Equipment investment in France and the euro zone: similarities and differences with respect to the previous cycle

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The recent trend in equipment investment by French firms seems paradoxical: on the one hand, its annual growth—about 4% since 2004—remains moderate, particularly by comparison with Germany, raising fears of under-investment in France; on the other hand, the investment rate, i.e., the share of GDP devoted to capital spending, seems unusually high for this phase in the cycle. In fact, it is close to the level reached during the previous cyclical peak.

A comparative analysis of the current cycle and previous cycles in France, Germany, and the euro zone as a whole provides some explanations for this apparent paradox:

- By comparison with previous recoveries, we find no distinctive lag, at present, in investment by French firms; consequently, on this evidence, there is no under-investment.

- By contrast, investment displayed far greater resilience in the cyclical downswing in 2003; this may be due to the fact that the downturn itself was milder.

- We observe the same pattern in the euro zone as a whole: the distinctive feature is not so much the current recovery phase but the preceding downswing, in which the investment rate was equally high given the cyclical timing.

- Germany stands apart from the euro zone as a whole; investment fell very sharply between 2000 and 2003, the current recovery is also stronger, but, overall, the investment rate is still far from its previous cyclical peak.

Thanks to an econometric analysis of the main determinants of investment, we can refine these conclusions:

- Investment by French firms now seems broadly consistent with its main determinants (expected demand, profitability, etc.); in fact, in 2003 and 2004, investment appears to have been substantially higher than what these determinants would have led observers to expect.

- If the French investment rate seems high today, it is indeed because the cyclical trough was relatively modest, but also and especially because, when the previous cycle bottomed out in 1993, investment fell more sharply than what the demand and profitability trends predicted.

- Germany's more pronounced investment cycle is partly due to the greater slowdown of the domestic economy; another factor is that German firms—like their U.S. counterparts but contrary to their French and other euro-zone counterparts—seem to have substantially overinvested during the Internet bubble. The post-2000 adjustment in investment therefore exceeded what the macroeconomic environment alone would have justified. Once these excesses had been offset, investment's return to normal translated into a sharper rebound than elsewhere in the euro zone.

- In the euro zone as a whole, investment patterns appear to be broadly consistent with their determinants. As in France, the cyclical trough was moderate, and thus helped to curb the decline in investment during the downswing. However, financial conditions played a greater role in reviving investment in the zone than in France.

This analysis centers on a macroeconometric approach to equipment investment and its determinants. It does not address issues relating to its composition. In particular, we do not distinguish investment in manufacturing industries and investment in the service sector. Nor do we deal with the qualitative aspects of investment, such as the growing share of new information and communication technologies (NICTs). However, the widespread notion that both industrial investment and NICT investment are currently weak does not, in principle, contradict our findings. ■

Equipment investment in France and the euro zone

While Germany's investment cycle ended rather abruptly in the early 2000s, the same does not apply to the euro zone in general and France in particular

To assess investment growth in recent years, it will be useful to begin by examining the current situation in light of past developments. For this purpose, we conducted a comparative analysis of investment cycles over the past 25 years in the euro zone, its four leading countries (France, Germany, Italy, and Spain), and the United States. This preliminary investigation shows that the current equipment-investment cycle in the euro zone falls within the average of cycles observed in the 1980s and 1990s, whereas it is relatively slack in the United States. Within the euro zone, Germany stands apart for having been more strongly impacted by the world economic slowdown in the early 2000s and by its firms' worsening financial position.

Cycle dating

To qualify the current investment dynamics, we performed a cyclical analysis using the cycle dates supplied by the NBER *(NBER (2003))* and the CEPR *(CEPR (2003))*. The two institutions date the troughs and peaks that bound economic expansions and recessions in the United States and the euro zone respectively. The NBER defines a recession by a significant decline in the economy spreading to all activity sectors over several months. By definition, its incidence is clearly visible on GDP, real income, employment, industrial production, and wholesale/retail trade. The CEPR has adapted this definition to the euro zone, in particular by stating that recessions should generate similar conditions in most of the zone's countries.

Since 1981, the NBER has detected three cyclical troughs (Q4 1982, Q1 1991, and Q4 2001). The CEPR has defined the first two (Q3 1982, Q3 1993) but has not yet published the latest dating. According to OECD *(Cotis, Coppel (2005))*[1] it will be dated to Q2 2003.

Standard investment and activity recoveries in the euro zone

On this approach, the euro-zone's current investment cycle greatly resembles earlier ones *(Chart 1a)*. In particular, the cumulative growth of equipment investment in the first 12 quarters of the present cycle stands at 13.5%, a rise comparable to those recorded in similar phases of the cycles of the 1980s (11.9%) and 1990s (14.5%).

The investment curve had been more atypical in the cyclical downturn. In contrast to the marked declines in the early 1980s and before the 1993 recession, the phase prior to the current cyclical trough is broadly characterized by investment's remarkable resilience. These differences can hardly be ascribed to the form of the cycle itself *(Chart 3a)*: both the downturn and the recovery are very similar to the phases of previous cycles. It is all the more remarkable, therefore, that investment did not weaken during the latest economic downswing. In sum, the investment rate for euro-zone firms has barely declined in cyclical troughs; this year, it has already returned to its 1999 level, i.e., close to its previous cyclical peak.

However, there is a contrast in investment dynamics between countries

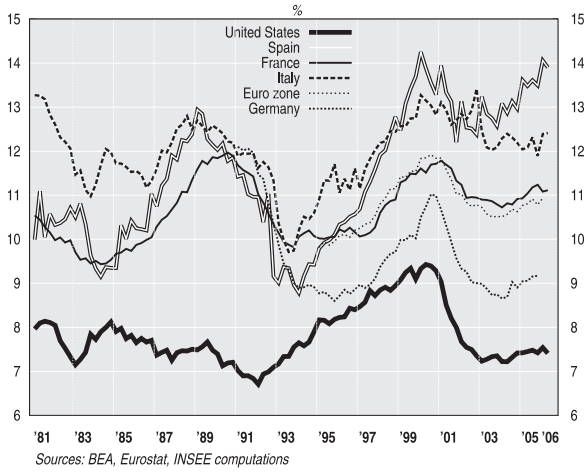
The four main euro-zone countries do, however, display rather different equipment-investment dynamics. In France, Spain, and—to a lesser extent—Italy, the investment rate has been comparatively high in historical terms since the start of the current cycle. The reason is that the investment rate in all three countries did not fall sharply at the end of the previous cycle *(Chart 2)*. In Germany, by contrast, the investment rate seems relatively low at this stage in the cycle. It has scored very limited gains since the 2003 trough and now stands at a modest 9%.

Germany's productive investment is currently on a robust uptrend, with cumulative growth of 16.1% in the first 12 quarters versus 14.3% in the 1980s cycle and 7.7% in the 1990s cycle *(Chart 1b)*. This is very likely also due to the drastic investment adjustment between 2001 and 2004. In those years, firms appear to have reversed their expectations

1. This extension seems all the more legitimate as the datings of earlier long cycles, as supplied by the authors, are very similar to the CEPR's.

2

EQUIPMENT INVESTMENT RATE*



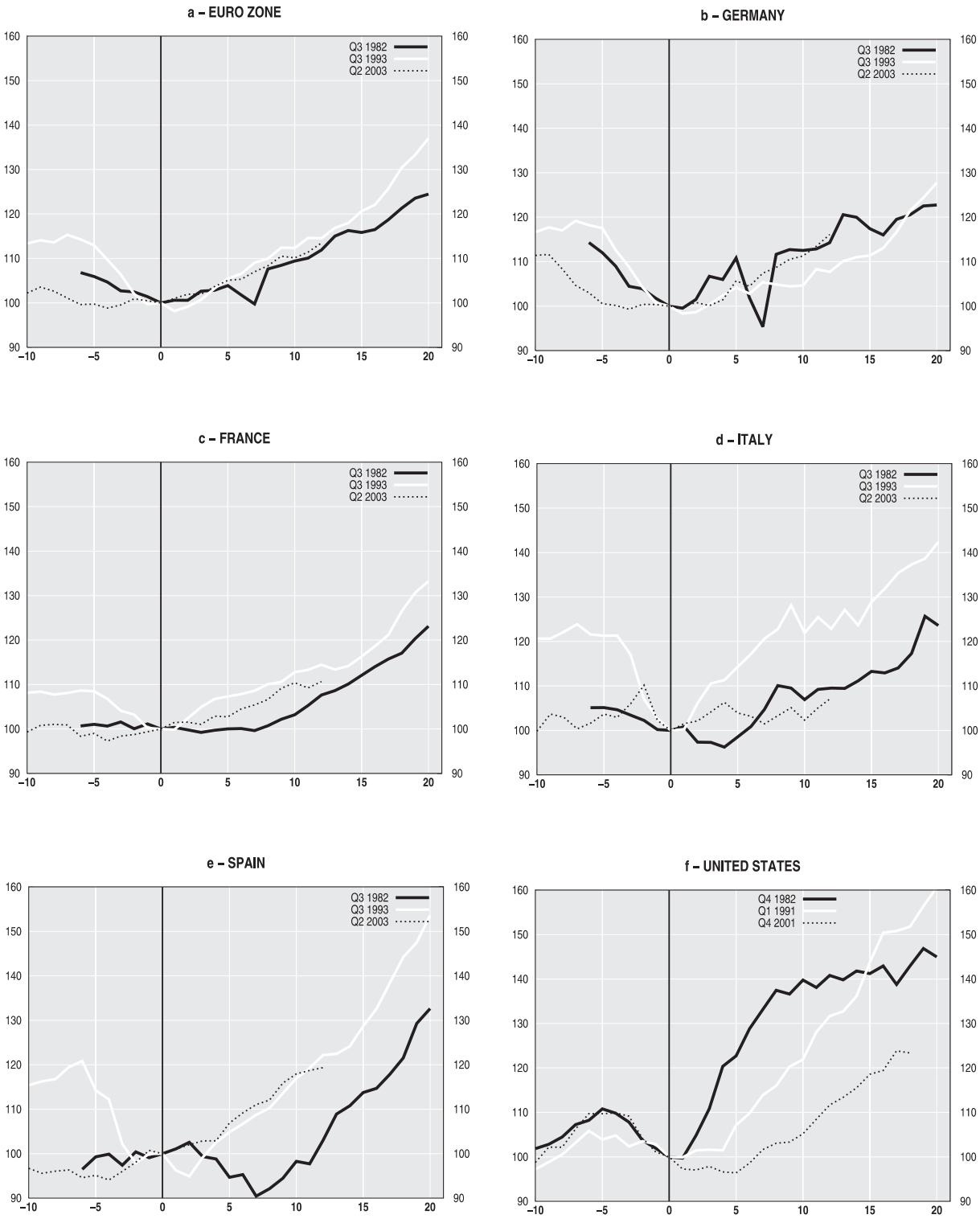
Sources: BEA, Eurostat, INSEE computations

*Equipment investment rate = ratio of nominal investment to nominal GDP

Equipment investment in France and the euro zone

1

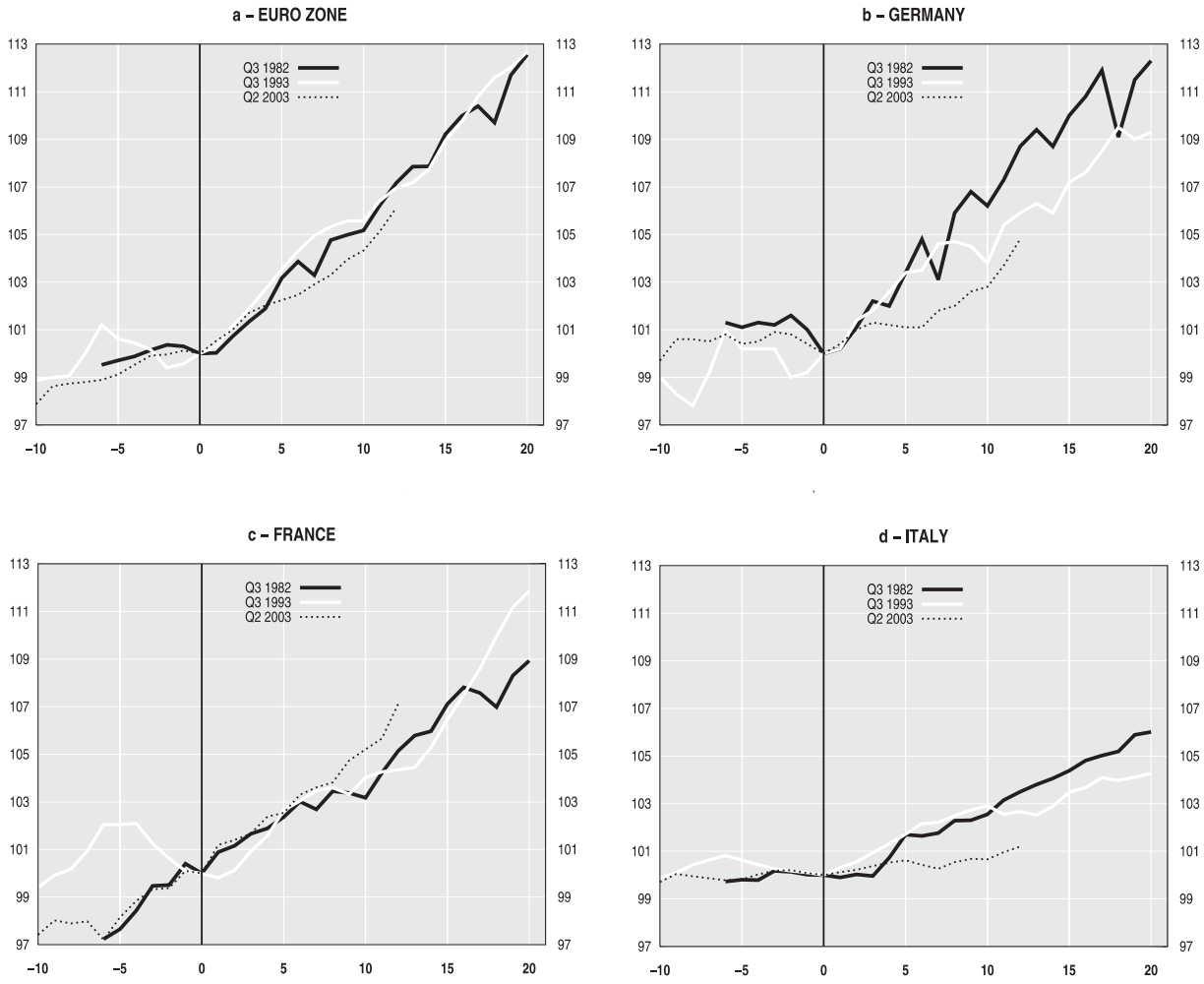
EQUIPMENT-INVESTMENT CYCLE



Series are based to 100 = cyclical trough. X-axis shows quarters before and after selected troughs.
Sources: BEA, INSEE, Eurostat, INSEE computations

Equipment investment in France and the euro zone

3
ECONOMIC CYCLES



Sources: INSEE, Eurostat, INSEE computations

faster than in the previous cycle, and their sharply worsening financial position precipitated the end of the investment cycle. Accordingly, investment began falling sooner than in previous cycles, whereas the pace of economic activity in the early 2000s was comparable to that recorded at the end of earlier cycles *(Chart 3b)*. The main difference in the German investment profile with respect to other euro-zone countries thus concerns the end of the 1990s cycle. In the current cyclical upswing, the investment recovery is, by contrast, broadly consistent with previous recoveries.

In Spain, equipment investment is currently very buoyant, as it was in the previous cycle *(Chart 1e)*. The situation in Italy bears a greater resemblance to that of the 1980s, with the investment cycle off to a rather sluggish start *(Chart 1d)*. Today's configuration seems partly due to a somewhat slack economic cycle, characterized by a particularly lackluster recovery phase.

France occupies an intermediate position. Its present investment cycle is somewhat slacker than the previous one, but more vigorous than that of the 1980s: the cumulative growth rates at the start of the cycle are 10.6%, 14.4%, and 7.6% respectively *(Chart 1c)*. By comparison with the 1990s cycle, one specific trait—already noted for the euro zone—should be mentioned: this time, equipment investment proved resilient during the slowdown prior to the cyclical trough. In terms of activity, another distinguishing feature of the present cycle relative to the earlier one is a far less jagged profile *(Chart 3c)*. By contrast to the sharp recession between end-1992 and end-1993, and the brisk recovery of 1994, gross domestic product (GDP) dipped for only a

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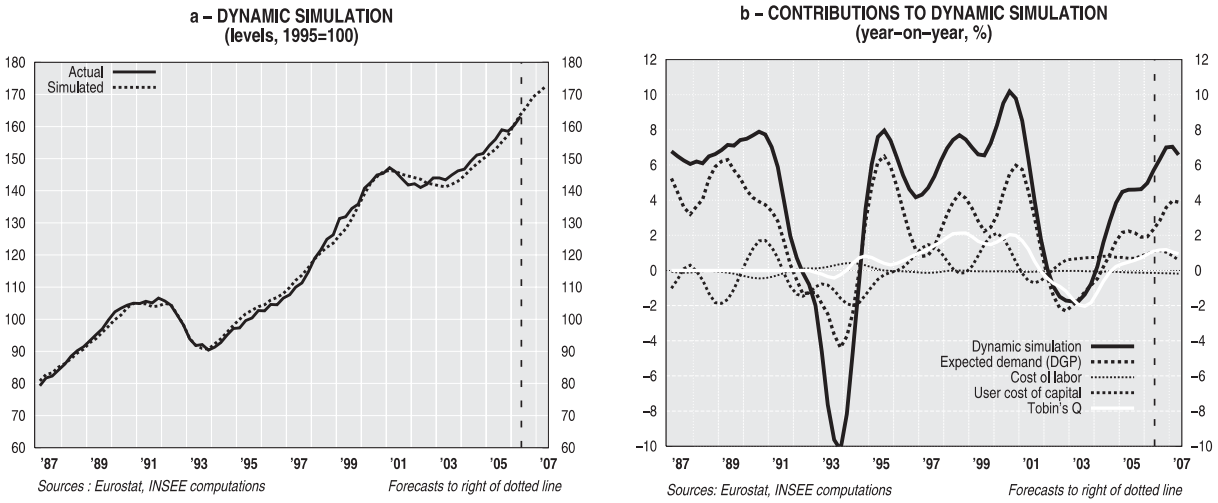
EURO ZONE - EQUIPMENT INVESTMENT EQUATION



Sources : Eurostat, INSEE computations — Forecasts to right of dotted line

Sources: Eurostat, INSEE computations — Forecasts to right of dotted line

single quarter in 2003, returning swiftly to its trend rate. As a result, the accelerator effect[2] is automatically less perceptible in the current cycle, including the cyclical trough and the upswing. Comparing the present investment cycle with that of the 1980s, we find a more robust acceleration in the recovery period lasting 1-2.5 years after the cyclical trough.

In this time interval, businesses thus responded to demand for their products with stronger investment. As regards the economic cycle, it now bears a close resemblance to that of the 1980s, with a rather steady rise in GDP, especially in the pre-trough period.

Lastly, by way of illustration, investment growth in the United States[3] has been weaker than in previous cycles, gaining only 23.4% in the first 18 quarters of the current cycle versus 51.8% at the start of the 1991 cycle and 42.9% at the start of the 1982 cycle *(Chart 1f)*. Unlike France, the United States is therefore posting a sluggish investment rate for this stage of the cycle: the bursting of the new-technologies bubble required a long downward adjustment of equipment investment. Thus, the U.S. situation most closely resembles that of Germany.

In Germany, investment is apparently no longer restricted by firms' financial weakness; in France and the euro zone, it seems to have moved back in line with the changes in its standard determinants at the end of the period

The figures presented above reveal major behavioral differences between France, the euro zone, and Germany, as well as between this cyclical phase and earlier ones. This finding is an invitation to deepen our analysis by examining key determinants of the investment decision: expected demand, relative changes in production-factor prices, and the market supply of financing (represented by average Tobin's Q). The contribution of these determinants largely explain investment dynamics in the euro zone.

Through econometric analysis, we can plausibly show that Germany entered an overinvestment period in the early 2000s, which later required an adjustment. The latter was all the more significant as firms faced tighter access to finance because of high indebtedness and the restructuring of the banking system. This period now seems over, and investment has picked up briskly since 2004. France tells a different story: its firms do not appear to have overinvested in the early 2000s like their German counterparts, but investment revived sooner than one would have expected from the changes in the determinants reviewed here.

The current investment cycle seems relatively consistent with its determinants in the euro zone

The econometric estimate of an investment equation reveals the 2003 equipment-investment recovery in the euro zone to be consistent with the changes in its

2. The accelerator principle states that any variation in demand, proxied here by changes in GDP, generates a more than proportional variation in investment. This phenomenon is explained by the fact that capital goods participate in the production process beyond the period of their acquisition. The effect is maximal under the following assumptions:
- Productive capacity is close to saturation; if this is not the case, then, when demand rises, firms will prefer to increase their equipment utilization rate rather than invest.
- Capital productivity is constant (i.e., there is no technical progress).
- The increase in demand must not be temporary, otherwise firms, instead of investing, may either raise their selling prices (to rebalance supply and demand) or intensify the use of their equipment.
3. Comparisons between U.S. and European data on equipment investment should be made with caution, because of the differences in product classifications.

Table 1: Quarterly contributions to investment growth in slowdown phases

(%)

	Euro zone		Germany		France	
	Cycle 1	Cycle 2	Cycle 1	Cycle 2	Cycle 1	Cycle 2
Expected demand (GDP)	-0.5	-0.1	-0.3	-0.4	-0.6	-0.1
Cost of labour (HWC*)	0.0	0.0	-0.8	-0.1	-0.1	0.1
User cost of capital (UCK)	-0.3	0.0	0.3	0.2	0.0	0.0
Tobin's Q	0.0	-0.2	-0.1	-0.2	0.1	-0.3
Trend	0.5	0.3	0.2	0.2	0.2	0.2
Dummy variable	-0.7	-	-	-	-	-
Simulated investment	-1.0	-0.1	-0.7	-0.3	-0.4	0.0
Actual investment	-1.0	0.0	-0.6	-0.6	-1.0	0.2

** Hourly wage cost*
Cycle 1 → from Q3 1990 to Q3 1993
Cycle 2 → from Q2 2000 to Q2 2003
Source : INSEE computations

Table 2: Quarterly contributions to investment growth in recovery phases

(%)

	Euro zone		Germany		France	
	Cycle 1	Cycle 2	Cycle 1	Cycle 2	Cycle 1	Cycle 2
Expected demand (GDP)	0.9	0.6	0.6	0.6	0.6	0.7
Cost of labour (HWC*)	0.0	0.0	-0.1	0.0	0.0	0.0
User cost of capital (UCK)	0.0	0.2	-0.1	0.5	0.0	0.0
Tobin's Q	0.2	0.2	0.2	0.1	0.2	0.1
Trend	0.3	0.3	0.2	0.2	0.2	0.2
Simulated investment	1.5	1.3	0.9	1.4	1.1	1.1
Actual investment	1.1	1.1	0.6	1.3	1.6	1.1

** Hourly wage cost*
Cycle 1 → from Q3 1990 to Q3 1993
Cycle 2 → from Q2 2000 to Q2 2003
Source : INSEE computations

determinants *(Chart 4)*. However, the estimate shows mild overinvestment at the start of the cycle, due to a revival that was premature particularly with respect to the demand curve. The phenomenon persisted in the following quarters, until investment returned to the equilibrium determined by the model. The main cause of this one-time differential appears to be the special position of investment in France *(see below)*.

In sum, the high investment rate relative to this cyclical phase can be explained by changes in fundamentals. During the decade, the euro zone underwent major structural changes, foremost among them the implementation of Economic and Monetary Union and a greater nationalization of the capital market. By analyzing the determinants' contributions to investment growth as estimated by our equation, we can specify how the structural changes may have affected the cycle.

First, business owners' demand expectations, as measured by the concurrent change in GDP, had a broadly similar influence on the investment curve in the present cycle relative to the previous one. Investment fluctuated far less sharply around the 2003 trough than it did in the 1990s. The pre-trough economic slowdown was thus milder in the current cycle than in the early 1990s. The result was a more moderate disinvestment, and the ensuing business acceleration similarly failed to match the pace recorded a decade earlier. In the end, demand seems to have exerted less downward pressure on investment in the business downturn, trimming it by an average 0.1 points per quarter between Q2 2000 and the 2003 trough, versus 0.5 points between Q3 1990 and Q3 1993 *(Table 1)*. Demand has also provided less momentum to the investment recovery in the current cycle: the data point to an average contribution of 0.6 points to quarterly investment growth in the three years after the 2003 cyclical trough, against 0.9 points in the equivalent period after the 1993 trough *(Table 2)*.

Conversely, the more positive trend in interest rates during this cycle (captured in our estimations by the "factor cost" variables) has sustained investment, whereas relative factor cost did not contribute to investment growth after Q3 1993 (0.0 points on average): long-term interest rates in the euro-zone countries stayed high throughout 1994, despite central banks' accommodative policies. By contrast, in the recovery phase of the 2000s, the steady decline in long-term interest rates seemingly dampened the economic slowdown and kept the user cost of capital moving on a positive track for investment (average contribution of 0.2 points). Not only did the introduction of the single currency substantially improve the monetary-policy credibility of the entire zone, but the abundance of liquidity from other regions of the world exerted a downward pressure on long-term interest rates *(Pluyaud 2006)*.

Lastly, financial-market volatility has risen sharply since the 1990s. This has tended to signal wider fluctuations in expected return on investment (represented by average Tobin's average Q) and—all other things being equal—in investment itself. However, the average contribution of this financial

variable to simulated investment was identical in the last two recovery periods.

Despite disruptions at the start of the cycle due to firms' heavy indebtedness, German investment appears to have returned to equilibrium at the end of the period

As in the euro zone, the German cycle of the 2000s is characterized by narrower swings in demand, with a gradual economic pickup following a far milder slowdown than in the 1990s *(Chart 5a)*.

However, factor prices moved very differently in Germany compared with the euro zone, and in the 1990s compared with the 2000s. In 1993, after the EMS crisis, aggregate real interest rates in the euro zone rose sharply, whereas real interest rates fell in Germany, contributing positively to investment growth via the user cost of capital. But this positive contribution was more than offset in the short run, in 1993 and 1994, by the sharp rise in wages after reunification (although, in the long term, the rise in real wages tended to promote substitution of capital for labor and therefore, at a given growth rate[4], to drive up investment).

By contrast, at the start of Germany's current cycle, the contribution of factor prices soon became positive, as in the euro zone, but on a larger scale. This was due to (1) strong wage restraint, resulting in a near-zero contribution from the cost of labor, and (2) a positive trend in the user cost of capital, connected to the stepped, continuous decline in real interest rates and in the price of equipment investment. Consequently, the average contribution of relative factor price to investment growth was estimated at -0.2 points per quarter in the three years after the 1990s trough, and at +0.5 points in the equivalent period after the 2000s trough.

The specific feature of the German investment slowdown in the early 2000s was the sharp reaction to the adjustment process in the financial markets, after the over-appreciation of the 1999-2001 period. The decline in average Tobin's Q admittedly signals weaker financial positions and more difficult access to finance for firms, but does not fully explain the scale of this trend.

This phenomenon is perceptible in the breakdown of investment-finance sources in Germany. The gap between investment and savings was particularly wide at the peak of the cycle, in the late 1990s: despite their weak savings, non-financial corporations invested heavily. To do so, they relied massively on loan borrowings. But the later adjustment was just as violent. To reduce their indebtedness, German firms curtailed investment, boosted savings, and cut back on net bond purchases. As Box 1 shows, these shifts in business financing set Germany apart from the other major European countries.

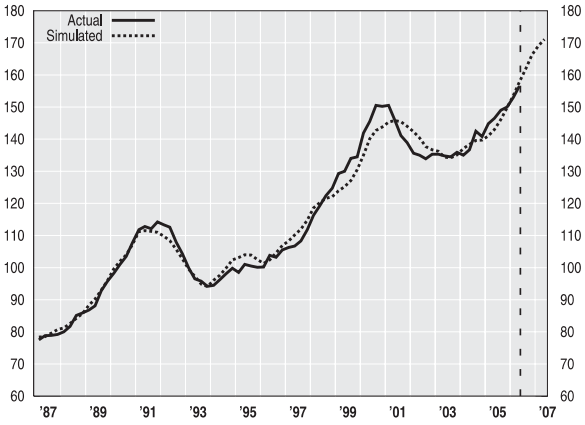
Admittedly, the causality direction between investment and credit is not predetermined: the decline in net loan borrowing by German firms in the early 2000s may have been due to an investment cutback tied to factors such as an economic slowdown. However, in this specific case, the post-2001 contraction in German investment seems to have been driven both by (1) a deliberate effort by firms to lower their loan outstandings in order to restore their financial position, and (2) a reduction in the banks' credit supply. The cause of latter phenomenon appears to be the erosion of banking profitability, itself due to

4. The total effect of a wage rise on investment should, however, allow for the fact that wage increases also depress economic growth—most notably by eroding competitiveness—and therefore weaken investment. Thus the overall effect is not necessarily positive.

5

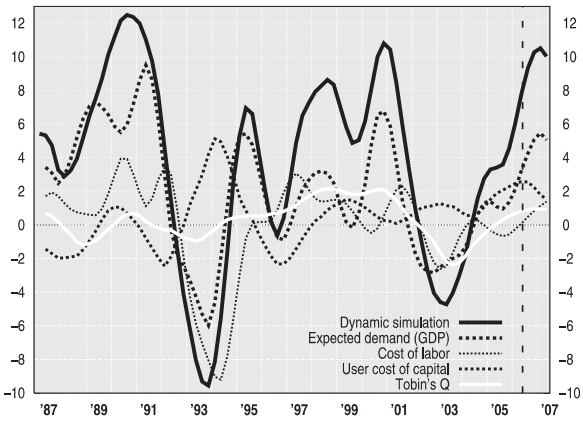
GERMANY - EQUIPMENT INVESTMENT EQUATION

a – DYNAMIC SIMULATION
(levels, 1995=100)



Sources: Eurostat, INSEE computations *Forecasts to right of dotted line*

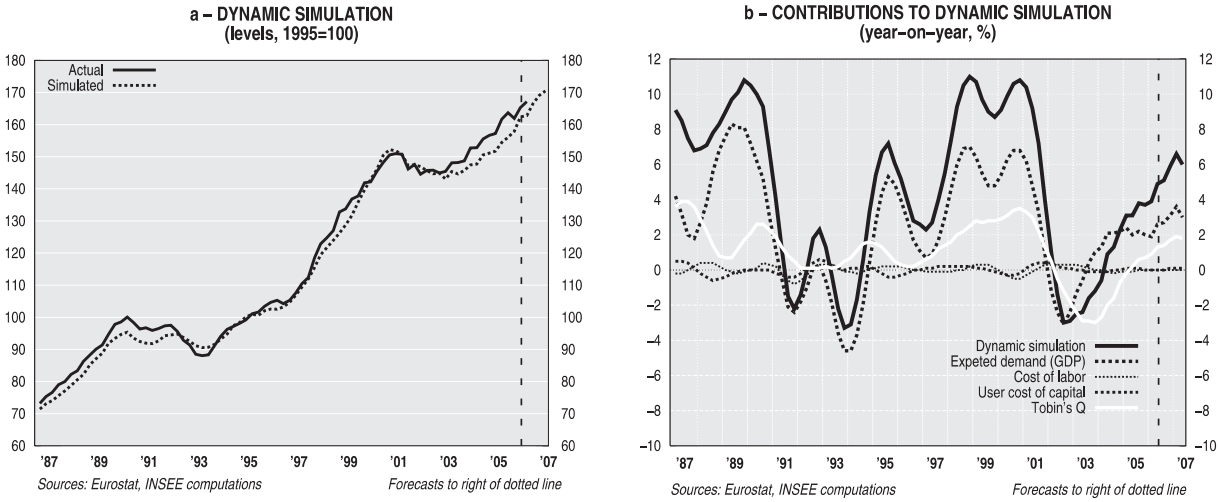
b – CONTRIBUTIONS TO DYNAMIC SIMULATION
(year–on–year, %)



Sources: Eurostat, INSEE computations *Forecasts to right of dotted line*

6

FRANCE - EQUIPMENT INVESTMENT EQUATION



the financial-market downswing and weaker economic activity—amid stiffer competition and a tightening of bank-supervision regulations. Indeed, several studies have identified an excess of credit demand over supply in Germany in 2001-2002 *(KfW (2005), Nehls and Schmidt (2004), Schumacher (2006))*.

By contrast, relatively to the euro zone as a whole, supply factors seem to have weighed less than demand factors in the weakness of German firms' net loan borrowings since 2003 *(KfW (2005))*. If we compare the results of the ECB bank lending survey for Germany and the euro zone, we find that German banks toughened their lending standards in 2003-2004, but not significantly more than euro-zone banks: for the two-year period, the average balances of positive and negative responses in Germany and the euro zone are identical. However, slack corporate demand seems to have undermined borrowings in Germany far more than in the euro zone in the same period: the survey finds an average 14-point gap between the respective balances.

This would explain the substantial disinvestment by German firms in 2001-2002, but also the vigor of their catch-up since 2004, once they had achieved their debt reduction: by the end of the period, the dynamic simulation of investment converges toward the actual level.

French firms have invested heavily since mid-2003

In France's case, the current cycle is rather atypical in terms of firms' investment rate, which remained relatively high even in the cyclical trough *(see above)*. Investment seems more robust than what determinants would indicate for the years 2003-2005. By the end of the period, nearly all the "excess" investment appears to have been absorbed.

According to the behavior equation, most of France's equipment investment is explained by two determinants: changes in GDP and financial conditions measured by Tobin's Q. The other two determinants (factor prices for labor and capital) have a marginal influence on investment variations. In the recovery phases of the current and previous cycles, the accelerator effect predominates, contributing 0.6-0.7 points per quarter to investment growth. Financial profitability also plays a role, but a less decisive one.

In terms of changes in the full set of determinants, the French investment rate does not seem to have behaved atypically during the economic slowdown of the early 2000s. By contrast, the investment recession observed in the early 1990s remains partly unexplained. The investment rate's fluctuations in this period were far more pronounced than what our model would suggest.

A share of French equipment investment, however, remains unexplained by the behavior equation, for we observe overinvestment by firms between 2003 and 2005 *(Chart 6a)*.

There are three explanations for this:

- First, Tobin's Q used in the equation measures only firms' liabilities and ignores their assets. The period before the bursting of the Internet bubble saw major mergers and acquisitions. In 1998-2000, firms' equity purchases surpassed their equity issues. By contrast, in 2003-2005, firms' net equity issues were largely positive and thus generated funds for investment. This phenomenon is specific to France among the major euro-zone countries *(Chart C in Box 1)*. It shows that firms had no difficulty in raising funds on financial markets and therefore

in financing investments that might not have been financed in other periods.

- Second, the introduction of the 35-hour workweek may have promoted the substitution of capital for labor. Many agreements stipulated that wages would be maintained at their current levels and be subject to smaller increases in the initial years following the introduction. This may explain a share of the excess investment recorded in 2003-2004 and the return to normal from end-2005 on, insofar as the limited variability of the cost of labor during the equation's estimation period leads to a low estimated elasticity of investment and therefore makes it impossible to account for the effect.
- Third, the early-2004 implementation of a reduction in the business tax (taxe professionnelle) on new investment may also have contributed to the gap between actual investment and simulated investment. First, this tax measure lowers the cost of investment. Second, while it has since been made permanent, the reduction initially applied only to investments made between January 2004 and June 2005, and may therefore have spurred firms to anticipate their planned investments during the period. ■

BOX 1: RECENT CHANGES IN INVESTMENT FINANCING IN THE EURO ZONE

After paying their expenses (intermediate consumption, wages and salaries, interest, dividends, taxes, etc.), firms are left with savings that can cover all or part of their investment expenditures. Firms can also finance investment from external sources by issuing securities (stocks and bonds) or taking out loans.

Since 1999, the corporate self-financing ratio-i.e., firms' savings divided by their total investment-has been trending up slightly in the euro zone. However, the overall pattern masks sharp differences between the main countries in the area. While the rate rose significantly in Germany, it fell in France, Spain, and Italy *(Chart A)*.

Firms' self-financing ratio may be viewed as the relationship between their saving rate (savings/value added) and investment rate (gross fixed capital formation/value added). The investment rates of non-financial enterprises in the leading European countries have relatively similar profiles: a decline after 2000 and an upturn starting around 2004. By contrast, the saving-rate profiles for the euro zone and its main countries are similar to those of the self-financing ratios, with a rise for the euro zone as a whole and Germany, but a decline in Spain, Italy, and France. The saving rate for French firms, which exceeded that of German firms in 1999, fell below it in 2005. One of the main reasons was that the margin ratio has risen sharply for German firms but has eased slightly for French firms since 1999.

Using national accounts, we can identify other sources of investment financing. In national accounting, the sum of savings by non-financial incorporated enterprises and capital transfers is allocated between gross fixed capital formation, inventory changes, net acquisitions of valuables, and net acquisitions of non-produced non-financial assets. The result is a balance that consists in net lending if positive or net borrowing if negative. This balance is also equal to the difference between the changes in financial assets and financial liabilities, allowing for a statistical discrepancy to reflect methodological differences between financial and capital accounts *(Table A)*.

From these accounting equalities, we can break down investment in several ways. We thought it would be relevant to separate corporate saving and investment, as well as firms' main sources of financing. To make the charts more legible, we have displayed financing and investment transactions in net-change terms (changes in liabilities minus changes in assets). The breakdown chosen is therefore the following:

Gross fixed capital formation

= Gross savings

- Other capital-account items and statistical discrepancies

+ (Change in shares and other equities issued - change in shares and other equities held)

+ (Change in borrowings - change in loans held)

+ (Change in other financial liabilities - change in other financial assets)

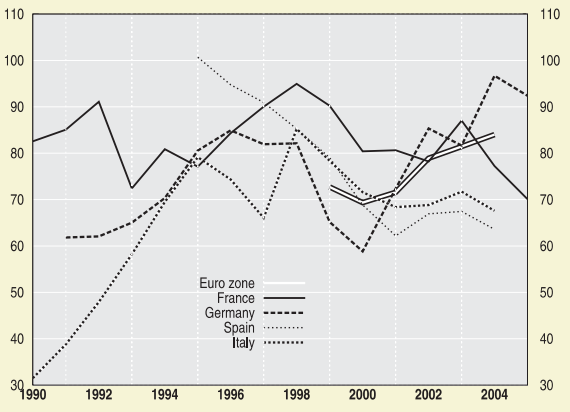
For the euro zone as a whole, investment exceeded savings between 1999 and 2004, but the gap has been narrowing—a phenomenon that corresponds to the rise in the self-financing ratio described earlier *(Chart B)*. The gap was substantially filled in the previous cyclical peak by a large contribution of net borrowings. This contribution diminished in the following years.

These developments were chiefly due to the situation in Germany *(Chart C)*. Between 1999 and 2001, German firms relied on loan debt to make up for their weak saving/investment ratio. In later years, German non-financial incorporated enterprises sharply reduced their net loan borrowings. In exchange, they invested less, saved more, and cut back on their net bond purchases.

In France, investment posted gains between 1999-2001 and 2002-2004, while saving stagnated. In book-keeping terms, for the period 2002-2004, the saving-investment gap was filled mainly by a net increase in loan borrowings

A

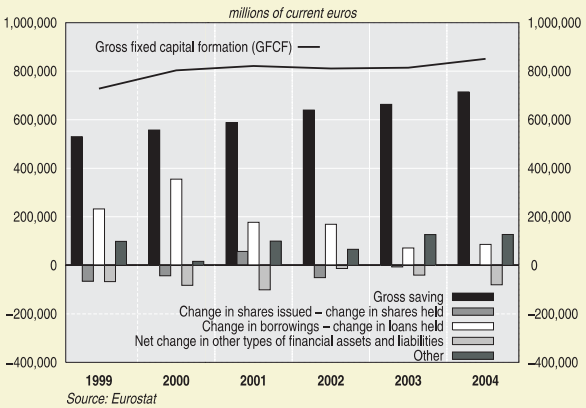
SELF-FINANCING RATIO OF NON-FINANCIAL INCORPORATED ENTERPRISES
(GROSS SAVING/GFCF)



Source: Eurostat

B

EURO ZONE – CHANGE IN GFCF AND CONTRIBUTIONS



Source: Eurostat

Table A : Simplified table of capital account and financial account of non-financial incorporated enterprises

ASSETS	LIABILITIES
Capital account	
Gross fixed capital formation	Gross saving
Changes in inventories	Capital transfers
Net acquisitions of valuables	
Net acquisitions of non-produced non-financial assets	
Net lending / Net borrowing	
Conversion from capital account to financial account	
Net lending / Net borrowing	Net changes in financial assets and liabilities
Adjustment for financial/non-financial accounts	
Financial account	
	Net changes in financial assets and liabilities
Monetary gold and special drawing rights	Monetary gold and special drawing rights
Currency and deposits	Currency and deposits
Securities other than shares	Securities other than shares
Loans	Loans
Shares and other equities	Shares and other equities
Insurance technical reserves	Insurance technical reserves
Other accounts receivable/payable	Other accounts receivable/payable

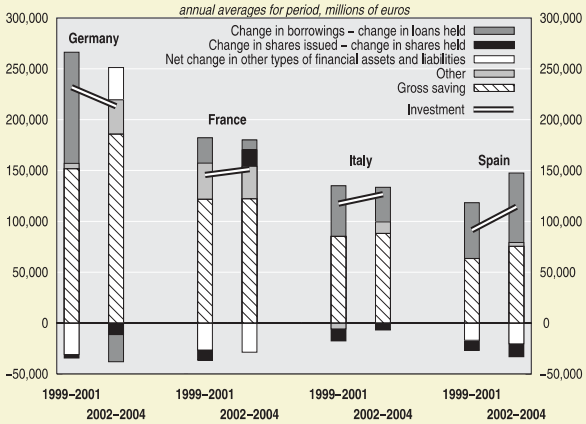
but also by a net rise in equity issuance. The contributions of other items are sizable, but carry opposite signs. They notably include commercial loans and advances, as well as adjustments between financial and non-financial accounting methods.

In Italy, as in France, investment remained relatively buoyant while saving stalled. Firms relied heavily on loan borrowings in 2002-2004.

Spain, as well, registered heavy loan borrowings-indeed, at a very vigorous pace-in the recent period. Firms did save more, but they also took advantage of highly favorable credit terms to grow their investments robustly and their net acquisitions of assets. ■

C

CHANGES IN BREAKDOWN OF INVESTMENT FINANCING, BY COUNTRY



Source: Eurostat

BOX 2: ESTIMATION OF INVESTMENT EQUATIONS

Data used

We have confined our study to equipment investment for two reasons: (1) it is the investment component that responds most readily to cyclical fluctuations; (2) this restriction enables us to ignore the sometimes heterogeneous developments observed in the construction industry, which are very often shaped by strictly national forces.

We calculated equipment investment from Eurostat series, aggregating the following headings: "metal products and machinery," "transport equipment," and "other products." Some specific processing operations were required:

* We backcast the German series on the basis of pre-reunification growth rates in former West Germany.

* For the euro zone before 1995, we backcast the series used from national data available on an exhaustive basis over the period (France, Germany, Italy, Spain, and Netherlands, or 85% of the zone's GDP).

Theoretical framework

Our modeling assumes two types of firms: (1) demand-constrained firms, which determine their investment according to demand-captured here by GDP-and to changes in relative factor costs; (2) firms for which the overriding criterion for investment is return on capital. The latter group is captured by Tobin's Q, which measures the ratio of a firm's market value to the value of its capital assets: when Q>1, the return on an investment exceeds its cost and the firm should therefore invest; when Q<1, the cost outweighs the return, and the firm should therefore not invest.

In formal terms, the investment equation is written

$$\log(I_t) = \log(GDP_t) + \alpha \log(RPx_t) + \beta \log(Q\_Tobin_t) + \delta t$$

with:

I: equipment investment

GDP: real GDP

RPx: ratio of price of labor to price of capital. The price of labor is represented by the hourly wage cost (HWC) deflated by value added prices. The price of capital is modeled by the user cost of capital (UCK), which is equal to: (price of the investment) x (real interest rate + annual depreciation rate of capital assets) / value-added prices. The labor-productivity trend should be subtracted from this variable. Here, the effect is simply captured by the term δt.

Q_Tobin: Tobin's Q, measured here by the ratio of the firm's market value to its productive fixed assets.

Estimation strategy

As all the variables included in the equation are integrated of order 1, we assume a cointegration relationship to estimate an error-correction model for the quarterly growth rate of equipment investment.

For relative factor prices, we consider two modeling approaches. Over the long run, the first model uses the relative price as suggested by theoretical models. The second treats factor prices separately. In the latter case, investment may display different short-term responses to a shock on each price. This hypothesis is, in fact, confirmed in all our equations.

The estimation involves two problems created by breaks in continuity. The first break concerns the German equation and occurred on January 1, 1991, with reunification. The second, later break (Q3 1992) was due to the devaluation of the Italian lira and affects the euro-zone equation. We modeled these breaks in the series by means of breaks in the equations' deterministic variables, but they are significant only for the euro-zone equation (Johansen et al. (2000)).

Presentation of long-term equations

Table A recapitulates our models for the three geographic entities studied. The long-term elasticity of investment with respect to GDP is normalized to unity. The elasticity of investment relative to financial profitability is fairly similar for all the geographic areas examined.

By contrast, elasticity with respect to the price ratio is very strong for Germany, near-zero for France and, consequently, in mid-range for the euro zone: the impact of this variable is therefore very different depending on the geographic unit. The response functions shown in the chart below highlight these differences.

Presentation of short-term equations

Table B recapitulates our short-term models for the three geographic entities studied. The order of magnitude of the error-correction mechanism is similar for all three.

The response functions enable us to describe how determinants act on investment after a permanent shock (Chart):

- For a unit shock on demand, the accelerator effect peaks after three quarters at nearly 2 for the euro zone and 2.4 for Germany. In France, the impact is milder, peaking at only 1.7. Consistently with our model, elasticity decreases, tending to unity in the long term.
- For a shock on average Tobin's Q, the response increases most sharply in the first two years. Germany and the euro zone display similar elasticities; by contrast, France posts a slightly higher value, particularly beginning in the third quarter after the shock.
- For a shock on the price of the labor factor, both the short-term and long-term elasticities are very different according to the geographic unit. In France, the shock generates a slightly negative elasticity in the early

months, followed by a near-zero value after the first six months. In the euro zone, elasticity rises in the first two years, then stabilizes at just under 0.2. In Germany, the shock has a far stronger impact, with a different dynamic pattern from that of France and the euro zone as a whole: in the first year, elasticity rises very quickly to almost 0.8; it then diminishes but stays above the values found in the other geographic entities studied.

- A shock on the price of capital has the opposite long-term effect of the previous shock. Elasticity is near-zero in France and very negative in Germany. The euro zone is half-way in between, with an elasticity converging to -0.18 in the first 30 months. ■

Table A : Long-term relationships

Variable		Euro zone	France	Germany
GDP		1.00 (c)	1.00 (c)	1.00 (c)
Price ratio (HWC / UCK)		0.18 (0.09)	0.02 (0.06)	0.30 (0.08)
Q_Tobin		0.08 (0.03)	0.10 (0.03)	0.08 (0.04)
Intercept		0.01 (0.00) 0.01 (0.00)	0.01 (0.00)	0.01 (0.00)
Trend	period 1 period 2	0.68 $\times 10^{-2}$ (0.06 $\times 10^{-2}$) 0.33 $\times 10^{-2}$ (0.10 $\times 10^{-2}$)	0.24 $\times 10^{-2}$ (0.11 $\times 10^{-2}$)	0.23 $\times 10^{-2}$ (0.06 $\times 10^{-2}$)

Standard deviations in parentheses
For the euro zone: period 1 = before Q3 1992, period 2 = from Q3 1992 on

Table B : Short-term relationships

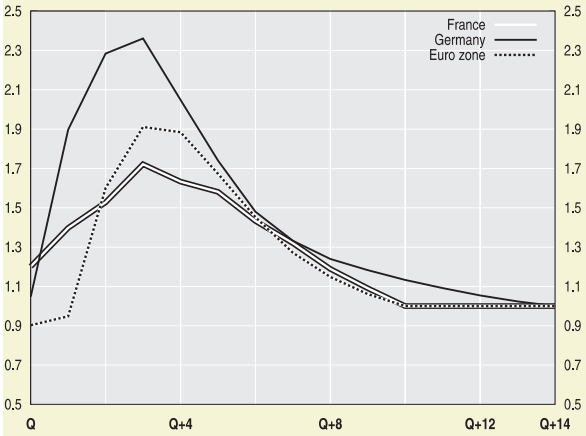
Variable	Lag	Euro zone	France	Germany
Error-correction mechanism	-	-0.17 (0.03)	-0.15 (0.03)	-0.15 (0.03)
Intercept	period 1 period 2	0.74 (0.02) 0.71 (0.02)	1.88 (0.01)	9.09 (0.00)
ΔI	1	0.07 (0.08)	ns	0.20 (0.09)
	2	0.24 (0.09)	0.37 (0.08)	0.14 (0.09)
	3	-0.14 (0.09)	ns	-0.15 (0.09)
ΔGDP	0	1.16 (0.21)	1.49 (0.18)	1.14 (0.20)
	1	ns	0.32 (0.21)	0.73 (0.20)
	2	0.60 (0.24)	-0.28 (0.23)	0.27 (0.21)
	3	0.67 (0.25)	0.28 (0.19)	0.31 (0.21)
ΔQ_Tobin	0	0.02 (0.01)	0.03 (0.01)	0.01 (0.01)
	1	ns	ns	ns
	2	ns	-0.02 (0.01)	-0.01 (0.01)
	3	ns	0.02 (0.01)	ns
ΔHWC	0	ns	0.26 (0.18)	ns
	1	ns	ns	ns
	2	ns	-0.30 (0.19)	0.40 (0.12)
	3	ns	ns	0.29 (0.12)
ΔUCK	0	ns	ns	ns
	1	0.01 (0.01)	ns	ns
	2	0.01 (0.01)	-0.01 (0.01)	0.04 (0.02)
	3	0.01 (0.01)	ns	0.05 (0.02)

Standard deviations in parentheses
For the euro zone: period 1 = before Q3 1992, period 2 = from Q3 1992 on

Equipment investment in France and the euro zone

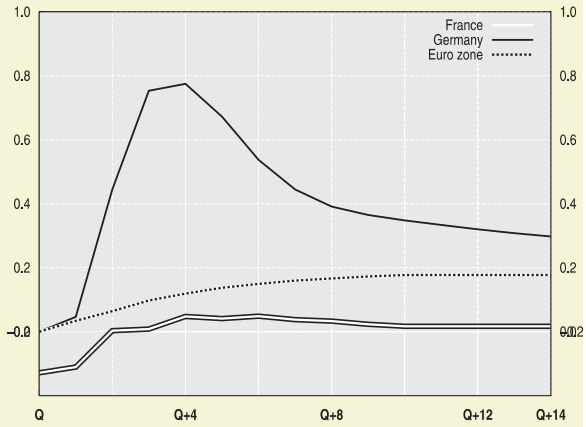
ELASTICITIES OF BEHAVIOR EQUATIONS

a – EXPECTED DEMAND



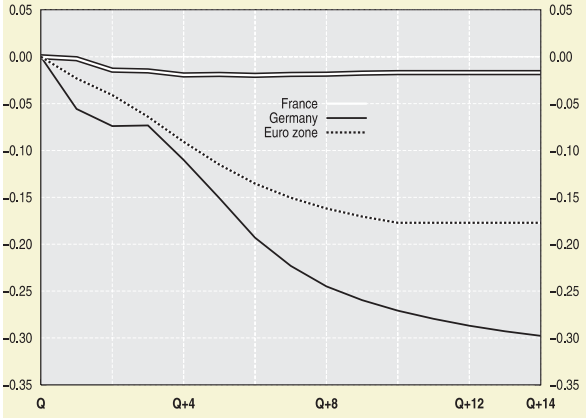
Source: INSEE computations

b – HOURLY WAGE COSTS (HWC)



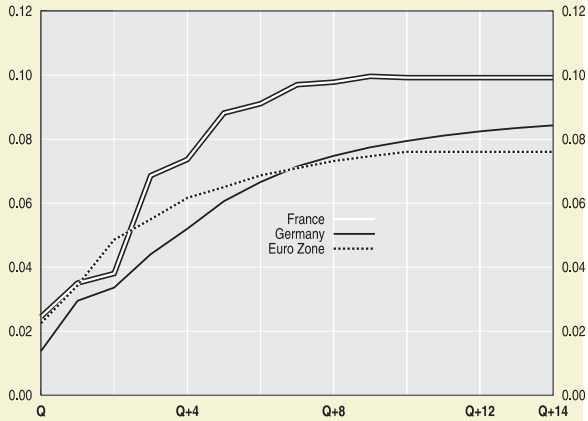
Source: INSEE computations

c – USER COST OF CAPITAL (UCK)



Source: INSEE computations

d – TOBIN'S Q



Source: INSEE computations

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