What is driving corporate investment?

William De Vijlder

Corporate investment is an important component of GDP. Because of its volatile nature, it has a big impact on the variability of real GDP growth. Capital is a production factor so investment influences potential output and its growth rate. There is a feeling that investment has been weak in recent years, but this partly reflects the subdued recovery of GDP following the Great Recession. Empirical research shows that a range of factors drives capital formation: expected sales versus available productive capacity, funding considerations and financial frictions, confidence versus uncertainty.

Various factors explain why policymakers, businessmen, and financial markets pay particular attention to the evolution of corporate investment. As a component of final demand, it exhibits greater volatility than components such as private consumption, which means that it can have a profound impact on the short-term evolution of GDP growth even though its weight in GDP tends to be rather small. To the extent that it increases the capital stock, corporate investment increases potential GDP. It can boost the productivity of production factors and thereby raise potential GDP growth, which influences the natural rate of interest. In the conduct of monetary policy, central banks hope that corporate investment will respond to large cuts in interest rates. It is a long-horizon commitment, implying that internal funds (retained earnings) are not to be used for dividend payments or share buybacks. This may influence share prices. The long-horizon aspect also means that uncertainty can have a big impact on investment behaviour. Chart 1 shows that since the early 90s, real private investment has been more dynamic in emerging economies than in the advanced economies. This shouldn’t come as a surprise in consideration of the fact that the cumulative growth of real GDP has also been significantly more important in the former than in the latter, reflecting a catch-up process. One also observes considerable differences in the behaviour of investments during the 2008 recession with the big decline in the advanced economies and more limited declines elsewhere. Judging by the number of articles published in recent years, there is a sense that investment in the advanced economies has been subdued in this cycle. However, as Chart 1 shows, after a considerable drop, real investment has picked up considerably in the developing economies and to a lesser extent in the advanced economies. The remainder of this paper will focus on the latter and more specifically on corporate investment, its evolution and drivers. The conclusion is that capital formation depends on a mix of drivers: expected sales versus available productive capacity, funding considerations and financial frictions, confidence versus uncertainty. This combination explains the complexity of analysing corporate investment.

Real GDP & Private Investment

![Chart 1](source: IMF WEO, April 2015/16)

Some stylised facts

Table 1 provides a number of key metrics to gauge the importance and behaviour of corporate investments in comparison with GDP in general as well as other components of GDP. Gross fixed capital formation (GFCF) represents about 20% of GDP, but this includes dwellings and other buildings and structures. Investment
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Table 1  
Source: OECD
in machinery, equipment, weapons, and intellectual property products is in a range of approximately 8 to 12% of GDP. The international differences of the average real annual growth rate of GFCF excluding dwelling, buildings, and structures are quite significant, both in an absolute sense (the US seeing the fastest growth) and a relative sense (the growth rate compared with GDP growth). The standard deviation of real growth shows the volatile nature of investment in comparison with GDP. This also explains why, while representing a rather small percentage of GDP, the contribution to GDP growth during a recession can be significant.

Chart 2 shows the annual growth rate of corporate investment defined as private non-residential gross fixed capital formation. The swings can be huge with big drops during a recession, in particular in 2008, and strong rebounds in the recovery phase of the business cycle. There is a high degree of co-movement between the US, the Eurozone, the UK, and Japan with an average pairwise correlation of 0.68 over the period 1996-2015. This is not a surprise in view of the fact that corporate investment is very cyclical and the cycles in real GDP growth as shown in Chart 3 are also quite correlated (average pairwise correlation of 0.72). Charts 4-7 also show that the swings in GDP growth are less extreme than those in investment.

Has corporate investment been abnormally weak?

Several years after the Great Recession of 2008-2009, non-residential gross fixed capital formation as a percentage of GDP is still below the levels seen before the crisis (Chart 8). This weakness of corporate investment has coincided with a slow recovery in activity in general in the advanced economies, so the question is whether the weakness of investment has been abnormal. For the US, Pinto & Tevlin (2014) analyse the equipment and intellectual property products part of corporate investments. Looking at the evolution of overall activity, financing conditions, profit expectations, and measures of uncertainty, they conclude that on the whole investments have behaved in a normal way, i.e., according to what one would expect based on the economic environment. In a more distant perspective, the slowdown in the rate of growth of the labour force and the growth rate of technical progress also explains why companies have expanded their capital stock at a slower pace than in previous decades. The relationship between demography and investments is also emphasised by Daniel Gros (2014). Ceteris paribus, a decline in the growth rate of the working-age population lowers the potential growth rate of the economy. “This implies, in turn, that a lower investment rate (investment as a share of GDP) is required to maintain a constant level of the capital-to-output ratio.” (see box 1) If the investment rate were to remain too high, corporate profitability would suffer with ensuing detrimental effects for the economy (unemployment, non-performing loans). The relationship between labour force growth and private non-residential investment is shown in chart 9.

Box 1

**Investment and long term growth**

(source: based on Gros, 2014)

With K = capital stock, Y = GDP and δ = rate of depreciation, the change in the capital/output ratio is

\[
\frac{d(K/Y)}{dt} = \frac{dK}{dt} \frac{1}{Y} - \frac{dY}{dt} \frac{K}{Y^2} - \frac{\delta K}{Y}
\]

With g = growth rate of GDP and I = dK/dt, this becomes

\[
\frac{d(K/Y)}{dt} = \frac{I}{Y} - \left(\frac{\delta + g}{K/Y}\right)
\]

When the economy is in a long-run equilibrium, the capital/output ratio is constant, which implies

\[
\frac{I}{Y} = \left(\frac{\delta + g}{K/Y}\right)
\]

The ratio investment/GDP depends on the capital/output ratio, the rate of depreciation of the existing capital stock, and the long-term growth rate of the economy. A decline in g, for demographic reasons or because of a decline in productivity growth reduces the level of gross investments necessary to keep the capital/output ratio constant.
Banerjee et al. (2015) of the BIS explore two hypotheses of why investment has been weak: funding constraints and a lack of profitable investment opportunities. For the former, they consider that access to funding has not been an issue. Availability of internal funding has been such that many companies have been able to set up share buy-back programmes. External funding has benefitted from low interest rates and well-functioning capital markets on the back of investors’ quest for yield. Although they mention that in the Eurozone access to bank credit has been more restrictive than before the financial crisis, which may have weighed on smaller firms that rely on bank funding, the macro impact should be small given the limited contribution of small companies to aggregate investment.

Barkbu et al. (2015) argue that in addition to output dynamics, financial constraints have affected investment, particularly for Italy, Portugal, and Spain and high uncertainty and corporate sector leverage have been additional impediments to investment, particularly for some of the stressed countries. “These factors explain a big portion of the decline in investment that was not explained by output changes and real cost of capital.” The specific nature of the stress period (the sovereign debt crisis of 2010-11) is also highlighted by the IMF (2015). For Eurozone economies with high borrowing spreads during this period, adding a financial constraint improves the explanatory power of an investment model in comparison with looking exclusively at the evolution of demand.

However, more recently, ECB policy and the improved economic environment have changed the picture. The survey conducted by the ECB (2016) in the fourth quarter of 2015 and the first quarter of 2016 to assess the access to finance of enterprises in the Eurozone shows that ‘access to finance’ was the least important concern for Eurozone SMEs. “For the third time in a row, SMEs confirmed, on balance, an increase in the availability of bank financing (loans and bank overdrafts) and the willingness of banks to provide credit at lower interest rates.” Moreover, “SMEs in most countries signalled that the potential supply of external funds may have exceeded their need for external financing.” Finding customers remained the dominant concern. Other challenges were the availability of skilled labour, increases in costs of production and labour, competitive pressures, and regulation. According to Banerjee et al. (2015), “A lack of demand for credit is surely a large part of weak credit growth, so this is probably a consequence rather than a driver of weak investment”. This is confirmed by a survey by the ECB of 74 large Eurozone firms that shows that “Financial constraints related to costs of, or access to, funding were seldom seen as important… Overall, demand factors in terms of weak current demand and weak growth prospects were consistently cited as the main constraints on euro area investment at the present time.” (ECB, 2015) This echoes the second explanation in Banerjee et al. (2015), the lack of profitable investment opportunities, whereby the authors consider that uncertainty has acted as a drag on the willingness of companies to invest, although that probably does not tell the whole story.
What drives corporate investment?

Box 2 provides an overview of economic theories of corporate investment. In recent years, several articles have been published providing empirical estimates of the drivers of corporate investment. Bussière et al. (2015) use annual data covering the period 1996-2014 for a panel of 22 advanced economies. Investment depends on GDP growth (either realised or expected), an uncertainty measure, and the cost of capital. They obtain an adjusted $R^2$ of 0.45. Expected demand is highly significant. Uncertainty is also important, but the cost of capital measures less so. However, for a sub-sample of 14 European Union countries, the financial constraint variable (cost of capital, difference between corporate bond yield and government bond yield) is significant. The main finding of their analysis is "that, on average over all the countries, expected demand always plays the largest role in explaining investment growth, while the contribution of uncertainty tends to become negative during recession periods (2001 and 2008-09). Uncertainty also played a negative role over the years 2010-12, but not to a large extent. It is also noteworthy that the role of financial constraints is always quite small."

Palenzuela and Dees (2016) analyse business investment in the Eurozone over the period from 2003 to 2013. Capacity utilisation and sales growth have a positive and significant impact. The cost of external financing has a negative and highly significant impact whereas internal sources of financing (retained earnings) do not play an important role. Tobin's Q (the ratio between the market value of company assets and their replacement costs) is positive and significant. In the post-crisis period, gains in competitiveness (unit labour costs) had a positive impact.

Barkbu et al. (2015) estimate three investment models. In the accelerator model, business investment depends on lagged changes in real GDP. The coefficients are highly significant with the correct (positive) sign, but the model "suggests sizeable underinvestment (a level lower than the predicted value) for the countries considered for the duration of the euro area debt crisis (2010Q2–2013Q4), with the exception of Spain."

Box 2

Theories of corporate investment

Investing is about putting money (internal funds, debt) to work to generate future cash flows. They should be high enough in comparison with the cost of debt and the opportunity cost of money in case internal funds are used. In addition, risk also needs to be rewarded. A macroeconomic analysis of corporate investment should look at the role of cash flows and the level and fluctuations of the discount rate. The accelerator model provides an intuitively clear and hence very popular approach to explaining fluctuations in investment. In this model, net investment (i.e., changes in production capacity) depends on the expected change in output because a certain level of output corresponds to a desired capital stock. Under the assumption that initially the existing capital stock is not fully used, an increase in expected output will not be met by net investment (there will only be replacement investment to replace depreciated assets). Net investment becomes positive only when a company approaches full capacity and expects further increases in the demand for its products. Gross investment (depreciation + net investment) jumps: this is the acceleration effect. When expected demand no longer grows, net investment will stop.

The neoclassical theory takes a different approach. It states that firms will invest in an extra unit of capital to the extent that the extra output that it generates (the marginal product of capital) is at least equal to the user cost of capital. When this user cost declines, the desired capital/output ratio increases. The user cost is influenced by the level of interest rates, the depreciation rate, and taxes.

Another popular model is Tobin's Q theory. In this approach, companies compare the cost of acquiring capital goods with the impact it would have on the market value of the company. Investment is now a function of the ratio of the firm's market value on the stock and bond markets to the replacement cost of the capital stock. Swings in share prices are a key driver of changes in Q and hence impact corporate investment. Conceptually, the model is appealing because share prices are supposed to reflect not only the expected profitability of a business but also the risks it is facing.
Towards the end of the sample, the underinvestment becomes smaller. This finding suggests that other factors must play a role. In the neoclassical model, investment depends on the real cost of capital and a proxy for credit rationing. However, in most cases the coefficients are not significant. Finally, the authors estimate an “accelerator +” model whereby the ratio of private non-residential investment to total capital stock is modeled as a function of overall real lending rates, corporate bond spreads, uncertainty, corporate leverage, and cash flow. Financial constraints are controlled for to account for possible credit rationing. Most additional variables have significant effects on investment. However, real lending rates are only significant with the right sign in Italy. For the Eurozone, Germany and Spain the coefficient is significant but positive. An interpretation of this positive correlation would be that during a cyclical recovery, the policy rate rises and investment picks up (on the back of increased confidence, sales and capacity utilization). The opposite occurs during a downturn.

Banerjee et al. (2015) model the change in real business investment in Canada, France, Germany, Italy, Japan, the UK, and the US over the period 1990-2014. Explanatory variables are the short-term interest rate, the term spread between long-term and short-term government bond yields, the spread between the interest rates on high- and low-rated corporate bonds, the ex post real return on equity in excess of the risk-free interest rate, equity market volatility, credit growth from financial institutions, real profits in the non-financial corporate sector, and an uncertainty measure (the standard deviation of GDP forecasts). Statistically significant are the term spread (a flattening of the yield curve is accompanied by faster investment growth), excess equity market returns (which support investment via increased availability of funding on the back of reduced risk premia, an increase in the company value, or increased manager confidence), the uncertainty measure (a reduction in the dispersion of GDP forecasts leads to a quick increase in corporate investment). In most of the regressions, the short-term interest rate is not significant.

Gennaioli et al. (2015) explore how expectations influence investment behaviour. Rather than using growth forecasts of macro variables as a proxy for expectations of companies, they use the quarterly survey of CFOs of large US companies conducted by Duke University. This survey collects, amongst other things, information on earnings expectations and investment plans, both over the next 12 months. The CFO earnings expectations are compared with consensus earnings expectations of equity analysts. Both series are highly correlated. Investment plans as reported by CFOs are also highly correlated with actual investment over the subsequent period. The authors find that “CFOs’ earnings expectations have significant explanatory power for firms’ investment plans... A one percentage point increase in CFO expectations is accompanied by a 0.6 percentage point increase in planned investment growth.” The same applies to actual investment growth. Moreover, the CFO expectations variable remains significant when it is used in combination with more traditional economic variables used to explain planned and actual investment behaviour. Analyst expectations are also highly correlated with firms’ investment plans, though not to the same extent as CFO expectations. Analyst expectations are also correlated with realized investment (chart 10). Another striking result is that CFO earnings expectations as well as analyst earnings forecasts are extrapolative: there is a tendency to over(under) estimate future earnings growth when past earnings growth has been strong (weak). This could make company investment...
more volatile when it turns out that expectations have been too optimistic or cautious. This seems to be confirmed by a paper of Kothari et al. (2015), who find a negative relation between investment and future profit growth: prior strong profit growth is followed by a big increase in investment that in turn is followed by a decline in profit growth. This would indicate poorly-timed investment decisions: “Managers may overreact to prior profits and stock returns, expanding investment excessively in the late-stages of expansions and cutting investment excessively at the end of recessions.” The authors also analyse other drivers of business investment. In a univariate setting, there is a strong positive correlation with recent profits as well as stock returns and a negative correlation with the default spread. They note a positive correlation between short-term interest rates and investment growth: both rise (decline) when the cyclical environment improves (deteriorates). The correlation with market volatility is weak. When combining the different variables in a multivariate regression, stock returns predict a stronger and more rapid increase in investment whereas the default spread loses much of its predictive power. The authors find no evidence that an increase in aggregate uncertainty causes a cutback in investment.

The authors of the IMF World Economic Outlook (2015), on the other hand, find a clear negative impact of uncertainty. Using firm-level data for 27661 firms across 32 advanced economies, they conclude that increases in economic policy uncertainty have a bigger negative impact on investment in sectors that are more sensitive to uncertainty. They also find a significant relationship between business investment and sales, lagged values of Tobin’s Q and a banking crisis/financial dependence term.

In summary, based on this non-exhaustive review of recent empirical research, it seems business investment is driven by lagged changes in real GDP, capacity utilisation, expected demand, sales growth, stock returns, Tobin’s Q, earnings expectations (which tend to be extrapolative), cost of external financing, financial constraints, and uncertainty. Several authors find a positive relation between investment and short-term interest rates with both variables reacting to an improved economic outlook. To put it differently, business investment depend on expected sales versus available capacity, funding considerations, and confidence versus uncertainty.

The investment hurdle rate

A commonly used method to assess investment opportunities is discounted cash-flow analysis. The net present value (NPV) of all future cash flows generated by the project is calculated by using a discount rate. This rate should have some relationship with the cost of debt and equity finance of the company, i.e., its weighted average cost of capital (WACC). A positive NPV implies that the internal rate of return is higher than the discount rate (= hurdle rate) and would justify the implementation of the investment project. An alternative method is the payback period, the number of years it takes for the capital outlay to be returned by the cash flows of the project. This method does not take into account the time value of money or cash flows beyond the chosen cut-off date.

Sharpe and Suarez (2014) use data from surveys of corporate executives about their investment plans and how they would be impacted by changes in interest rates. Based on two special questions in the September 2012 survey, they find that investment plans are quite insensitive to changes in borrowing costs. “Only 8% of firms would increase investment if borrowing costs declined 100 basis points, and an additional 8% would respond to a decrease of 100 to 200 basis points. Strikingly, 68% did not expect that any decline of interest rates would lead to more investment.” Sensitivity to an increase in interest rates was low as well, although slightly higher than in the case of a decrease: 16% would reduce investment in the case of a rate increase of 100 basis points. These results are explained by ample cash reserves or cash flow and a product-demand-driven approach to investment rather than one driven by interest rates. High uncertainty did not play much of a role. Unsurprisingly, firms without financial constraints or with high growth-rate expectations were substantially less sensitive to interest rates. A ranking of 268 nonfinancial companies in terms
of revenue growth showed median hurdle rates per quintile of between 12% and 18.5%. Given the level of bond yields in 2012, these rates are clearly high and have not followed interest rates’ decline to the same degree. Indeed, the authors quote older research on hurdle rates in the US (in the 1980s, early ’90s and the first decade of this century), and it seems these rates have on the whole been remarkably stable.

Brunzell et al. (2013) contrast the survey-based hurdle rates for Nordic companies with the theoretical ones obtained on the basis of a CAPM model. The difference (the WACC premium) ranges between -4% and +19% with a mean of 4%. They find weak support for pressure felt by the CFO (short-termism). High hurdle rates are especially used by companies with less sophisticated capital budgeting methods.

Based on discussions with managers of Australian companies as well as survey evidence, Lane and Rosewall (2015) report a use of high (a 15% rate is quite common) and sticky discount rates to evaluate investment projects, which may explain the lack of direct interest rate sensitivity of capital formation. Hurdle rates are significantly higher than the weighted average cost of capital of companies because management wants to take into account cash-flow uncertainty and the risk that estimates are biased to the upside. For the same reason, many companies prefer the payback period method or use this method in conjunction with a discounted cash-flow approach.

A high hurdle rate could be a reflection of uncertainty, which would imply that in a low uncertainty environment, the stickiness of the hurdle rate at a high level causes investment to be lower than it would be if the hurdle rate were to display a more cyclical behaviour. Yongjin Kim (2016) analyses whether time-varying risk influences corporate investment at the nonfinancial companies that make up the S&P 500 index. The company-specific risk premium is calculated based on option prices. The author finds a significant negative relationship between this several-quarter-lagged risk premium and subsequent company investment. Bloom et al. (2001) analyse a panel of 674 UK manufacturing firms between 1973 and 1991. Daily stock returns are used as a measure of company-specific uncertainty. They find a significantly lower response of investment to sales growth when uncertainty is high.

Gilchrist et al. (2014) also use firm-level stock market data to construct a measure of idiosyncratic uncertainty. This measures turns out to be an important determinant of a company’s credit spread, and an increase in idiosyncratic volatility causes a decline in corporate investment. Both phenomena are linked. Increased uncertainty causes company management to postpone capital formation as investment is to a great degree irreversible: company fixed assets are highly illiquid. This illiquidity creates financial friction: when uncertainty increases, investors will focus on the negative impact on the resale value of capital (the collateral value of a company’s fixed assets declines) and require a higher compensation for risk, i.e., a bigger corporate bond spread over government bonds. These more expensive financing conditions in turn impact the willingness of firms to invest, creating a negative financial accelerator effect.

Uncertainty could lead to short-termism at both the shareholder and management levels, and the OECD (2015) analyses whether short-termism has an impact on companies’ investment behaviour. Activist investors and proxy advisors have become increasingly important so “The question arises as to whether the role of such investors is working to cause short-termism strategies at the expense of long-term investment, by effectively raising the hurdle rate (risk premium) associated with the latter.” To test this, the listed companies in a given market are ranked from capital-heavy firms that invest a lot to firms that focus on paying attractive dividends and buying back shares. It turns out that in a majority of cases, the latter outperform the former (see table 2). This illustrates an investor preference for quick returns (dividend payments and/or share buybacks that boost the share price), and to the extent that company management reacts to it, this phenomenon may become self-reinforcing. This short-termism can be rooted in uncertainty, but it can also reflect impatience (see box 3). A consequence may be that company management uses a high hurdle rate when analysing investment projects. However, to what extent corporate executives
are being “pushed” into short-termism is unclear. The Bank of America Merrill Lynch Global Fund Manager Survey asks fund managers what they would most like to see companies do with their cash flow. The survey for September 2016 reported that since the recovery started in the US in the summer of 2009, “increase capital spending” has been the preferred use rather than returning cash to shareholders via dividends or share buybacks. Since the end of 2012, the gap between the two has widened significantly.

Box 3

**Investment horizon, uncertainty, and impatience**

Norges Bank Investment Management (NBIM (2012)) analyses heterogenous preferences amongst financial investors: investors put different weights on short-run risk but also on long-run risk and the uncertainty associated with long-run risk. This causes investors to react in a different way to the same market signals and information. The differences in weights (importance) can reflect market segmentation (e.g. the home bias of investors, i.e. a preference to invest in shares of companies in their own country), the existence of intermediated markets (whereby asset owners delegate the management of their portfolios to intermediaries), which can give rise to principal/agent problems, regulations governing pension funds and insurance companies, etc. The difference in weights attached to the various risk factors is related with differences in the preference over the timing of resolution of uncertainty. This is “the willingness and ability to hold on to assets in periods when uncertainty about the long-run growth rate of future payoffs is high.” It reflects a difference in risk-bearing capacity and a difference in patience: how quickly do you want to know whether a decision was right or wrong? It implies that investors may very well have a long horizon but because of a high degree of impatience, act as if they are myopic.

This framework can be applied to capital formation. Companies have long horizons, but because of market pressure (short-termism as described in the main text, quarterly reporting frequency for listed companies) may manifest a high degree of impatience and a low risk-bearing capacity. In this case, companies would use a high hurdle rate for their investments. The irreversible nature of capital formation as opposed to financial investments that have low transaction costs can explain why the same information about (low) interest rates and the growth outlook leads to a bull market in equities or corporate bonds whilst corporate investments remain subdued, in which case the effectiveness of monetary policy is hampered.

<table>
<thead>
<tr>
<th>Percentage gain</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>0.56</td>
<td>1.70</td>
<td>16.18</td>
<td>11.98</td>
<td>3.84</td>
<td>15.55</td>
<td>49.82</td>
</tr>
<tr>
<td>Europe</td>
<td>-2.36</td>
<td>3.80</td>
<td>13.84</td>
<td>8.73</td>
<td>9.74</td>
<td>13.47</td>
<td>47.22</td>
</tr>
<tr>
<td>Japan</td>
<td>-7.27</td>
<td>0.45</td>
<td>9.63</td>
<td>9.29</td>
<td>2.17</td>
<td>-2.62</td>
<td>11.65</td>
</tr>
<tr>
<td>EMEs</td>
<td>-3.71</td>
<td>8.70</td>
<td>10.22</td>
<td>10.74</td>
<td>0.97</td>
<td>-5.52</td>
<td>21.40</td>
</tr>
</tbody>
</table>

Note 1: Europe refers to the European Union and Switzerland. The table is based on OECD calculations and Bloomberg data.

Note 2: buying the bottom quartile of companies CAPEX / (CAPEX + DIV & BUYBACKS) index and selling the top quartile.

Table 2

Source: OECD Business and Finance Outlook 2015
Short-termism comes with a cost. Souder et al. (2016) quantify a firm’s investment horizon based on an estimate of the average expected useful life of a firm’s assets using accounting data for 2300 US-based firms. They find that the return on assets of firms with a short (longer) horizon is lower (higher). They use trading frequency as a measure of “capital patience”, which reflects the investment horizon of the firm’s shareholders. A combination of a short investment horizon of company management and impatient investors produces the most negative performance in terms of return on assets. This should have macroeconomic consequences as well: a lower investment rate, less spending on research and development leading to slower productivity growth.

Corporate investment: important but complex

Corporate investment is an important component of final demand in the economy. Because of its volatile nature, it has a big impact on the variability of real GDP growth. Through its impact on the supply side of the economy (capital as a production factor), it influences potential output and via its impact on productivity growth, potential GDP growth as well. This in turn is related to the level of interest rates whereby a higher potential GDP growth is leading to a higher neutral rate of interest, which will be welcomed by savers and institutional investors. Empirical research shows that a range of factors drives capital formation: expected sales versus available productive capacity, funding considerations and financial frictions, confidence versus uncertainty. The non-linearity of investment with respect to its drivers makes forecasting particularly difficult. A pick-up in expected sales causes an accelerator effect, and an improvement in the financial market environment triggers a financial accelerator. Another element of complexity is the role of psychological factors: what is the exact level of the hurdle rate in the aggregate? What is the role of uncertainty and how can it be measured at a macro level? Do shareholders and company management display short-termism in their decisions? Is there a better way to illustrate the role of confidence than to refer to the positive correlation between investment and short-term interest rates? Both variables are highly pro-cyclical, reflecting the confidence company management and the central bank alike have in the improving or worsening outlook. Does this positive correlation mean that rate cuts and other aspects of the very expansionary monetary policy implemented since the Global Financial Crisis do not support investment? No, such a policy has been important although the impact on company investment has been very indirect: via confidence, a reduction in financial frictions and better access to funding, accelerator effects, and a reduction in uncertainty. This reminds us of how complex corporate investment really is.

Completed 7 October 2016
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NOTES

1 Adding an uncertainty variable also improves the quality of the model.
2 Source: ECB (2016)
3 For GDP forecasts, the authors use the IMF World Economic Outlook. The square root of the mean squared daily equity returns during the year is used as a proxy for uncertainty. The user cost of capital is calculated as \( \text{UCC} = (i - \pi + \delta) \cdot (\text{INVdef}/\text{GDPdef}) \). It depends on the real long-term interest rate \( i = 10\text{-year government bond yield} \), the annual change in the GDP deflator, the fixed capital depreciation rate \( \delta \), and the relative price of investment goods versus GDP.
4 In an alternative specification, they incorporate the expected fiscal balance and it turns out that an expansionary fiscal stance would stimulate investment.
5 This box is based on Gordon (1998).
6 16 countries excluding Malta and Cyprus.
7 This is represented by the real interest on loans to non-financial companies of an amount higher than 1 million euro.
8 Models are estimated using quarterly data for the Eurozone, Germany, France, Italy, Spain, Portugal, Ireland, and Greece. Depending on data availability, the regression period runs from the 1990s up to 2012 or 2013.
9 Variables like Tobin's Q, time-varying discount rates, past stock returns, financial constraints, uncertainty.
10 Interestingly, the authors find that a spike in investment also predicts a drop in GDP growth.
11 The default spread is the difference between the yield on corporate bonds and the yield on government bonds of similar maturity.
12 They even find a positive (!) and significant relation between market volatility and subsequent investment growth.
13 This sensitivity to uncertainty is measured by looking at the correlation between the excess return compared with the overall stock market and the economic policy uncertainty index.
14 See Lane and Rosewall (2015).
15 This survey of financial executives of 600 to 900 US companies is conducted on a quarterly basis by Duke University/CFO Magazine Global Business Outlook.
16 Given the quick payback that is required (the most common period being three years), this method is not influenced by (highly uncertain) long-term cash-flow estimates.
17 This collateral channel is reminiscent of Ben Bernanke’s financial accelerator model in which swings in the collateral value create swings in the financing capacity of companies and households.
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