

# The influence of structural changes on market functioning and its implications for monetary policy: a focus on the euro area

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## 1. Introduction

The last decade has been characterised by dramatic changes on financial markets: the development of electronic trading on foreign exchange markets or the introduction of the euro, for example, have had a significant impact on euro money, bond and equity markets. These changes have also been fostered by technical and financial innovations.

Amongst these changes, the paper focuses on three major themes:

- (i) The change in the relative supply of private debt securities, and the growing importance of credit markets.
- (ii) The spread of electronic trading and of distribution platforms.
- (iii) Factors which could amplify market dynamics.

Section 2 of the paper tries to assess whether and how these changes have impacted on euro area capital markets. In this fact-finding exercise, we gather some of the stylised facts that have emerged over the last decade and compare them with what has been evidenced for the United States or the United Kingdom.

Section 3 concentrates on some of the possible consequences of these recent changes for central banks' policies, with a particular focus on monetary policy. More specifically, we try to analyse their plausible impact on the choice of relevant indicators used for the setting of monetary policy, but also on the transmission mechanism through the growing role of financial markets, and ultimately on the implementation of monetary policy.

## 2. Structural developments affecting market functioning

### 2.1 Changes in the relative supply of government and private debt securities

Whereas in a period of rising public deficits such as the 1980s the policy debate focused on the negative externalities of government debt (eg "crowding-out" effects), recently the implications of fiscal consolidation for financial markets have highlighted the positive externalities of government securities eg as providers of benchmark interest rates and the difficulty of finding satisfying substitutes (IMF (2001)).

While the declining stock of US Treasury securities has already had significant implications for market participants and US policymakers, fiscal developments in the euro area have had much less of an impact on the bond market. However, other factors, triggered by the introduction of the euro, have also contributed to a structural evolution of the euro area bond market.

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<sup>1</sup> Bank of France. The views expressed in this paper are those of the authors and do not necessarily reflect the opinion of the Bank of France.

The launch of the EMU process has had far-reaching implications for euro bond markets:

- The implementation of the Stability and Growth Pact has involved a gradual strengthening of member countries' public finances, therefore reducing the net borrowing requirements of governments.
- The introduction of the euro in 1999 has accelerated the integration of bond markets across the euro area, intensified competition amongst issuers, particularly sovereign issuers, and boosted euro-denominated bond issuance by private sector borrowers both within and outside the euro area.

As a result, the euro area's bond market structure has shifted. The outstanding stock of government bonds fell from 55% of the total bond stock before the introduction of the euro to 50%.

Table 1  
**Outstanding long-term euro-denominated securities  
other than shares by sector of issuer**  
(as a percentage of total)

	<b>Banks</b>	<b>Non-monetary financial corporations</b>	<b>Non-financial corporations</b>	<b>Government (central and other general)</b>	<b>International organisations</b>
End-1998	35.5	3.1	4.4	54.8	2.2
End-1999	35.2	4.5	5.1	53.0	2.0
End-2000	36.1	5.3	6.8	50.0	1.8

Source: *ECB Monthly Bulletin*, Table 3.6.

### **2.1.1 Implications of the levelling-off of the euro government bond market and of remaining barriers to integration**

Medium-term budgetary consolidation in the major industrialised countries, except Japan, has resulted in a decline in government debt-to-GDP ratios. However, whereas the launch of EMU has involved a generalised improvement of member states' public finances, this decline has been less significant in the euro area than in the United States or in the United Kingdom and has, in addition, affected the euro area member countries unevenly.

Table 2  
**Government debt**  
(as a percentage of GDP)

	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001 f</b>	<b>2002 f</b>	<b>2003 f</b>	<b>2004 f</b>
<b>Euro area</b>	<b>75.4</b>	<b>74.8</b>	<b>73.0</b>	<b>72.0</b>	<b>69.6</b>	<b>67.9</b>	<b>66.0</b>	<b>63.8</b>	<b>61.8</b>
Italy	122.1	120.1	116.2	114.5	110.2	106.6	103.5	99.6	94.9
Germany	59.8	60.9	60.7	61.1	60.2	58.0	57.5	56.5	54.5
France	57.0	59.3	59.7	58.7	58.0	56.9	55.2	54.0	52.3
Spain	68.1	66.7	64.7	63.4	60.6	58.9	56.6	52.8	49.6
Belgium	130.5	125.3	119.8	116.4	110.9	105.8	101.4	97.2	92.9
Netherlands	75.2	70.0	66.8	63.2	56.3	52.3	50.2	48.7	46.7
<b>United States</b>	<b>73.9</b>	<b>71.4</b>	<b>68.3</b>	<b>65.2</b>	<b>58.8</b>	<b>55.0</b>	<b>51.7</b>	–	–
<b>Japan</b>	<b>86.5</b>	<b>92.0</b>	<b>103.0</b>	<b>115.3</b>	<b>122.9</b>	<b>130.5</b>	<b>138.3</b>	–	–

f: forecast.

Sources: Euro area and member countries: *ECB Monthly Bulletin* (1996-2000), stability and convergence programmes (2001-2004); United States and Japan: OECD.

The government debt-to-GDP ratio in the euro area declined for the fourth consecutive year in 2000 to 69.6% and is expected, according to the stability and convergence programmes of the member countries, to fall further to 61.8% in 2004.

Under these assumptions, the growth of the six largest national government debt compartments in terms of outstanding stocks (Italy, Germany, France - these three countries representing about three-quarters of the total stock - followed by Spain, Belgium and the Netherlands, in that order) and, more generally, of the euro area government bond market can be expected to level off during the period 2001-04, whereas the absolute size of government securities markets in countries with fiscal surpluses such as the US Treasury debt market has been declining sharply since 1998.

Consequently, government securities markets in the euro area are set to surpass the US Treasury market in terms of amount outstanding.

Table 3  
**Size of government bond markets**  
(outstanding stock in billions of US dollars)

	Face value		Market value
	2000	2002	2000
Euro area	2,834	2,900	2,430
United States	2,993	2,438	1,740
Japan	3,626	4,115	1,733

Source: Galati and Tsatsaronis (2001).

However, the euro area government bond market is not a fully integrated market yet as, despite progress achieved, some barriers to full integration persist, notably in the fields of market infrastructure, tax treatment and legal harmonisation.

Moreover, the multiplicity of sovereign issuers in the euro market and differences, albeit small, in their credit standing continue to distinguish the euro market from its US counterpart.

Member states with limited issuing volumes offer a spread over benchmark greater than that justified by differences in credit ratings (Deutsche Bank Research (2001)). Owing to this liquidity premium, spreads between government bonds of smaller and larger member countries have tended to widen marginally in the third stage of EMU despite the elimination of exchange rate risks and an upgrading of some countries, thus preventing the emergence of a single benchmark curve. In addition to market size as measured by outstanding stocks, these developments are also influenced by the existence (or not) of liquid futures markets that offer investors adequate hedging possibilities.

Intensified competition for the same pool of funds, fostered by the relatively high level of homogeneity between government bonds, has resulted in national treasuries implementing a number of measures aimed at attaining benchmark status by improving the liquidity of the secondary market:

- Buybacks and bond exchanges have been implemented to retrieve illiquid debt instruments.
- Over the past few years, sovereign issuance has concentrated on the 10-year segment of the yield curve to boost the liquidity of these "benchmark" bonds; moreover, the average size of individual public issues has increased, bringing outstanding amounts of individual 10-year bond issues of the largest euro area issuers to figures comparable to US Treasury benchmarks.
- For maturities other than 10 years, sovereign issuers, particularly smaller issuers, have tended to concentrate on strategic "niches" at different points along the yield curve.

As a result, no individual government securities market can offer the depth<sup>2</sup> and spread of issuance and, consequently, provide the range of services associated with a benchmark status across the entire yield curve (pricing of private fixed income instruments, management of liquidity and trading positions in securities markets, hedging of risks, etc). However, since corporate financing in the euro area does not yet rely to a great extent on securities markets (see 2.1.2), this drawback should be mitigated.

The implications for the liquidity of the euro area government bond market and, more generally, for the functioning of the financial system as a whole of the trend towards a sustained budgetary consolidation, which could, however, be threatened in a medium- to long-term perspective by the consequences of the ageing of populations (BIS (2001)) and of a still imperfect integration, have been addressed in the technical field, for example by an enhanced harmonisation of technical standards regarding public bond issuance in euros between sovereign issuers (eg similar coupon calculation conventions). More radical responses, such as fully coordinated debt issuance by the member countries of the euro area in order to foster a broader and deeper market for government securities (eg creation of a multilateral agency), are problematic, both technically and institutionally: the market is probably not yet ready to accept instruments with mixed credit ratings; moreover, cross-government guarantees are not consistent with the Maastricht Treaty.

Table 4  
**Euro area government long-term debt by sector of holder**  
(as a percentage of total)

	Domestic creditors <sup>1</sup>				Other creditors <sup>2</sup>
	Total	MFIs	Other financial corporations	Other sectors	
1997	76.4	38.8	19.3	18.3	23.6
1998	73.4	37.0	22.2	14.2	26.7
1999	69.8	35.2	20.5	14.0	30.2
2000	66.9	33.8	19.5	13.6	33.1

<sup>1</sup> Holders resident in the country whose government has issued the debt. <sup>2</sup> Includes residents of euro area countries other than the country whose government has issued the debt.

Sources: IMF (2001) and *ECB Monthly Bulletin*, Table 7.2 for the year 2000.

While still imperfect, integration has nevertheless improved on the secondary market with the removal of some obstacles to geographical diversification within the euro area brought about by the introduction of the euro, such as regulations restricting currency mismatches on institutional investors' balance sheets or by an increased integration of securities settlement systems. The share of government debt securities held by "domestic" investors (ie holders resident in the country whose government has issued the debt) has decreased from 73.4% in 1998 to 66.9% in 2000. "Non-domestic" (ie euro area residents and foreign investors) creditors' holdings account currently for one third of the total stock of euro area government debt securities, reflecting a lesser "national bias" of euro area investors and, more generally, an increasing internationalisation of the euro bond market.

<sup>2</sup> For example, the single largest borrower, the Italian Treasury, accounts for no more than 30% of the outstanding stock of euro-denominated government securities.

## 2.1.2 Implications of the increasing importance of the private euro bond market

Liquidity is rising in the private segment of the euro area bond market, with issuance having accelerated sharply since the beginning of 1999. The overall outstanding amount of private bonds increased by 16% in 1999 and by 12% in 2000. Non-euro area issuers are particularly active in the market: their share of the total outstanding amount rose from 13% at the end of 1998 to 18% in 2000. Private issuance in general has been stimulated by the introduction of the euro, which has brought about a widening of the investor base and reduced government issuance, and by other structural factors such as the funding requirements associated with large mergers and acquisitions or related to the deregulation of telecommunications companies and to changing technologies such as the sales of UMTS licences.

Bonds issued by financial institutions still dominate the market, reflecting the importance of bank finance in continental Europe (eg "Pfandbrief-style" mortgage bonds), banks being the main channel of financing for euro area corporates and partly relying on capital markets for their own financing. Financial institutions seem to have benefited the most from a "crowding-in" effect since their issuance, generally at initial maturities of 10 years or above, ie in the maturity range most particularly affected by the retrenchment of the public sector, has increased in nominal terms. However, the corporate segment of the market, which remains concentrated in the shorter segment of the yield curve, has been very dynamic, particularly the non-resident segment.

Table 5  
**Outstanding long-term euro-denominated long-term private securities**  
 (as a percentage of total)

	Euro area residents			Non-residents			
	Banks	Non-monetary financial corporations	Non-financial corporations	Banks	Non-monetary financial corporations	Non-financial corporations	International organisations
End-1998	73.9	4.9	7.6	4.6	1.9	2.2	4.9
End-1999	69.5	6.8	6.9	5.6	2.9	3.9	4.4
End-2000	65.6	7.6	8.8	6.6	3.1	4.8	3.5

Source: *ECB Monthly Bulletin*, Table 3.6.

The lag in the response of euro area corporations can be related to the fact that relatively few firms in the euro area (less than a third) had credit ratings at the time of the introduction of the euro since bank finance is predominant.

Consequently, whereas the euro government bond market is comparable in size to the US Treasury market, the euro area non-government securities market represents less than one third of the US dollar market, which is characterised by more active markets for corporate financing and for mortgage-backed securities.

However, non-government issuance is generally expected to remain relatively buoyant in the medium-term as non-bank finance grows further. As euro area private markets grow in importance, especially the corporate market, so will the need for reliable benchmarks for pricing private bonds and managing liquidity and trading positions in securities markets. The growth in the issuance of corporate bonds together with the lack of a single, clearly defined benchmark sovereign yield curve has already enhanced the depth of the euro swap market.

Moreover, the expansion of the corporate bond market has encouraged diversification of bond portfolios into "credits" and will stimulate the development of new segments of the market such as credit derivatives.

Table 6  
Size of non-government bond markets in 2000

	Outstanding stock (billions of US dollars)	Sector of issuer (percentages of total non-government debt outstanding)		
		Financial institutions	Corporates	Government sponsored enterprises
Euro area	3,964	73.2	17.7	6.3
United States	13,222	41.2	24.8	14.4
Japan	2,577	39.8	34.0	25.0

Source: BIS (2001).

## 2.2 Electronic trading systems: from theory to reality

Among the numerous structural changes that have taken place on financial markets during the last decade, the sudden emergence of the “new technologies” is one of the most striking, as it, potentially at least, affects the infrastructures of the markets in their entirety, from the trading desks of wholesale market participants and brokers to the settlement and clearing processes, from the institutional investor to the retail participant. In Europe, organised markets (for instance stock exchanges and futures markets) have led this move towards electronic devices, rapidly followed by the forex market and, at a later stage (in the wake of the monetary unification process), by bond and interest rate markets.

Basically, one can distinguish three groups of electronic platforms that cover the whole range of market activities:

- *Transaction platforms*, which match reciprocal interests from market participants, and allow transactions to be completed electronically; due to safety considerations, these platforms tend to use secured/proprietary telephone lines.
- *Distribution systems*, which are customer-oriented and allow a participant to centralise order flows from his clients and help secure his customer relationship. For cost considerations, these systems usually rely on internet-based technologies. While the initial approach was a bilateral one (between one market participant and his clients), the second generation of these platforms took a different approach, allowing a client to simultaneously access offers and services from a range of participants.
- *Issuance/initial offering platforms*, allowing issuers to reach more directly a wider range of final investors. These platforms are still at a very preliminary stage of development.

The following developments will mostly concentrate on the impact of these changes on wholesale over-the-counter markets (foreign exchange and interest rate markets).

When considering the changes that are being brought about by the spread of electronic systems, a crucial aspect is to assess whether these changes translate into a better functioning of financial markets, on an ongoing basis, and increase their stability and resilience in periods of stress. While, theoretically, the electronic revolution has the potential to deeply transform the functioning of financial markets, the magnitude of its impact up to now has been limited.

### 2.2.1 A better functioning of financial markets?

In theory, various characteristics of electronic markets can be considered as leading to an overall improvement in the functioning of financial markets.

A wide dissemination of accurate information, a large base of participants and investors and a liquid secondary market are among the key requirements for an efficient functioning of financial markets. Potentially, the technical changes brought about by the dissemination of new technologies are susceptible to improving the functioning of financial markets on these three scores, ultimately leading

to lower costs (as the marketplace becomes more competitive and technology more affordable) and allowing for increasing volumes.

#### *2.2.1.1 Brokerage activities*

The spread of electronic devices fundamentally alters the way brokerage has been traditionally conducted on OTC markets. Voice brokers are facing increasing difficulties to remain competitive when confronted with electronic platforms that offer automation possibilities (for instance, automated links with futures markets, allowing for immediate hedging, constant updating of prices and spread relations, etc), real-time execution and increased reliability at low unit costs. Indeed, on the forex market, electronic systems such as EBS or Reuters Dealing already capture most of the professional flows on the major pairs of currencies. The move towards electronic devices is also rapidly gaining momentum on bond markets, as traditional brokers turn electronic (Cantor's E speed) and new platforms develop (BrokerTec, the MTS family).

#### *2.2.1.2 Market-making and market liquidity*

Aside from pure brokerage systems, some bond market platforms impose market-making obligations on their participants, in order to guarantee a certain level of liquidity in the system. Such liquidity risk sharing agreements between participants are not new in essence (primary dealership frameworks often implicitly rely on a similar approach), but their implementation through electronic systems allows for a more systematic enforcement.

These market-making commitments are also expected to revive trading activity on "off-the-run" securities, which traditionally suffer from a lack of interest from market participants, due to a greater degree of illiquidity, translating into wider bid-offer spreads: once market-makers feel more comfortable with the structural liquidity of these securities, they will show more willingness to post their interests.

Electronic platforms on the bond market are more and more systematically offering connection functionalities with netting/clearing systems, a move that also has to be seen as positive in terms of market liquidity as it decreases bilateral counterparty risks for participants and thus frees up resources.

#### *2.2.1.3 Transparency and price discovery*

The development of electronic platforms allows for a wider and more rapid spread of information among the community of market participants, thus translating into a faster integration of new pieces of information into prices, a higher level of transparency in the price formation mechanism, and ultimately leading to more homogeneous pricing patterns (curve arbitrage). An illustration of this can be found in the ability of some platforms to give their participants a detailed picture of the pending interests in the marketplace, and a sense of the depth of the market.

This increased transparency is expected to benefit not only market professionals, but also, ultimately, final investors, who can take advantage of this improved dissemination of information on prices and volumes.

### **2.2.2 *The full effect of the electronic revolution remains to be seen***<sup>3</sup>

A preliminary appraisal of the move to electronic markets leads to mixed conclusions: while electronic platforms have been able to gain market shares in the most widely traded market segments, their impact on the functioning of these markets remains limited.

#### *2.2.2.1 A quantitative assessment of European interest rate markets*

Bond markets: a mixed picture

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<sup>3</sup> Coverage of the following developments relies extensively on information provided by S Lange and C Stevant (from the Bank of France Front Office Division).

- *Inter-dealer markets*: electronic systems are seen nowadays as capturing more than 50% of market-makers' cash volumes, with the MTS platforms being considered the main beneficiaries of this trend. However, it is worth noting that the average size of trades remains small (€10 million) and that trading is still concentrated on a limited set of benchmark bonds.
- *Dealer-to-customer markets*: the use of ET systems is significantly less pronounced than on the inter-dealer market, and is estimated to represent about 5% of the total business.

Money market cash transactions: a high level of concentration

- The leading European electronic platform is e-MID, which has an average daily turnover of €15 billion, a significant volume compared to the declared EONIA volumes (€40 billion). Liquidity appears highly concentrated both in terms of maturity (an overwhelming share of the business is done on the O/N and T/N segment of the market) and as regards the participants.

Repo markets: a rapid development

- Electronic platforms represent about 8% of the global market activity. However, it is widely considered that this segment (for GC transactions, especially on short maturities) is potentially among the fastest growing ones as ET capabilities could significantly reduce back office costs. The market appears spread between two major platforms.

Derivatives and corporate markets: still marginal

- Electronic trading in derivatives has remained quite limited up to now.
- Various platforms (notably the MTS family) now offer a “credit segment” (Pfandbrief-type bonds, supranational and agency bonds) as a complement to the initial government bond segment. However, activity remains largely concentrated on the latter. A reason for this lack of activity, despite the introduction of market-making commitments and strict listing requirements, might be that activity on the corporate market is mostly driven by final investors' demand, and thus follows a much less active pattern than government bonds.

#### 2.2.2.2 *Limited impacts on the functioning of financial markets*

As mentioned above, electronic markets can be expected to lead to more transparency in the price discovery mechanism and to more liquid markets. However, observation of day-to-day market functioning, during quiet periods as well as under stress conditions, leads to mixed conclusions.

Transparency remains limited

- While transparency is a plus for the market community as a whole, it does not necessarily serve the interests of each and every participant systematically. More specifically, major participants in a market segment can prove reluctant to “publicise” their trading interests (even anonymously) through electronic platforms for fear that it could alter their execution conditions. Hence, big size trades are often executed outside these platforms, or spread between different devices. Consequently, the market picture given by the electronic systems can easily prove incomplete and biased.
- It remains to be seen if the development of electronic systems has narrowed the existing gap between the major market participants that are able to participate in the different existing systems, and thus have a “global picture” of the marketplace, and a “second tier” group of market participants that gravitate around the former and are not in a position to fully benefit from the capabilities offered by the new information technologies.

Liquidity lacks resilience

- Contrary to initial expectations, the development of electronic platforms, especially when supplemented with market-making commitments, does not automatically lead to an improvement in market liquidity. Market-making has for years been affected by decreasing margins and low returns on capital. This trend has indeed been reinforced in recent years as new information technologies have strengthened the position of the “buyer's side” (investors) at the expense of the “seller's side” (market intermediaries). Hence, the business of making prices for the market community appears less and less affordable to the vast number of market participants, and more and more concentrated among a small group of major market participants. Consequently, there is the fear that liquidity, an ill-compensated risk, will prove



even more fragile, because increasingly dependent on a small number of global players, as electronic platforms gain market share.

- While this might not be a major problem in quiet times, it could prove detrimental to the market's functioning in periods of stress, when the number of market-makers willing and able to provide liquidity might shrink. Such episodes of liquidity gaps have been experienced during recent years on the forex market. An illustration of the difficulty encountered by market-makers can be found in the behaviour of the euro bond markets following the events of 11 September 2001 in the United States: the sudden deterioration of market conditions translated into a widening of bid-offer spreads that made market-making commitments on the platforms unrealistic to fulfil. Participants on the MTS and Eurex platforms decided to stop carrying out their market-making obligations and returned to the "old-fashioned" but more flexible way of trading.

## **2.3 Some potential sources of amplification of market dynamics<sup>4</sup>**

We will focus here on some factors that can be seen as prone to amplifying market dynamics but that are not specific to the euro area. While different in nature, what these factors have in common is to focus on the behaviour of market participants. The analysis of the financial market events of 1998 has clearly shown that, in times of market stress, the combination of short-termism, herding behaviour and a generalised use of similar risk management techniques could amplify the homogeneity of behaviours and contribute to market disruption and the spread of difficulties from one market segment to another. It should be noted that, up to now, markets have shown a higher degree of resilience than might have been feared in the aftermath of the tragic events of September 2001.

### **2.3.1 Imitation in behaviours: can they be rational attitudes?**

Numerous research projects have been devoted to studying the role of imitation, among market participants, in the dynamics of asset prices, and the development of asset bubbles and their subsequent collapse. Departing from the theoretical approach that considers the "standard" investor a rational person deciding on an investment strategy on the basis of an objective and up-to-date set of information, these approaches insist on the importance of interactions between market participants in their decision-taking process, and more specifically in the way they treat information. Such interactions help explain why contagion phenomena can take place, translating into excess volatility and leading ultimately to the development of asset bubbles: in a simplistic way, an irrational (valuation) situation can be defined as a situation where decisions based on expectations regarding other participants' behaviour spread among participants and take the lead over decisions based on a fundamental analysis.

However, as shown by Kindleberger (1978), concluding that the global outcome (the situation prevailing on the market at some point in time) is irrational does not necessarily mean that market participants individually have behaved irrationally in the first place.

Indeed, imitation, when considered from the individual's point of view, can be seen as a rational behaviour. Orléan (2001), for instance, offers an interesting classification of rational imitation patterns, distinguishing three different sorts of behaviours:

- *Informational imitation*, as it may be more judicious for a participant to herd with better informed participants than to acquire the needed information. As long as market prices can be considered as reflecting fundamental values, less well informed participants will be better off using these prices than conducting their own costly research and analysis. However, as shown by Grossman (1975 and 1976), as the incentive to collect information diminishes, so does the content of fundamental information encapsulated in the price. Unfortunately, the moment when a collection of individual rational imitation behaviours turns into a collective irrational pattern cannot be determined *ex ante*. A distinction is traditionally drawn between

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<sup>4</sup> An in-depth analysis of factors amplifying the financial cycle will appear in the Bank of France's November 2001 monthly bulletin.

“insider” and “outsider” investors, the former category encompassing well informed market professionals, having direct access to the market (fund managers, for instance), and the latter represented (mostly) by individual investors that do not benefit from the same tools, background and experience. Such a switchover from rationality to irrationality is all the more likely to happen as the number of “outsiders” grows. However, it would be too simplistic to infer that professionals are not prone to such behaviours.

- Even when (and if) participants realise that the market is moving away from what fundamentals would justify, it can still make sense for them individually to ignore such signals and feed the momentum. Once the existence of an asset bubble is recognised, the behaviour of the participants will depend on their estimation of when it will burst, ie on the probability that it will do so before the participants exit the market. As long as the potential rewards of investing in the bubble are seen as exceeding the rewards of retreating on a non-inflated asset, rationality commends feeding the bubble. In such circumstances, markets can be prone to *self-fulfilling imitation*. The analysis of informational cascades (Lee (1998)) shows how participants can chose to do so and deliberately ignore their own negative signals.
- Such situations are especially liable to happen as market participants, like any human group, have an inclination to generate a common set of rules and beliefs that will drive their behaviour and understanding of events, leading to a tendency to conformism. Once established, this consensus will not easily be challenged, translating into some sort of *conventional imitation*. Such a set of common beliefs does not need to emerge *ex ante*, and help trigger the movement. It can indeed materialise *ex post*, once the bubble has already inflated, and help justify its development. For instance, the virtues of the “new economy paradigm” and the idea that traditional valuation tools were inadequate to appreciate the movements in internet stocks to a large extent appeared after the stock market had already made most of its upward move.
- As mentioned above, it would be oversimplistic to consider, based on a rigid distinction between “insider” and “outsider” investors, or “informed” and “uninformed” investors, that only the outsiders/uninformed participants can succumb to such behaviours. On the contrary, there are reasons to believe that all kinds of market participants can be “victims” of these imitation biases and participate in herding. Institutional fund managers, for instance, because of the way their performance is measured, can be inclined to follow such imitative patterns. As the industry of fund management makes intensive use of benchmarking to judge the performance of its members, there is a natural tendency to appreciate one’s performance on a relative basis (compared to one’s peers) rather than on an absolute basis. This is all the more true when fund managers are compensated according to their market share: the risk of underperforming the “average” manager seems to be given more weight than the potential reward of outperforming. In the same vein, herding has been evidenced among stock analysts and investment newsletters (see, for instance, Jondeau (2001) for a survey of herding behaviour in financial markets).
- “Large players: are they destabilising?” Herd behaviour can be observed on markets whose agents are small and atomistic. However, a strand of the literature has investigated both theoretically and empirically the role of large players, ie agents with market power on market dynamics, in particular in currency crises. The main finding can be summarised as follows (Corsetti et al (2000)): the presence of a large player injects a degree of strategic fragility into the market. The influence of large players is not mechanically related to size, as measured by the value of asset holdings or market share (Corsetti et al (2001)). It depends also on the fact that they are better informed (or perceived to be better informed<sup>5</sup>), able to build sizeable short positions via leverage and prompt to react to a change in fundamentals. Consequently, their strategies provide a “focal point” for speculative behaviour, in particular for smaller investors prone to herd on their positions. Therefore, the presence of a large player makes

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<sup>5</sup> Analysing the results of a survey of US-based foreign exchange traders, Cheung and Chin (2001) find that some smaller segments of the market are believed to be dominated by a few big players. Large players are perceived to have a better customer and market network and, consequently, to have better information.

other investors more aggressive. Globalisation might incite smaller players to herd. Calvo and Mendoza (1996) show that the increasing number of countries available for international investment reduces the incentive of individual investors to acquire costly country-specific information, especially for highly diversified investors. Accordingly, investigating international US bank lending, Barron and Valev (2000) find that small US banks follow the behaviour of large banks: private lending by small banks responds primarily to private lending by large banks with regard to which countries to lend to. Moreover, they follow large banks to a greater extent in countries where there is more persistence in economic conditions (ie where prior investment behaviour provides valuable information about the current state of the economy).

### **2.3.2 Index management: is it neutral on market dynamics?**

Index management began developing dramatically during the 1970s, in parallel with the modern portfolio theory by Markowitz (1959) and works on market efficiency by Fama (1970). Modern portfolio theory states that, in an “efficient” market, a diversified portfolio guarantees an optimal performance: in such a market, where every piece of new information is immediately and fully reflected in the price of financial assets, an investor cannot systematically beat the market as a whole (the market is considered here as a proxy for the optimal market portfolio). Hence, it is wiser, and less costly, to mimic the market, through a diversified portfolio that replicates its global performance, than to actively trade the market (stock picking/stock selection).

The idea of efficiency, which constitutes the ground on which the index investment approach is built, is a complex notion, still under discussion among academics. This issue will not be discussed here.

By definition, index management offers a performance close to that of the reference index, at a low cost. As the turnover of the portfolio is limited, transaction costs, as well as research costs, are reduced. As a matter of fact, management fees associated with index funds are in general below 0.5%, against 0.8 to 1.2% for actively managed funds. Indeed, competition among index funds tends to concentrate on management fees, as performances appear, by construction, very similar. In addition, the tax treatment is usually also more favourable than on an actively traded portfolio.

However, some issues arise when considering index management:

#### *2.3.2.1 From the theoretical framework to the practical approach*

- The theoretical approach to index management implicitly considers that stock returns are distributed according to a normal distribution, which means that, among the shares that constitute the index (the portfolio), none contributes to the global performance for a proportion significantly different from the average contribution. If so, the index can be considered as the “average” stock. On the other hand, if the distribution of returns is not normal, then the contribution of each and every stock is meaningful, and “stock picking” and the skills of the fund managers become significant contributors to the global performance. The portfolio is then seen as a collection of particular stocks. Whether or not stock returns are distributed according to a normal distribution appears to be increasingly discussed in the literature. This question is of special interest when markets deviate from their “normal” pace and show either very high or very low levels of activity: in both cases, the performance of a portfolio compared to its benchmark index will crucially depend on the ability of the manager to pick up the right mix of assets.
- The above developments regarding imitation in behaviours have shown that the Efficient Market Hypothesis can be called into question: according to Grossman and Stiglitz (1980), under costly information, no equilibrium-efficient markets can exist. Similarly, one has to recognise that the very restrictive assumption of the CAPM (identical investment horizons, and homogeneous beliefs regarding asset returns and covariances among investors, unlimited access to short selling/borrowing) is hardly met in reality.
- Strictly speaking, a true index management approach should not be limited to an asset class (shares, bonds), as each of these classes represents only a fraction of the global universe of tradable assets, but should encompass all the categories of risky assets available on the market. Limited to a sole asset class, this approach ends up favouring an asset category to the detriment of the other ones, and thus risks distorting their relative prices. The same remark holds within an asset class when index management is excessively focused on a

specific index or family of indices (the major stock indices, for instance: in the United States, some 75% of index funds replicate the S&P 500 index). Interestingly, while active fund managers regularly underperform the major stock indices, they keep on overperforming the less widely known indices and the specialised ones. As regards index management on the stock markets, the question arises whether the inability of active fund managers to beat the S&P 500, for instance, is due to the intrinsic superiority of index management or to the excessive weight of the indexed management approach on the market for the shares that compose this index. Additionally, it would be worth examining which part of the overperformance of index funds comes from the tax effect.

While active fund managers are usually less diversified within a single asset class (an active stock manager generally does not own all the S&P 500 components), they are indeed usually more diversified among various asset classes, owning, as a complement to the core investments, cash/money market products and/or bonds. This diversification can act as a cushion in adverse market conditions, a comfort that does not benefit “pure” index funds. Indeed, it is interesting to note that new types of funds have been attracting renewed attention recently, following the stock market correction: “all-in-one” funds, which pool stocks, bonds and cash, either through a mix of actively traded funds or through index funds. As of 20 June 2001, the three-year annualised return on some of the largest of these “all-in-one” funds was ranked from 10.9% to 3.1%, depending on the mix of assets of each of these funds, compared with +4.9% for the S&P 500 index over the same period.

#### 2.3.2.2 *On the dynamics of market prices: is there a risk of an “index bubble” as the growth of indexation interferes with market pricing efficiency?*

What is at stake is the question of whether or not index management introduces a bias in the dynamics of prices. Three aspects of this general question are worth mentioning:

- The development of index management means that there are more “passive price follower” investors and market participants and fewer active ones. As such, one can ask whether this phenomenon impacts on the quality of the price discovery mechanism: not only are asset prices being determined by a decreasing group of market participants, but at the same time these prices are undisputed, and, to some extent, “ratified” as a whole by the community of passive investors. In essence, passive management looks like a “free rider strategy” that by definition cannot be generalised: in a world where passive management would dominate, relative prices of assets would stop carrying any information about the underlying issuers (but indexers by definition are insensitive to relative value), while absolute prices would only reflect the magnitude of the global flow of funds.
- Everything else being equal, index replication tends to amplify short-term market movements. Faced with a rise (a drop) in the price of a particular stock that will change its weight in the index, the index manager will be mechanically led to increase (decrease) its position on this specific share, thus amplifying the initial price movement (see, for instance, Artus and Orsatelli (2001)). This can act as a strong disincentive for active managers to trade on fundamental views, as there is less guarantee that mispricing will soon be corrected. On the other hand, one can consider that active managers will be tempted to “front run” passive managers and implement strategies based on index additions and deletions.
- The increasing demand for indices (for replication purposes as well as for performance measurement) raises the question of the influence of the “index industry” as a whole on the behaviour of markets, as indices are not neutral as regards market price dynamics. The decision to include a specific share in an index is likely to lead to the appearance of a “price bias” (whether this bias is a permanent or only a temporary phenomenon remains open among academics). While such a (upward) bias appears justified to some extent as it reflects the liquidity premium attached to the said stock, it might be magnified through the amplification mechanism of the “passive” imitation attached to index managing. This might be even more the case when the weight of a specific stock in an index does not adequately reflect its actual “tradable/investable” quantities, ie when its weight is based on its total capitalisation instead of being derived from its “free float”. In this respect, it is welcomed that the major index providers have now embarked on a process of adjusting their index building methodology to reflect the “true” market capitalisation of their index components (ie free float). More generally, these potential problems clearly show the crucial importance of securing well designed/objective (ie representative) index constitution processes.

The use of capitalisation-weighted indices can lead to disturbing, or even aberrant situations. Such phenomena have been well publicised on equity markets, especially in continental Europe as former state-owned companies were progressively brought to the market. But they can also appear on fixed income markets: for instance, the sheer increase in Japanese government bonds in recent years, while the relative supply of bonds in some other government markets was declining (in the United States and the United Kingdom notably), has translated into a growing weight of JGBs in bond indices, leaving indexers with no choice but to increase their allocation of Japanese bonds, at a time when these bonds not only offer historically low yields but are also subject to rating downgrades.

Lastly, the distortion that indices can contribute to creating between stocks when one is included in the index and not the other is not neutral for the firms themselves as it translates into distortions in their respective cost of capital.

Ultimately, what is questionable is not the idea of passive management through the replication of an index, but the extensive use of standard indices that are supposed to represent “the market” as a whole. For an investor, defining a theoretical portfolio that matches his investment goals (in terms of duration, risk profile, sector allocation, etc) and replicating this portfolio or its profile is obviously the sensible approach. But the replication of a standard “market portfolio” implicitly leads to the puzzling idea that in the world of investment “one size can fit all”. Indeed, tailor-made benchmarks and indices entail more costs than using standard indices, and thus reduce the traditional cost advantage that is supposed to be enshrined in index management.

In this respect, the development of “all-in-one funds” as well as the move towards a “core/satellite” portfolio approach (the combination of a core, passively managed portfolio and aggressively managed satellite portfolios) can be seen as potentially significant improvements on the traditional indexing approach, as they imply a higher degree of diversification and give increased weight to the manager’s judgment. However, it is clear that the border between a “traditional” active management and the “core/satellite” approach is difficult to draw precisely.

### **2.3.3 The use of value-at-risk (VAR) techniques**

VAR/DEAR (daily earnings at risk) calculations have become the standard approach implemented by market participants to assess the risks deriving from their financial market activities, whether they act as market-makers or investors. These approaches have also been encouraged by supervisors who have promoted market-sensitive risk management systems over recent years. Both the 1996 amendment of the Basel Accord on regulatory capital for market risk and the new capital adequacy framework are illustrative of this new climate. Position limits are frequently defined, and consequently stop-losses triggered, according to this risk management framework. As such, VAR calculations obviously represent useful tools for market participants as they help them quantify and monitor more precisely the risks inherent in their market activities.

However, it is legitimate to ask if what can be rightly regarded as beneficial at the level of each firm remains positive when considering the community of market participants as a whole: can an attitude that may be considered rational at the level of the firm become counterproductive when simultaneously adopted by numerous participants?

A series of weaknesses in the VAR approach have been identified, and feed these concerns:

- By construction, VAR models fail to take into account the feedback effects on market conditions that result from the implementation of decisions based on their signals. As stated by Shin et al (2001), “by their nature [these] systems treat the uncertainty governing asset returns as being exogenous” and “fail to take into account [...] the fact that the behaviour of market participants is affected by the adoption of these techniques, creating a feedback effect on the whole financial system”. It is quite surprising to see that while the day-to-day observation of market participants’ behaviour shows that they treat market risk (defined here as the impact on market behaviour of their own decisions and the decisions of their peers) as endogenous, the risk management systems they use do not.
- Models developed by Shin et al (2001), but also by Artus (2001), show puzzling consequences of the widespread use of these risk management techniques: a general tendency for prices of risky assets to be undervalued, a greater instability of their equilibrium prices, and a global decline in market liquidity. Somehow, the use of VAR techniques translates into a permanent increase in the market’s level of risk aversion. However, this level of risk aversion keeps on fluctuating with the current market situation, and becomes

especially constraining in periods of stress, thus amplifying market disruptions and contagion phenomena at the worst time.

If a greater focus on risk management techniques and on internal models and ratings might contribute to financial stability in general, the combination of market participants' behaviours, prone to herding, index management and the spread of identical tools for the analysis of risks might deliver the opposite result in periods of market stress. In such periods, the lack of diversity amongst behaviours and techniques might result in the disappearance of market counterparties, or market-makers, and quite sharply reduce market liquidity. Besides these financial stability issues, recent changes have also impacted on the way central banks operate.

### 3. Impact on central banks' policies

The deep changes recently observed on financial markets have directly impacted on the transmission mechanism of monetary policy: for example, technical changes are likely to have improved financial markets' efficiency, from which one might expect a greater responsiveness of both prices and real activity to monetary policy impulses.

As a consequence, both the tactics and the implementation of monetary policy have to deal with and adapt to this new environment.

#### 3.1 Should monetary policy react to asset prices?

The greater role played by financial markets and their potential effects on the real economy have recently raised the issue of whether monetary policy should react to financial prices, and more generally to asset prices. Not only could the large swings observed on asset prices endanger price stability, which is the primary objective of most central banks, but also they could impinge upon financial stability.

Recent papers addressing this issue are far from having reached a consensus: in their seminal paper, Bernanke et al (1999) advocate that central banks should ignore movements in asset prices that do not appear to generate inflationary or deflationary pressures. Conversely, elaborating on the same model, Cecchetti et al (2000) conclude that central banks should react systematically to asset price bubbles in many cases.

In order to assess these conclusions, we slightly modify the framework of Bernanke et al (1999) by introducing various monetary policy rules, depending or not on asset prices. Then, we try to analyse the welfare implications of these rules by assuming the central bank is seeking to minimise a loss function à la Rudebusch and Svensson (1999):

$$L = \lambda_{\pi} \text{Var}(4 \times \pi_t) + \lambda_y \text{Var}(y_t) + \lambda_r \text{Var}(r_t) \quad (1)$$

where  $(4 \times \pi_t)$  stands for the annualised inflation rate,  $y_t$  is the output,  $r_t$  the nominal interest rate and  $\lambda_{\pi}$ ,  $\lambda_y$  and  $\lambda_r$  the weights assigned to these variables by the monetary authority. All the objective variables are expressed in deviations from their steady state levels.  $\text{Var}(x)$  stands for the unconditional variance of  $x$ . The weights respectively take the values of 1, 1 and 0.5 as in Rudebusch and Svensson (1999). Since these weights are not uncontroversial, Table 7 below provides an estimation of each component of the loss function.

We consider three different kinds of policy rules: (1) "accommodative", for which the central bank moves its key policy rate according to the changes in expected inflation so as to keep the real interest rate unchanged; (2) "aggressive", for which the central bank overreacts to the changes in expected inflation so as to modify the real interest rate; and (3) a Taylor-like rule, which depends on the output gap, the deviation of the inflation rate from the target (here set equal to zero for convenience) and the lagged nominal interest rate to account for financial stability purposes (interest rate smoothing). Each of these rules is considered in two versions, one of which incorporates the central bank's response to asset prices, with a 10% weight.

Whereas Cecchetti et al (2000) only consider a single scenario of a bubble in asset prices lasting exactly five periods, we try to account for the probabilistic nature of the bubble, and consider the entire

probability distribution of this shock. For each of the envisaged monetary policy rules, we compute out the second moments of the variables by taking averages across 500 stochastic simulations of the model.<sup>6</sup> Four different shocks are embedded in this model: a technological shock, a demand shock, a monetary policy shock and an asset price bubble. As in Bernanke and Gertler (1999), we make the termination point of the asset price bubble probabilistic and assume that the probability of the bubble lasting another period is 0.5. Following Battini and Nelson (2000), we divide our 500 simulations into nine unequal amounts, each associated with the bubble ending after 1, 2, ... 9 periods.<sup>7</sup> The results are provided in Table 7.

Table 7  
**Welfare implications of alternative monetary policy rules**

Forward-looking policy rules	Standard deviations			Loss
	$\sigma(4 \times \pi)$	$\sigma(y)$	$\sigma(r)$	
$r_t^n = 1.01 \cdot E_t \pi_{t+1}$	41.10	13.71	10.23	1,929.91
$r_t^n = 1.01 \cdot E_t \pi_{t+1} + 0.1 \cdot s_t$	26.02	1.14	6.57	700.12
$r_t^n = 2.0 \cdot E_t \pi_{t+1}$	0.22	1.29	0.95	2.17
$r_t^n = 2.0 \cdot E_t \pi_{t+1} + 0.1 \cdot s_t$	0.43	1.19	0.85	1.96
$r_n^i = 0.765 \cdot r_{t-1}^n + (1 - 0.765) \cdot [1.26 \cdot E_t \pi_{t+1} + 0.63 y_t]$	7.26	1.87	1.76	57.68
$r_n^i = 0.765 \cdot r_{t-1}^n + (1 - 0.765) \cdot [1.26 \cdot E_t \pi_{t+1} + 0.63 y_t + 0.42 s_t]$	8.73	1.56	2.07	80.86

Note:  $S_t$  stands for the market asset price.

As shown in the table, responding to asset prices generally reduces the loss incurred by the monetary authorities (comparing (2) to (1), and (4) to (3)). But this is not systematic since, when incorporated in a Taylor-like rule,<sup>8</sup> it may then generate higher losses. Conversely to Cecchetti et al (2000), our results are not sensitive to the parameters of the Phillips curve, which has the features of the New Phillips Curve, described in Gali et al (2000), and is calibrated according to their econometric estimations.

As in Bernanke and Gertler (1999), we find that what is most important to limiting asset price bubble casualties is to implement an aggressive monetary policy since, according to our results, the greater the responsiveness of nominal interest rates to changes in inflation expectations, the lower the loss.

To conclude, even if financial prices provide central banks with useful information about both future activity and prices, they should not directly enter the central bank's reaction function. Furthermore, on practical grounds, it may be very difficult to detect with certainty whether asset price changes reflect the dynamics of fundamentals or rather are due to a bubble.

Needless to say, financial prices must be part of the information set the central bank mobilises when setting its monetary policy. But the recent changes observed on financial markets may also have impacted on their information content.

<sup>6</sup> See Clerc (2001) for details.

<sup>7</sup> Because the probability of a bubble lasting nine periods is the smallest, the number of simulations considering this case is the lowest: out of 500 simulations, only one is dedicated to a bubble lasting nine periods ( $500 \cdot 0.5^9 \approx 1$ ).

<sup>8</sup> The Taylor rule has been estimated on euro area data using GMM. See Verdelhan (1999) for details.

### 3.2 A need for new indicators for monetary policy

Amongst the most important changes observed these last few years, Section 2 of the paper has pointed out some issues raised by the changes in the relative supply of government and private debt securities. The introduction of the euro, the emergence of a euro bond market supported by technical changes, and potentially increased competition amongst European issuers may have impacted on the informational content of government bond yields for the conduct of monetary policy.

Government bonds constitute a traditional indicator for monetary policy. Using the standard Fisherian approach, according to which the nominal interest rate can be explained as the sum of the real rate, expected inflation and a risk premium term, they provide monetary authorities with some information on future economic activity, since the real rate is generally considered as reflecting long-term growth prospects, future inflation and to some extent the uncertainty associated with these expectations, via the risk premium term. Furthermore, when assuming a constant risk premium and a steady real rate, changes in nominal bond yields reflect changes in inflation expectations and, as such, provide central banks with a measure of their credibility.

Since the seminal papers by Harvey (1988) and Stock and Watson (1989), the slope of the yield curve has been considered a useful indicator for monetary policymakers: the performance of this slope, generally measured as the difference between a 10-year government bond's rate and a short-term rate, as a leading indicator of future economic growth has been well established. Estrella and Hardouvelis (1991) for the United States, Estrella and Hardouvelis (1997) for some European countries, Ricart et al (1997) as well as Sédillot (1999) for France, and more recently Hamilton and Kim (2000) have evidenced such a performance. For instance, Hamilton and Kim (2000) compare the slope of the yield curve, computed as the difference between the 10-year Treasury bond and the three-month Treasury bill, to the annualised growth rate of US real GDP and show that the yield curve has flattened or become inverted prior to all seven recessions identified by the NBER.

Recent patterns observed on financial markets may have diminished this information content of government bond yields:

- first, medium-term budgetary consolidation in the major industrialised countries evidenced in Section 2, accompanied by debt buyback programmes in the United States, the United Kingdom and some European countries, provoked an inversion or a flattening of the yield curve in these countries, unrelated to any expectation of a forthcoming recession. Moreover, volatility in government bond yields may have increased due to discrepancies between demand and supply of bonds, therefore reducing their usefulness as leading indicators;
- second, EMU has accelerated the process of integration of financial markets in Europe and created a wide euro-denominated market for government securities. However, as pointed out by the IMF (2001), this market remains segmented. As a consequence, different maturities are characterised by different degrees of liquidity and therefore are not traded in a homogeneous manner across the euro area. In such a context, it is likely that the slope of the yield curve does not convey accurate information about future growth prospects but rather embeds variable liquidity premia;
- third, recent papers by Gertler and Lown (2000) and Dotsey (1998) also show that some standard indicators such as the term spread, which performed well through the 1980s, have lost considerable forecasting power in the last few years. One explanation, provided by Gertler and Lown (2000), relates this reduction in explanatory power to recent changes in the role monetary policy plays in the business cycle.

As a consequence, new indicators, which convey similar information to government bond yields, are needed. Some alternatives have already emerged.

Swap yield curves, for example, may better reflect market interest rate expectations than government bond yields. As noted above, government bond markets, or segments of the market, may be relatively illiquid, whereas swap markets are generally liquid and the contracts standardised across currencies, as far as credit, taxes and structure are concerned. The only caveat in using swaps rather than government bond yields is the credit risk they entail.

Focusing on the role financial factors may play in the business cycle, Gertler and Lown (2000) consider the market for high-yield corporate bonds as another possible alternative. According to the literature dedicated to the "financial accelerator mechanism", imperfect credit markets give birth to the so-called external finance premium, by which financial factors amplify and propagate business cycles.



In their analysis, they consider the information content of the spread between the high-yield bond rate and the corresponding safe rate, which may approximate the external finance premium. According to their results, such a spread outperforms other leading indicators, including the traditional term spread. As far as the euro area is concerned, the issuance of corporate bonds has accelerated dramatically over the recent period. However, the market for corporates in the euro area is far from being as important and as liquid as in the United States. Indicators of this kind should also be considered by policymakers although they are currently probably less relevant for the euro area.

### 3.3 New issues related to the transmission mechanism of monetary policy

The growing role of financial markets for the financing of the economy and evidence gathered over the recent period on the key role financial factors may play in shaping and amplifying business cycles have both emphasised the importance of the “broad credit channel” in the transmission mechanism of monetary policy. Moreover, recent fluctuations on stock markets have also drawn attention towards the relative importance of wealth effects on the real economy.

Although wealth effects are still likely to be limited in the euro area, when compared with the United States, the empirical literature has already underlined the relevance of the financial accelerator mechanism for European countries such as France (Rosenwald (1995), Chatelain and Teurlai (2000)), Germany, Italy and Spain (Vermeulen (2000)). However, the emergence of new instruments aimed at hedging against credit risks, such as credit derivatives, may dampen the efficiency of this financial accelerator mechanism and finally affect the impact of monetary policy on the real economy.

The financial accelerator mechanism has its roots in imperfections on credit markets, such as information asymmetries between lenders and borrowers. As a consequence of imperfect credit markets, there exists a spread between the cost of external and that of internal finance, called the external finance premium, which decreases with the borrower’s net worth relative to the amount of funds required. An adverse shock to the borrower’s net wealth increases the cost of external finance, reduces his access to finance and may lead to a cutback in investment and employment spending, which in turn may result in a fall in aggregate supply.

To illustrate such a mechanism, we simulate a dynamic general stochastic equilibrium model directly inspired from Bernanke et al (1999), in which we introduce real rigidities via an increasing adjustment cost in the production of capital, and allow for a one-period delay in investment to account for time-to-plan/time-to-build in investment decisions. As above, the model is calibrated on euro area data. We assume that the central bank responds only to expected inflation, which is consistent with the ECB mandate. In the monetary policy rule, we also assume an interest rate smoothing parameter of around 0.8. Three different shocks are considered: a supply shock, which takes the form of a shift in total factor productivity; a demand shock, which works through unanticipated public expenses; and finally a monetary policy shock (Figures 1 to 4 below).

Figure 1  
Supply shock

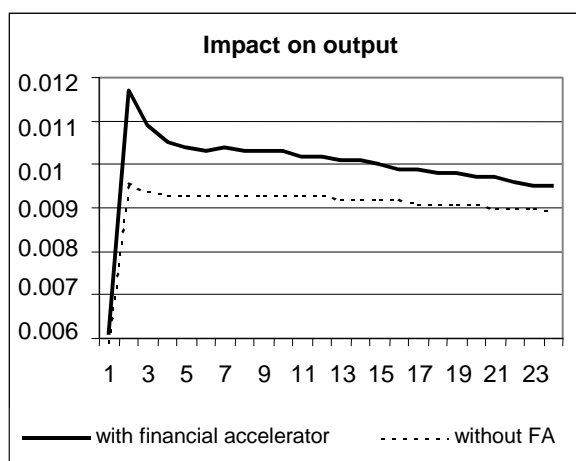
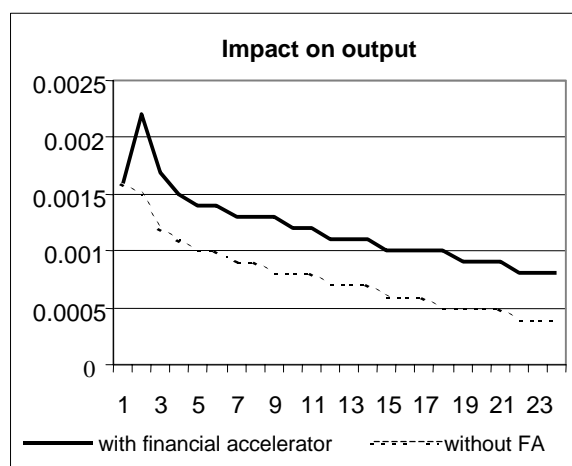


Figure 2  
Demand shock



## Monetary policy shock

Figure 3

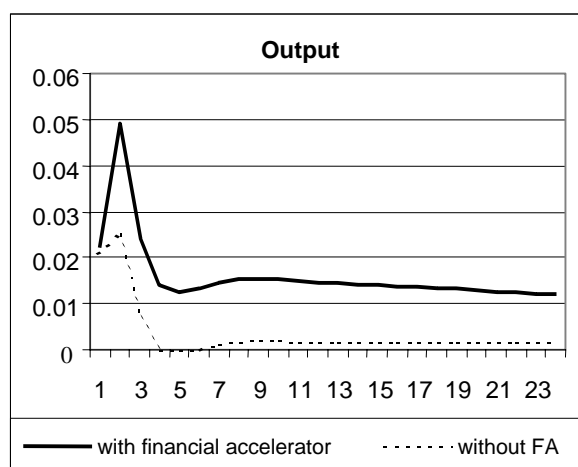
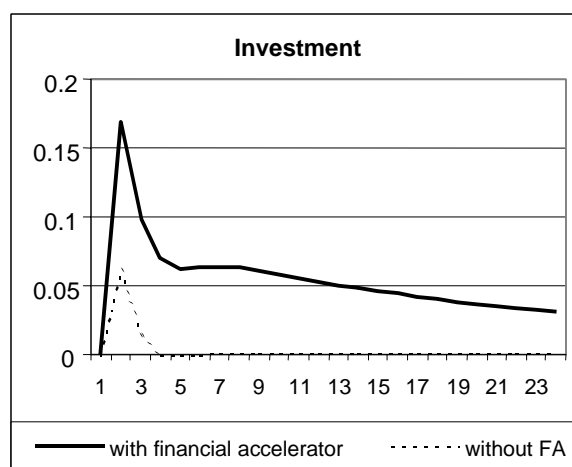


Figure 4



As illustrated in Figures 1 and 2, financial factors contribute to amplifying and to exacerbating the effects of exogenous shocks on the real economy via the financial accelerator mechanism. Such a mechanism also improves significantly the impact of monetary policy impulses on the economy. In this setting, an unanticipated monetary easing stimulates real activity through two different channels: first, the traditional interest rate channel, which activates the interest-rate-sensitive components of aggregate demand; and second, the decrease in nominal interest rates increases the discounted value of the collaterals, thus raising the borrower's net worth and leading to a lower external finance premium. This, in turn, stimulates investment and finally aggregate supply (Figures 3 and 4).

However, corporate hedging or new financial products, such as credit derivatives, may hamper such a mechanism and reduce the efficacy of monetary policy. A rationale for corporate hedging is provided in a paper by Froot et al (1993). Building upon a simple setup, the authors show that, amongst the conditions that have to be satisfied for hedging to be beneficial, one is at the very heart of the financial accelerator literature, namely: that the level of internal wealth must have a positive impact on the optimal level of investment. As a consequence, hedging might help ensure that the firm will have sufficient internal funds to finance investment opportunities, and then reduce quite sharply the need for external finance. In such circumstances, the broad credit channel of monetary policy should be affected. The results obtained by Froot et al (1993) depend on the extreme assumption that all the fluctuations in internally collected funds are marketable, which has to be mitigated despite the huge increase in derivatives. However, the recent and very rapid growth of the credit derivatives market (see Rule (2001)) might also impact on this broad credit channel since it provides the lenders (banks) with an opportunity to reduce their credit exposure, and therefore the importance of information asymmetries on credit markets. Both sides of the financial accelerator mechanism, ie banks and firms, have increasing opportunities to hedge against credit risk and to transfer risks to other financial institutions. While such developments are likely to improve financial market efficiency and contribute to financial stability, they also reduce the power of monetary policy.

### 3.4 Operational issues

As far as the operational implementation of monetary policy is concerned, recent changes in financial markets have highlighted two important issues dealing with shrinking government bond supply and technological changes.

The first issue addresses the set of eligible collaterals for monetary policy operations. Because of their features (no credit risk, active trading, deep markets, etc), government bonds are widely accepted as collateral against the future delivery of cash and, as such, play a very important role in monetary policy operations. However, changes in the relative supply of government bonds have impacted on their relative prices, making them increasingly expensive for market participants. In turn, their role as collateral for transactions has diminished, to the extent that some central banks have expanded the set of eligible collaterals for monetary policy operations: as an illustration, both the Federal Reserve

and the Bank of England expanded the menu of securities they use for the implementation of their monetary policy in 1999. However, such changes are irrelevant for the euro area: first, because government bond markets are deep and active, and fiscal consolidation in Europe has to date had a limited impact on the supply of government bonds, as illustrated in Section 2; and second, because the set of collaterals used by the ECB is already large enough to deal with such an issue.

Technical changes have also had an impact on the direct implementation of monetary policy. However, this impact has been limited on the money market relative to what has been observed on foreign exchange markets or euro bond markets (see Section 2). Greater efficiency might result from these technological changes, and this should also improve monetary policy efficacy. As far as the implementation of monetary policy is concerned, the most noticeable change might probably be related to the possibility of operating on a real-time basis. Such a change has many implications, both for financial stability, through the setting-up of a real-time payment system for instance, and for monetary policy. In the latter case, technological changes facilitate tenders not only by allowing the central bank's counterparties to participate in the tender directly, ie without any intermediary, but also by helping the central bank to monitor closely money market conditions (Pauly (2001)), ie in a "real-time" fashion. It should also help market participants to manage their resources more efficiently. However, while technological changes also favour market transparency, they have to be accompanied by appropriate communication.

### **3.5 A new role for central bank communication**

Most major central banks have become independent over the last decade. As a consequence of and counterpart to independence, accountability and transparency have been considered one of the prime issues for central bankers. While theoretically they might contribute to reducing time inconsistency and inflation bias, they should also reduce financial market volatility and improve overall financial conditions. The forward-looking nature of monetary policy has also put greater emphasis on communication, which is sometimes considered a supplementary channel - if not "a hidden pillar", to quote Otmar Issing - of monetary policy. Moreover, transparency has been facilitated by modern communications over recent years.

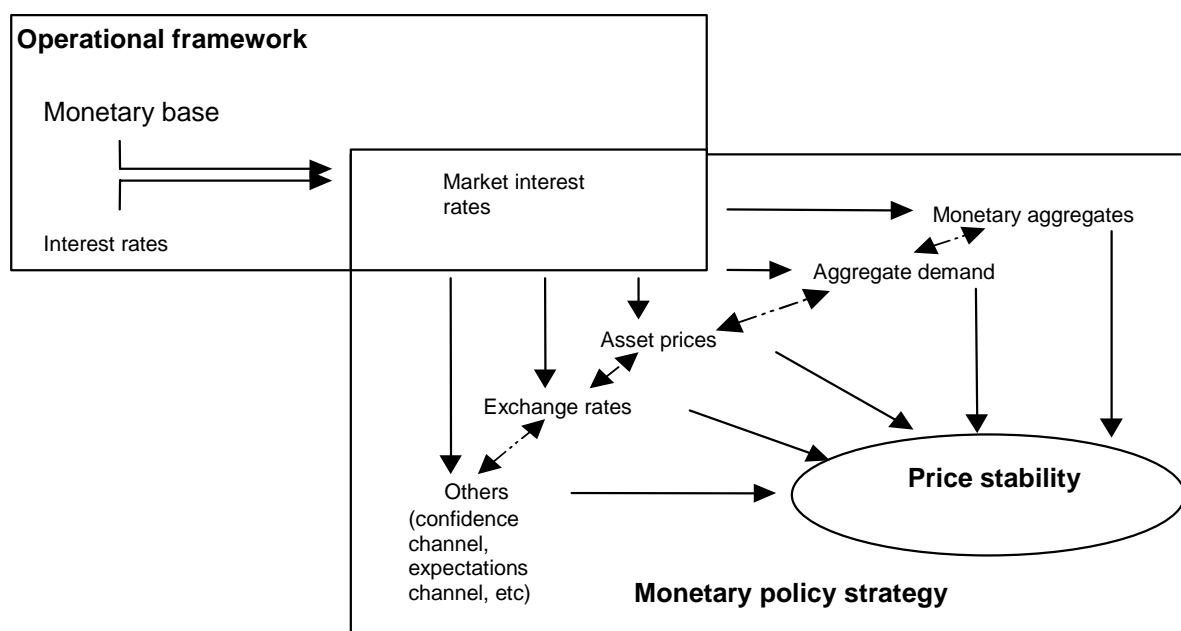
The greater role played by financial markets has led central banks to operate in a more market-oriented way and, to that extent, to devote greater attention to the way they communicate their monetary policy decisions to market participants.

A simple description of the transmission mechanism of monetary policy helps explain why communication matters (see Figure 5).

As illustrated in Figure 5, markets play a central role in the monetary policy transmission mechanism as an interface between the operational framework and the strategic side. Monetary policy actually controls mainly the interbank overnight rate, which, as stressed by Blinder (1999), is not relevant for any important economic decisions. The only extent to which monetary policy affects significantly the real economy is when it moves relevant financial prices, ie when it impacts on the whole yield curve, but also on exchange rates or asset prices, besides other prices (eg wages). The common feature of all these financial prices is their dependency on agents' expectations. But to affect these expectations in an appropriate way, monetary policy decisions have to be clearly understood. This is why central banks have to communicate and why communication contributes to monetary policy effectiveness. As an illustration, Gaspar et al (2001) show in their in-depth analysis of the euro money market that markets have generally predicted the ECB's interest rate changes quite accurately.

To operate, the transmission mechanism requires market participants to understand each monetary policy decision as the "path of a logical chain of decisions leading to some objectives", as stated by Blinder et al (2001). For this reason, and according to our simplified version of the transmission mechanism, monetary authorities have to be clear about their instruments, their objectives and their horizon, which is generally longer than the markets' horizon, that is to say, their overall strategy, and also have to explain by which mechanisms their policy decisions will help to achieve in turn their objectives. Due to the forward-looking nature of monetary policy, such an explanation can be provided through an appropriate communication, an element of which might consist in the publication of projection exercises. Communication and transparency may finally result in greater efficiency of monetary policy and contribute to reducing financial market volatility.

Figure 5  
Transmission mechanism of monetary policy



Source: Manna et al (2000).

Obviously, one has to keep in mind that market participants also have their own expectations and their own explanation of asset price dynamics, which may not be influenced solely by monetary policy decisions. Even if market volatility may be reduced by greater transparency and appropriate communication, this may be only to the extent that they reduce monetary policy uncertainties.

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