

ARTICLES

BUSINESS INVESTMENT IN THE EURO AREA AND THE ROLE OF FIRMS' FINANCIAL POSITIONS



Investment is both a component of aggregate demand and a factor of aggregate supply. Thus, understanding its determinants is important for the assessment of macroeconomic developments. These determinants include financial factors such as cash flow, leverage, debt burden and the cost of financing. This article reviews the link between firms' financial positions and investment from macroeconomic and microeconomic perspectives. It shows that investment dynamics are largely explained by developments in economic activity; however, high cash flows and favourable financing conditions have persistently supported investment in recent years. Firm-level data reveal that firms with different financial positions tend to have different investment rates, indicating that investment is indeed affected by firms' financial positions.

I INTRODUCTION

Analysis of investment prospects plays a crucial role in the assessment of the economic outlook. First, investment, which accounts for around 20% of euro area GDP, is one of the main forces driving the business cycle, being almost three times more volatile than private consumption spending. Second, business investment increases the production capacity of the economy – and may increase future productivity if it is accompanied by an increase in the amount of capital per worker. Overall, it tends to support economic growth.

This article explores the link between financial factors and investment. In traditional investment models, the role played by these factors is fairly limited. For instance, in the neoclassical model, firms choose the level of capital that maximises the discounted value of all future income streams. While the outcome of the model is affected by the cost of financing, it is assumed to be independent of firms' financial positions. Hence, in this model, other financial factors such as a firm's cash flow, level of indebtedness or debt burden do not influence the cost of external financing (nor, as a result, investment).

In practice, this is an oversimplification. First, some firms may have limited access to external funds as a result of asymmetric information (the lender has less information than the firm about the quality of the investment project) or agency problems (the interests of the firm and the lender are not necessarily aligned). As a result, firms may be forced to rely to a large extent on internally generated funds as a source

of financing. Second, even firms with access to external funds are more likely to rely on cash flow as a source of finance, given that external funds imply additional costs such as administrative fees or potential bankruptcy costs.

The extent to which asymmetric information problems and agency and bankruptcy costs affect investment spending depends on the structure of a firm's balance sheet, which determines its creditworthiness. Higher debt servicing payments or higher leverage, as well as lower cash flow, have a negative impact on creditworthiness and hence, all else being equal, increase the external finance premium (the gap between the cost of funds raised externally and the return on internally generated funds) and, as a result, reduce firms' demand for loans.

This article focuses on the impact of such financial factors on corporate investment decisions in the euro area. The topic seems especially relevant in the light of the fact that recent events in financial markets have resulted in a repricing of risk, which has negatively affected external financing conditions. This follows a period in which non-financial corporations benefited from very favourable financing conditions, partly driven by an increased appetite for risk on the part of financial investors and the compression of spreads, and have substantially increased their levels of indebtedness. Consequently, attention has been brought to bear on the impact of financial factors on spending decisions.

The structure of this article is as follows. Section 2 presents recent developments in euro area investment. In Section 3, the role

of financial factors in explaining investment dynamics is addressed from a theoretical point of view. Section 4 presents empirical evidence based on macroeconomic and microeconomic data; it also includes some econometric results, which are detailed in two boxes. Finally, Section 5 concludes.

2 EURO AREA INVESTMENT FROM A CYCLICAL PERSPECTIVE

In this section, developments in euro area investment in the period from 1980 to the third quarter of 2007 are assessed from a cyclical perspective.¹

During this period, real investment in the euro area grew on average at roughly the same rate as real GDP, i.e. slightly above 2% per year (see Chart 1). As a result, the share of investment in GDP has remained unchanged over the long run, at slightly above 20%. This is in line with the standard growth literature which posits that output grows at the same rate as investment, so that investment is a constant fraction of output. However, in spite of this long-run stability, the investment-to-GDP ratio has fluctuated widely over the business cycle. In developed economies,

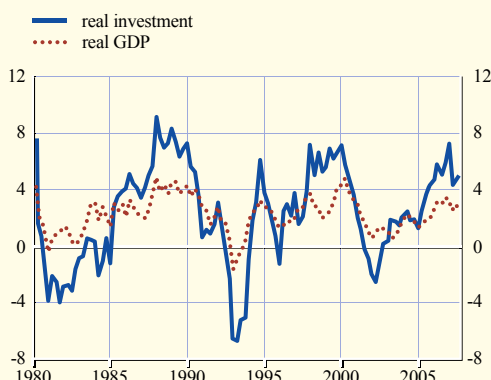
investment dynamics display a clear pro-cyclical pattern, accelerating more than overall economic activity at the beginning of a recovery and decelerating more during a slowdown. As a result of this phenomenon, which reflects what is termed the “demand accelerator”, the investment-to-GDP ratio is pro-cyclical. Accordingly, investment accounts for a large part of the volatility of GDP, being more volatile than private consumption with a standard deviation that is around three times higher.

Over the period under review, two cycles can be identified. The first one started in the mid-1980s – when investment began to recover from the recession that followed the “second oil shock” – and peaked at the beginning of the 1990s. The second one started in the mid-1990s and peaked at the beginning of the current century. These cycles are also discernible in the investment-to-GDP ratio (see Chart 2). In both cycles, the ratio experienced similar fluctuations and oscillated between 19% and 22%.

¹ For a broad description of trends in the last two decades, see the article entitled “Trends in euro area gross fixed capital formation” in the July 2003 issue of the Monthly Bulletin.

Chart 1 Investment and economic activity

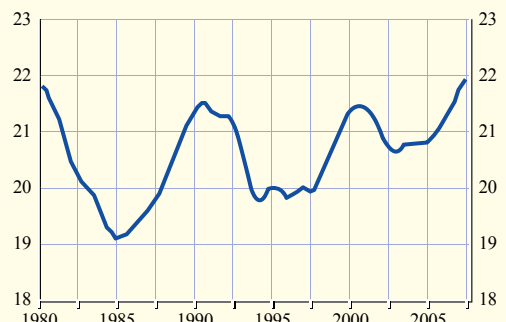
(annual percentage changes)



Source: ECB computation based on Eurostat data and the Area Wide Model (AWM) database.
Notes: The latest data refer to the third quarter of 2007. The AWM database is available at <http://www.eabcn.org/data/awm/index.htm>.

Chart 2 Share of real investment in real GDP

(four-quarter moving average; percentages)



Source: ECB computation based on Eurostat data and the AWM database.
Notes: The latest data refer to the third quarter of 2007. The AWM database is available at <http://www.eabcn.org/data/awm/index.htm>.

Thereafter, in the early part of the current decade, a deceleration in investment was observed. Investment started to pick up again in 2005 as the pace of economic activity accelerated, with real investment reaching an annual rate of growth of around 7% at the beginning of 2007. Over this period, movements in investment do not seem to have departed significantly from the pattern observed during previous recoveries, and the share of investment in GDP has developed broadly in line with its historical behaviour. The share of real investment is now above the value reached at the two previous peaks and around the peak recorded at the beginning of the 1980s.

In terms of institutional sectors, both the household sector (which also includes small businesses) and the non-financial corporations sector have contributed to the recent acceleration in investment.² Since 2000 the non-financial corporations sector has accounted for slightly more than half of the increase in euro area investment and the household sector for one-third. The rest has been accounted for

by the public sector and, to a lesser extent, by the financial sector (see Chart 3).

The relationship between investment and economic activity, together with the relationship between investment and the cost of capital, is the basis for standard investment models. The following sections explore the role of financial factors.

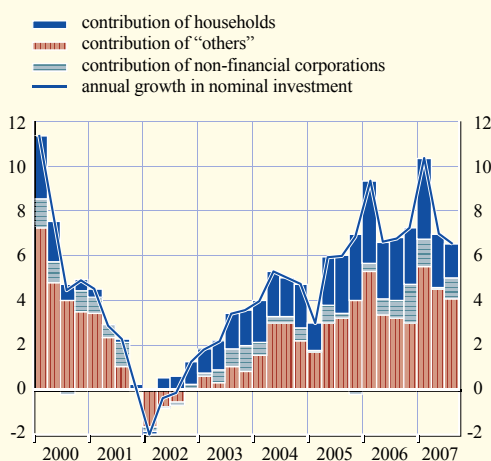
3 THE IMPACT OF FINANCIAL FACTORS ON INVESTMENT FROM A THEORETICAL PERSPECTIVE

The neoclassical theory has provided the basis for a large part of the research in the field of investment. In the neoclassical model, a firm chooses a level for its stock of capital that maximises the present value of all future net profits. This results in a relationship between the level of capital stock, the level of output and the user cost of capital. The latter represents the cost of using the assets during a period. It depends on the purchase price of new capital relative to the output prices, on the financing costs and on the depreciation rate of the capital stock.

The empirical results of the approach based on the neoclassical theory have not been entirely satisfactory. Investment is generally found to be responsive to output but less responsive than theory would suggest to the user cost of capital.³ Instead, other factors, such as cash flow, seem to explain a large part of investment movements. One avenue that has proved to be useful in explaining investment dynamics is to consider other financial factors in addition to the user cost of capital.

Chart 3 Contribution of institutional sectors to nominal investment growth

(percentage point contributions; annual percentage changes)



Source: ECB computation based on euro area integrated accounts.

Note: The latest data refer to the third quarter of 2007. "Others" includes the public sector and the financial sector.

2 As defined in the national accounts data, the household sector comprises all households, as consumers of goods and services, as well as resident unincorporated enterprises, which comprise sole proprietorships and most partnerships that do not have an independent legal status. The non-financial corporations sector comprises all private and public corporate enterprises that produce goods and non-financial services.

3 See Chirinko, R. (1993), "Business Fixed Investment Spending: Modeling Strategies, Empirical Results, and Policy Implications", *Journal of Economic Literature*, vol. 31(4), pp. 1875-1911.

Financial factors have generally been introduced in standard investment models in the form of information asymmetries or agency costs. As has been extensively argued, financial market imperfections, such as information asymmetries or the limited enforceability of contracts, can result in divergences between the cost of funds raised externally and the return on internally generated earnings. As a result, the investment spending of firms that face a larger gap between the cost of internal and external funds is expected to be more sensitive to cash flow.

The extent to which asymmetric information problems and agency and bankruptcy costs affect investment spending depends on the structure of a firm's balance sheet. Accordingly, the structure of a firm's balance sheet influences its investment decisions.⁴ For example, higher cash flow or net worth can reduce the cost of external funds by lowering the external finance premium. The impact of changes in cash flow may be greater for highly leveraged firms (or firms with high debt servicing obligations relative to the cash flow that they generate) than for firms with lower leverage. As a result, the investment spending of highly leveraged firms may be more sensitive to changes in cash flow.

Finally, it is also worth mentioning that the external finance premium required by lenders also depends in practice on other factors (such as their appetite for risk), which, in turn, are linked to the financial factors mentioned above.

4 EMPIRICAL EVIDENCE CONCERNING THE EFFECT OF FINANCIAL FACTORS ON EURO AREA INVESTMENT

This section focuses on the role played by the cost of financing, indebtedness, debt burden and cash flow in determining the level of euro area investment. An investigation is first carried out using macroeconomic data from quarterly national and euro area accounts.⁵ The analysis also incorporates firm-level data,

which are derived from the AMADEUS database of Bureau van Dijk Electronic Publishing. The sample used consists of around 120,000 firms in six euro area countries (Belgium, Germany, Spain, Italy and the Netherlands for the period 1997-2005, and France for the period 1998-2005).⁶

The availability of microdata allows for an investigation of heterogeneity in the behaviour of different types of firm that would be impossible using only aggregate data. In particular, with firm-level data it is possible to analyse differences in investment rates across firms facing different degrees of financial pressure. In this respect, there is evidence that firms in more fragile financial positions make different investment decisions from those in better financial health when facing changes in financial pressure.⁷ Hence, a micro analysis is useful in order to make a proper assessment of the financial situation of non-financial corporations for macroeconomic policy purposes, since the financial fragility of certain firms may be compensated for by the soundness of others using aggregate data.

THE REAL COST OF FINANCING

A key financial factor affecting investment is the cost of financing, which determines the user cost of capital and, hence, the rate of return needed

4 See "Corporate finance in the euro area" (2007), ECB Occasional Paper No 63, for a review of studies on the impact of financing constraints on investment.

5 National accounts data enable us to focus on non-construction investment, which accounts for most corporate investment, while euro area accounts provide information on all investment by non-financial corporations. These sources do not provide a decomposition of investment by both type of capital goods (construction and non-construction, for example) and sector (the household and non-financial corporations sectors, for example).

6 At the firm level, no breakdown between construction and non-construction investment is available. It is important to bear in mind that, owing to differences between the macro and firm-level datasets, as well as the incompleteness of the latter dataset, the firm-level data cannot simply be aggregated in order to derive aggregate euro area investment data.

7 See Hernando, I. and C. Martínez-Carrascal (2008), "The impact of financial variables on firms' real decisions: Evidence from Spanish firm-level data", *Journal of Macroeconomics*, vol. 30, pp. 543-561.

from an investment project in order for it to be profitable. As mentioned above, the user cost of capital is determined by the financial cost of capital (the weighted cost of alternative sources of finance, i.e. equity and debt), as well as its depreciation rate and the price of capital goods relative to output prices.

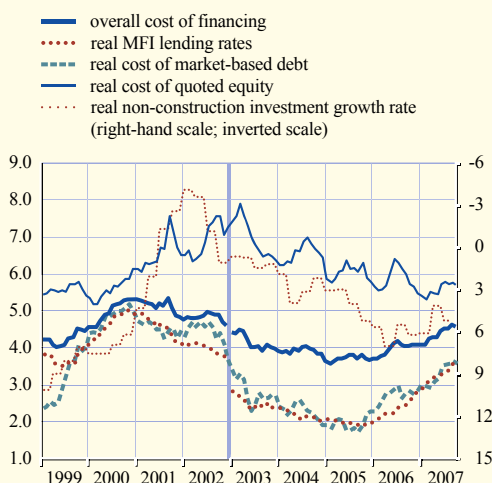
Focusing on the financial cost component of the user cost of capital, the real cost of financing may be proxied by the long-term interest rate deflated by a measure of cost inflation, with the addition of depreciation and risk premium terms. However, in some circumstances, this simplified approach may miss important explanatory factors and an analysis based on a composite cost of financing might give better insight.

Indeed, while corporate investment in the euro area is primarily financed internally by firms, it also relies on external financing – mainly through loans, debt securities and equities. Although the various measures of the cost of capital co-move, they also exhibit different short-term patterns and different volatilities. As shown in Chart 4, there can be marked differences in the cost of capital depending on the source of financing. The overall cost of financing – which includes the costs of bank lending, debt securities and equity, according to the extent to which they are used by firms for financing – may prove a better measure of the cost of capital than market interest rates for two reasons. First, it takes into account the cost of each type of financing. Second, it takes into consideration the evolution of the share of each component in firms' financing.

Chart 4 shows that investment growth rates and financing costs have both tended to decrease during most of the current decade, but started to increase from 2006. Hence, it is not possible to infer a negative relationship between these two variables from the chart. This fact seems to indicate that other factors, such as GDP growth, have tended to more than offset interest rate effects on investment. Other financial factors, such as profit developments or balance sheet

Chart 4 Investment and the real cost of financing of euro area non-financial corporations

(percentages per annum; annual percentage changes)



Sources: ECB, Eurostat, Thomson Financial Datastream, Merrill Lynch and Consensus Economics Forecasts.

Notes: The real cost of financing for non-financial corporations is calculated as a weighted average of the cost of bank lending, debt securities and equity, based on the outstanding amounts of each component, deflated by inflation expectations (see Box 4 in the March 2005 issue of the Monthly Bulletin). The introduction of harmonised lending rates of MFIs at the beginning of 2003 (marked by a vertical line in the chart) led to a break in the statistical series.

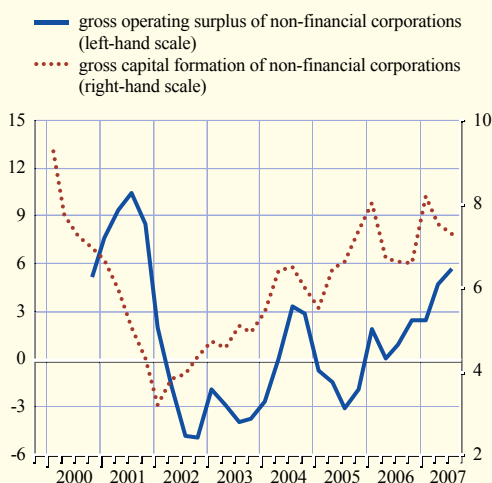
restructuring, may have also contributed to counterbalancing the impact of recent trends in financing costs on investment.

INTERNAL FINANCING AND THE ROLE OF PROFITS

As can be seen in Chart 5, there is a strong co-movement between investment and a profit indicator, namely the gross operating surplus. At the beginning of 2000 a marked deceleration in the growth of investment by non-financial corporations occurred, together with a deceleration in the growth of their gross operating surpluses; more recently, there has been an acceleration in the growth of investment by non-financial corporations, accompanied by an acceleration in the growth of their gross operating surpluses, which rose from around 3% year on year in 2005 to above 6% in the third quarter of 2007. However, to some extent these co-movements may reflect a correlation due to common determinants, rather than causality.

Chart 5 Internal financing and investment of non-financial corporations

(annual percentage changes)

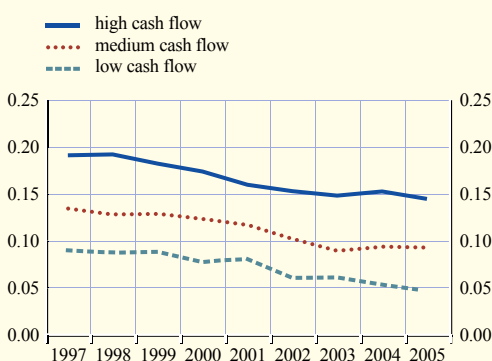


Source: ECB computation based on euro area integrated accounts.
Note: The latest data refer to the third quarter of 2007.

The relationship between internally generated funds and investment is also clear from firm-level data. Chart 6 presents the euro area weighted mean of the median investment rates in Belgium, Germany, Spain, France, Italy and

Chart 6 Investment rates for firms with different cash flow levels

(euro area weighted average of country median investment rates)



Sources: Bureau van Dijk Electronic Publishing and ECB calculations.

Notes: The investment rate is defined as the ratio of gross fixed capital formation to capital stock, while cash flow is defined as the ratio of cash flow to total assets. The lines present the euro area weighted mean (according to the shares of euro area gross fixed capital formation of Belgium, Germany, Spain, France, Italy and the Netherlands) of the median investment rate for firms with a high cash flow (above the 90th percentile), medium cash flow (between the 45th and 55th percentiles) and low cash flow (lowest decile).

the Netherlands for firms with a high cash flow-to-assets ratio (above the 90th percentile), a medium ratio (between the 45th and 55th percentiles) and a low ratio (lowest decile).⁸ As can be seen, there is a clear relationship between the availability of internal funds and firms' capital demand, since firms with a higher ratio of cash flow to assets have higher investment rates.⁹

EXTERNAL FINANCING AND INDEBTEDNESS

The financing gap can be defined as the ratio of investment less gross operating surplus to investment. It indicates the extent to which firms require external funds to finance investment and, hence, a high ratio is expected to exert a dampening effect on investment.¹⁰ The econometric results reported in Box 1 illustrate that an increase in the size of this gap has a negative impact on fixed capital investment, once other investment determinants are controlled for. The intensity of the relationship may, however, be limited for various reasons. For instance, profits or external funds may be used for other purposes, such as financial investment or internal restructuring. Indeed, between the late 1990s and early 2000s firms in the euro area increased their liabilities (and their indebtedness) not only to finance the expansion

8 The euro area weighted mean is calculated using as weights the shares of each country in aggregate gross capital formation by non-financial corporations in all six countries, on the basis of national accounts data. The average patterns presented in Charts 6, 8 and 9 mask some variability observed at the country level, where the same relationship between financial ratios and investment rates applies (see Martínez-Carrascal, C. and A. Ferrando (2007), "The impact of firms' financial positions on investment decisions: an analysis with firm-level data", at http://www.ecb.europa.eu/events/conferences/html/ws_eccbsd.en.html).

9 This positive relationship is not, per se, evidence of the existence of financing constraints: if current cash flow is correlated with future profitability, the positive relationship between the two variables could simply reflect an improvement in business prospects. See, for example, Fazzari, S.M., R.G. Hubbard and B.C. Petersen (1988), "Financing constraints and corporate investment", *Brookings Papers on Economic Policy*, pp.141-206.

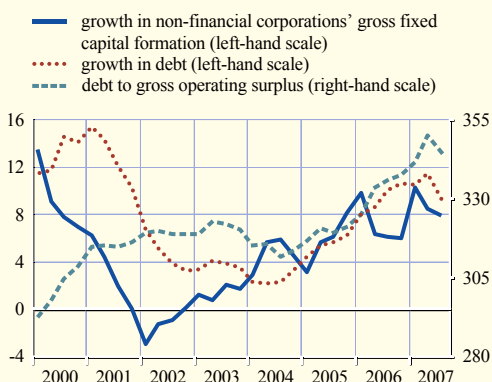
10 The retained earnings of non-financial corporations would be a better proxy than the total gross operating surplus of the economy. However, data on retained earnings are only available in the euro area integrated accounts (hence, from 1999).

of fixed capital investment, but also to carry out mergers and acquisitions. In this period firms' indebtedness – relative to their gross operating surpluses – rose rapidly. Thereafter, and especially in 2002, corporate balance sheet restructuring, including a reduction in debt in many sectors, probably contributed to dampening fixed capital investment. Since early 2005 the growth rate of both debt and investment have accelerated (see Chart 7).

The dampening effect that indebtedness may have on investment may be better captured at the firm level. Firm-level data indicate that highly leveraged firms have the lowest investment rates, which may point towards a negative relationship between leverage and investment

Chart 7 Gross indebtedness, debt flows and investment of non-financial corporations

(annual percentage changes; percentages)



Source: ECB computation based on euro area integrated accounts. Note: The latest data refer to the third quarter of 2007.

Box I

QUANTIFYING THE IMPACT OF FINANCIAL FACTORS ON INVESTMENT USING A MACROECONOMIC APPROACH

This box considers in detail whether a study of financial factors may improve the understanding of investment dynamics. An equation for non-construction investment is estimated and used as the basis for a contribution analysis.

A standard specification of the production function is used to derive an equation in which investment is a function of economic activity and the real cost of capital. In this approach, the desired level of capital stock is related to the level of output and (expected) relative factor prices, and firms choose an investment level that allows the capital stock to converge to its desired level. In the long run, the capital-to-output ratio remains stable and, hence, the investment flow is such that it not only covers the depreciation of the capital stock but also ensures that it grows at the same rate as the trend increase in output.¹ Accordingly, investment dynamics depend on an error correction term, which is based on the co-integrating (or long-run equilibrium) relationship between investment and overall economic activity. In addition to the error correction term, the equation incorporates as explanatory variables demand factors (proxied by the growth of real GDP excluding investment), a measure of the cost of capital (which takes into account both the cost of equity and the cost of lending) and the financing gap. The following reduced form is estimated:

$$\Delta \log(I_t) = \alpha_1 + \alpha_2 \cdot \log\left(\frac{I_{t-1}}{Y_{t-1}}\right) + \alpha_3 \cdot OCF_{t-1} + \alpha_4 \cdot \Delta \log(YWI_{t-1}) + \alpha_5 \cdot \frac{FG_{t-1}}{FG_{t-5}} + \alpha_7 \cdot D_{9293}$$

¹ For a discussion of the standard approach to model investment, see Baumann, U. and S. Price (2007), "Understanding investment better: insights from recent research", Bank of England Quarterly Bulletin. For an estimation at the euro area level, see Fagan, G., J. Henry and R. Mestre (2001), "An area-wide model for the euro area", ECB Working Paper No 42.

Relationship between investment and financial factors

$\log(I(-1)/Y(-1))$	OCF (-1)	$\Delta\log(YWI(-1))$	FG(-1)/FG(-5)	D_{9293}
-0.11 [0.03]	-0.91 [0.18]	0.92 [0.32]	-0.07 [0.02]	-0.02 [0.00]
R squared (%)	69.4			
residual standard error	0.9			

Source: ECB computations.

Note: The estimation is based on data covering the period from the first quarter of 1991 to the second quarter of 2007.

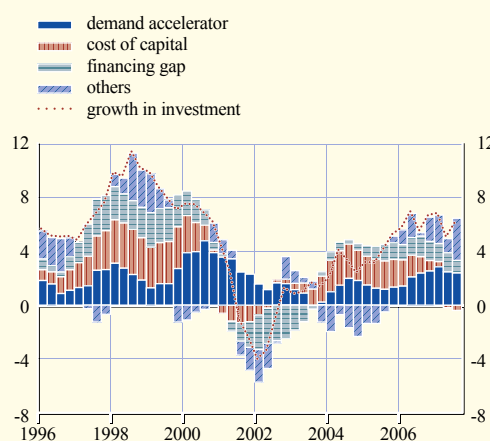
where I stands for real non-construction investment, Y is real GDP, YWI stands for real GDP excluding investment, OCF is the real overall cost of financing, FG is the financing gap, and D is an intervention variable.² An increase in economic activity is expected to have a positive impact on investment, while an increase in the cost of capital or in the financing gap is expected to exert negative pressure.

As can be seen from the table, the equation explains a large proportion of the movements in non-construction investment (69%), and all the coefficients have the expected sign and are highly significant. The expected long-run relationship between investment and economic activity appears to be statistically significant. With an error correction of around 11% per quarter, the half-life of a deviation from the long-term equilibrium is close to one year. The elasticity of investment to the cost of capital is negative and close to one, so that the hypothesis of a Cobb-Douglas production function, which would imply a unit elasticity, does not seem to be rejected by the data. Finally, the two financial variables considered (financing costs and the financing gap) enter negatively and significantly in the equation.

The estimated equation can be used to compute the contributions of the exogenous variables to non-construction investment growth (see the chart).³ Over the estimation period, a large part of the investment dynamics is explained by changes in economic activity (the demand accelerator effect). Financial factors also contribute substantially to investment dynamics. This is clearly evident at the end of the 1990s. It is also interesting to note that since 2004 these factors have contributed positively, and in mid-2007 continued to account for around 1 percentage point of the annual growth of non-construction investment. Focusing on the synthetic measure of the cost of capital, it appears that financing conditions were persistently supportive from mid-2003 until the beginning

Contributions to non-construction investment growth³

(annual percentage changes; percentage point contributions)



Source: ECB computations.

Notes: Computed on the basis of the equation estimated from the first quarter of 1991 to the second quarter of 2007. The component labelled "others" merges the intervention variable, the residuals and the lasting impact of initial conditions.

- The financing gap is defined as the difference between nominal investment and gross operating surplus divided by nominal investment. Data used in the estimation are computed on the basis of Eurostat national accounts data. The intervention variable takes the value 1 between the first quarter of 1992 and the third quarter of 1993, and zero otherwise.
- The contribution of a determinant is obtained as the difference between the simulated growth in investment when all the determinants follow their historical paths and the simulations obtained when keeping the determinant in question unchanged and using the historical paths for all the other determinants.

of 2007. However, as monetary policy rates rose, financing conditions became progressively less supportive in the period from the beginning of 2006. More recently, the contribution of the cost of capital has become close to zero.

The chart also highlights the poor performance of the equation on some occasions, such as during the latest downturn where a considerable share of actual developments is accounted for by large negative residuals. This may reflect specific factors, for example the balance sheet restructuring that occurred around 2002.

(see Chart 8, which depicts the euro area weighted mean of the median investment rates in Belgium, Germany, Spain, France, Italy and the Netherlands for firms facing different degrees of indebtedness). However, firms with medium leverage levels show similar (in fact, slightly higher) investment levels to less indebted firms. Hence, the relationship between the two variables does not appear to be clear at a merely descriptive level.

Together with indebtedness, the amount of funds devoted to debt repayments out of internally generated funds determines the level of financial pressure faced by firms and, hence, the external finance premium. As a result, a negative relationship between investment rates and the debt burden may exist.

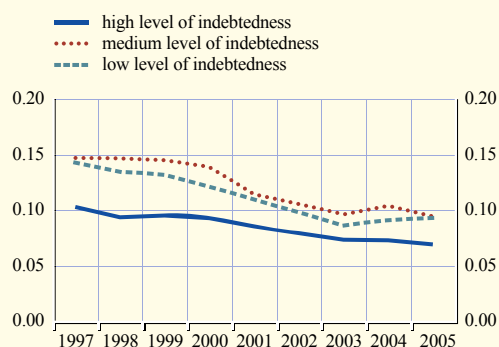
Chart 9 compares the investment rates for three groups of firms with high, medium and low debt

burdens. The debt burden is defined as the ratio of interest payments to gross operating surplus plus financial revenue. A clear negative relationship between investment and the debt burden emerges, as firms with a higher debt burden have substantially lower investment rates.

This section has discussed the main channels through which financial factors may affect corporate investment. It has shown that the level of internal funds seems to affect the level of investment. A relationship between the latter and balance sheet indicators has also been found. The econometric analysis presented in Box 2 supports the evidence of a negative relationship between financial pressure and firms' investment. This analysis, carried out at the country level, broadly confirms the descriptive results and sheds light on the different behaviours of firms across countries.

Chart 8 Investment rates for firms with different indebtedness levels

(euro area weighted averages of country median investment rates)

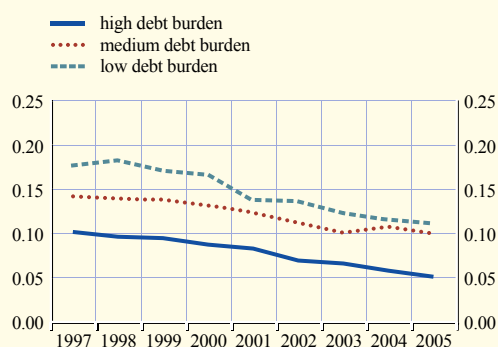


Sources: Bureau van Dijk Electronic Publishing and ECB calculations.

Notes: Indebtedness is the ratio of net debt (debt, including trade credit, minus cash and cash equivalents) to total assets. For details on the euro area weighted mean, see the notes to Chart 6.

Chart 9 Investment rates for firms with different debt burden levels

(euro area weighted averages of country median investment rates)



Sources: Bureau van Dijk Electronic Publishing and ECB calculations.

Notes: Debt burden is the ratio of interest payments to gross surplus plus financial revenue. For details on the euro area weighted mean, see the notes to Chart 6.

Box 2

QUANTIFYING THE IMPACT OF FINANCIAL FACTORS ON INVESTMENT USING A MICROECONOMIC APPROACH

The econometric investigation presented in this box aims to examine the responsiveness of fixed capital investment to changes in the financial pressure faced by a firm, which is proxied by means of three financial variables: cash flow, indebtedness and debt burden. The equation to be estimated is:

$$\left(\frac{I_{it}}{K_{it-1}}\right) = \beta_1 \left(\frac{I_{it-1}}{K_{it-2}}\right) + \beta_2 \Delta \ln Y_{it} + \beta_3 \Delta \ln Y_{it-1} + \beta_4 (\ln K_{it-2} - \ln Y_{it-2}) + \gamma X_{it-1} + \alpha_i + \theta_t + S_i + \varepsilon_{it}$$

where i indexes firms $i=1,2,\dots,N$ and t indexes years from 1 to T . Δ denotes a first difference, I/K is the investment rate, Y is real sales, K is real fixed capital stock, and X represents a financial pressure indicator (cash flow, indebtedness or debt burden). α_i is firm-specific fixed effects, θ_t is time effects that control for macroeconomic influences on fixed investment common across firms, and S_i controls for sectoral effects that are constant over time. ε_{it} is the error term.¹ The coefficients β_2 and β_3 indicate the short-run responsiveness of fixed investment to sales growth, while the coefficient β_4 indicates the speed of adjustment of the capital stock towards its desired level. γ captures the impact of the financial ratio introduced in the equation. A positive coefficient is expected for cash flow, and negative ones for debt burden and indebtedness ratios.

The equation is estimated separately for six euro area countries (Belgium, Germany, Spain, France, Italy and the Netherlands) using the AMADEUS database of Bureau van Dijk Electronic Publishing.² The table shows the estimated coefficients for each country for each of the financial ratios considered, together with the p-value associated with the significance of each coefficient.³

As can be seen in the table, the financial factors affect investment rates in the expected directions. Cash flow is significant (and positive) for all the countries analysed, indicating that there is a positive relationship between this variable and firms' investment rates (see columns 1 and 2 in the table). If a weighted mean of the estimated coefficients is computed to calculate a coefficient for the euro area,⁴ a value of 0.4 is obtained, that is, if cash flow increases by 1 percentage point, firms increase their investment rates by nearly half a percentage point.

The third column in the table shows the coefficients obtained for the indebtedness ratio when it is included in the baseline investment equation (p-values are in the fourth column). A negative

1 The depreciation rate is included in the unobserved firm-specific effects and it is assumed that the variation in the user cost of capital can be controlled for by including time-specific, sectoral-specific and firm-specific effects.

2 When interpreting the country-level results reported in this box, it is important to bear in mind that these firm-level data cannot be compared across countries in the same way as aggregate national accounts data on investment, since the representativeness of firm samples differs across countries.

3 A GMM-system estimator has been used. For the non-financial variables, the results are as expected: the error correction term ($\ln K_{it-2} - \ln Y_{it-2}$) is correctly signed and statistically significant, while sales growth has a positive short-run impact on investment. For more details, see Martínez-Carrascal, C. and A. Ferrando (2007) at http://www.ecb.europa.eu/events/conferences/html/ws_eccbsd_en.html.

4 The weight for the coefficient for each country is equal to non-financial corporations' gross fixed capital formation in that country over gross fixed capital formation for all six countries.

Relationship between investment and financial position						
	Profitability		Indebtedness		Debt burden	
	coefficient	p-value	coefficient	p-value	coefficient	p-value
Belgium	0.49	0.01	-0.06	0.07	-0.07	0.07
Germany	0.28	0.09	-0.02	0.85	-0.06	0.14
Spain	0.33	0.04	-0.06	0.03	-0.07	0.05
France	0.54	0.00	-0.06	0.01	-0.07	0.07
Italy	0.60	0.08	-0.08	0.03	-0.12	0.06
Netherlands	0.37	0.07	-0.11	0.18	-0.17	0.04
Euro area weighted mean ¹⁾	0.43		-0.04 ²⁾		-0.08	

Notes: For each financial indicator and each country, the coefficient captures the impact of a 1 percentage point increase in the ratio (for example, an increase in profitability from 5 to 6 percentage points). The investment rate is defined as the ratio of gross fixed capital formation to capital stock, cash flow as the ratio of cash flow to total assets, indebtedness as the ratio of debt minus cash and cash equivalents to assets, and debt burden as the ratio of interest payments to gross operating surplus plus financial revenue.

1) The coefficients for each country are weighted according to the share of that country in the aggregate gross fixed capital formation of Belgium, Germany, Spain, France, Italy and the Netherlands.

2) The coefficients on indebtedness for Germany and the Netherlands are set to zero as indebtedness is not found to be significant in these two countries.

(and significant) coefficient is obtained in most countries for this variable, suggesting that a high level of debt can lead to balance sheet adjustments whereby firms defer or forego investment projects. Finally, the last two columns of the table report the results when financial pressure is proxied by debt burden. A clear negative effect is found, suggesting that debt servicing plays an important role in influencing the investment levels of firms.

The results presented above can be used, together with the information on the average levels of debt burden across countries in 2005, to quantify the impact of a 25% increase in debt burden on investment, which approximately corresponds to a 100-basis-point increase in financing costs from the levels observed at the end of 2005. This simple calculation shows that the impact varies considerably across countries, with the reduction in investment rates ranging between 0.3 percentage point and 0.9 percentage point. This heterogeneity is the result of differences across countries in both the marginal impact of the debt burden on investment rates and firms' financial positions. To evaluate the impact of this increase in debt burden in the euro area as a whole, the impact in each country is weighted according to the relative share of that country in the aggregate gross fixed capital formation of non-financial corporations for the six countries (derived on the basis of national accounts). According to this simple exercise, this 25% increase in debt burden would imply a reduction of slightly more than 0.4 percentage point in the euro area investment rate in the following year.

5 CONCLUSION

As a result of capital market imperfections, financial factors, such as internally generated funds, indebtedness or the debt burden, have an impact on investment spending, in addition to the cost of capital. This article has explored the role that these financial factors have in explaining corporate investment developments in the euro area. It shows that firms with different financial positions tend to have different investment rates:

firms with a higher cash flow tend to have higher investment rates, while firms with a higher debt burden or high indebtedness levels record lower capital expenditure.

Econometric evidence corroborates the descriptive evidence on the relationship between investment and firms' financial positions, indicating that the assessment of investment prospects can be improved by considering financial factors.

At the macroeconomic level, financial factors seem to contribute substantially to investment dynamics in specific circumstances, such as in periods of balance sheet restructuring and strong profit growth. Quantifying the role that financial factors have in explaining investment dynamics at the aggregate level is, however, difficult and microdata seem better able to provide evidence on the role that financial factors have in investment decisions.