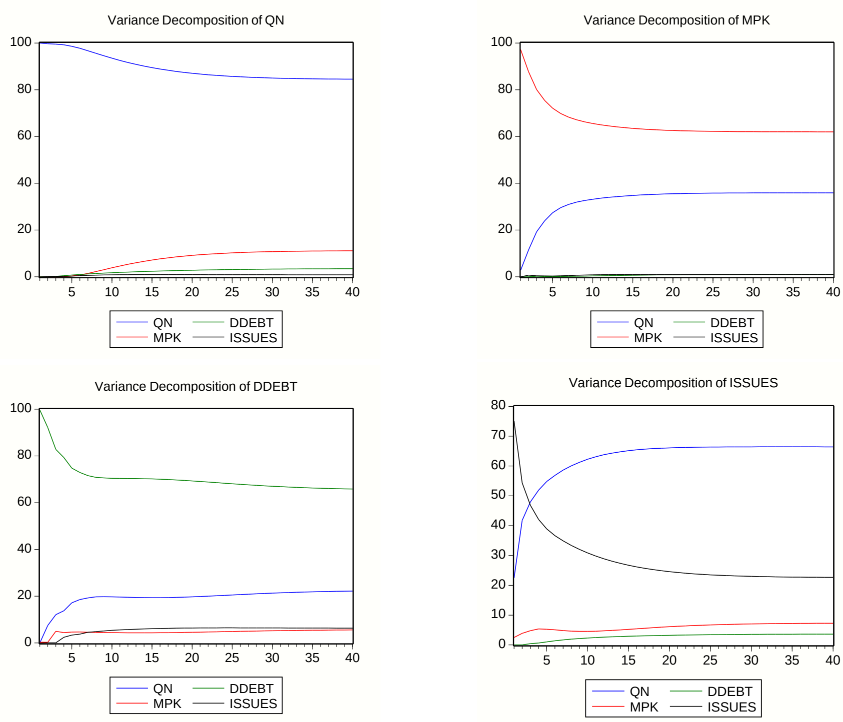

Figure 12: Forecast error variance decomposition of Qn, MPK, DDEBT, and ISSUES at horizons up to ten years. The source of this forecast error is the variation in the current and future values of the innovations to each endogenous variable in the VAR. Vertical axis shows the percentage of the forecast variance due to each innovation, the sum adding up to 100. Cholesky ordering: Qn, MPK, DDEBT, ISSUES.

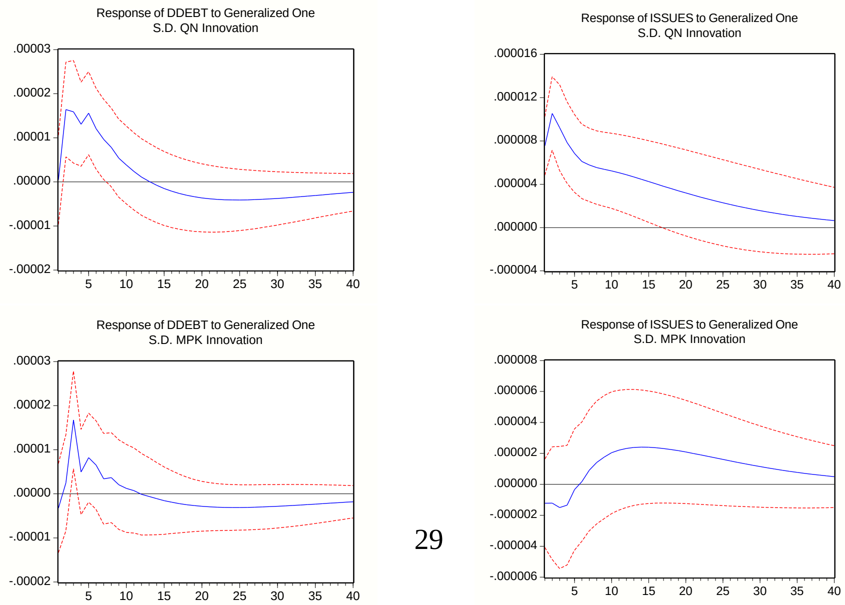

Figure 13: Impulse response functions of DDEBT and ISSUES to a one-standard deviation shock on Qn and MPK. Horizontal axis shows 10-years response horizon. The responses are generated by using the generalized impulse response procedure, confidence intervals shown are at the 95 percent level.

4 Conclusions

The basic result of our analysis is that the Tobin's q theory of investment is not empirically supported. A static neoclassical model of investment has a stronger empirical support. We find evidence, in fact, that the significance of the Tobin's q, when regressed on investment, is due to the marginal productivity of capital. On the contrary, the basic specification of the Tobin's q model provides a good model of external finance, as it is empirically supported and delivers results in line with the firm-level evidence. In particular, we find that the amount of resources raised issuing shares and debt by industrial corporations in the US has no significant impact on aggregate investment, as it should be the case if the availability of external finance represents a relevant constraint. These results are in line with Blanchard, Rhee, and Summers (1993), Chirinko and Schaller (1996), Fama and French (1999). More surprisingly, we also find that the amount of finance raised by means of primary placements depends only marginally on the needs to finance investment. In the case of shares, we even find that positive investment shocks cause a significant *negative* impact on issuance. Moreover, the issuance of shares is largely driven by stock market valuations, confirming the findings of Welch (2004). Issuance rises when the stock market has an upward trend, as managers that benefit from inside information try to anticipate the peak in stock market valuations. This is in line with the theory developed by Pástor and Veronesi (2005) suggesting that firms do not go public uniformly over time, but that rather IPOs tend to be concentrated in waves. We thus conjecture, in line with Pagano et al. (1998), that industrial firms issue shares in order to reap the benefits of successful past investments, when market prices match or exceed insiders' valuations.

Equally surprising, we find evidence that investment shocks have a negative impact on share issuance. Also in this case, our results complements those of the literature based on firm-level data. Lyandres et al. (2007), in particular, highlight that firms issuing stocks tend to invest more than the average, and suggest that the larger investment causes the poor returns that the shares of these firms normally experience during the two years following the issuance. Given the aggregate nature of our data, we do not find evidence that issuance affects investment, since the largest share of aggregate investment is originated by large established firms and it is mainly financed by means of retained earnings, as shown by Fama and French (1999). We interpret this result as evidence that the stock market rationally anticipates that the shares of those firms that need to finance large investment projects tend to underperform the rest of the market. Shares of firms of industrial sectors that require heavy capital investment, in fact, normally trade at much lower multiples with respect to fundamentals than those of other sectors. Since the need to finance investment is a drain on cash flows, firms in these industries have lower than average dividend payouts. As a consequence, firms that need to invest less in real capital (such as those of human capital intensive sectors) experience higher than average price-earning ratios, and the IPOs or seasoned equity offerings of these firms raise larger amounts of cash.

Finally, we also find that debt issuance is positively influenced by both the value of the Tobin's q and the current value of the productivity of capital. Debt issuance turns out to be strongly pro-cyclical and forward looking. Moreover debt issuance positively react to share issuance; equity issuance and changes in the level of debt are thus complements. We thus conjecture that the three variables react to the same underlying driving force, the expected profitability of firms.

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