Abstract. This paper examines the rationale behind a separate monetary pillar in the ECB’s monetary policy strategy, in the light of the poor performance of monetary aggregates since the start of EMU. Six observations are put forward and discussed. First, it is unlikely that a single indicator is able to incorporate all the relevant information to forecast future inflation. Second, a structural break in M3 velocity occurred in 2001. Third, historical euro area time series derived from the aggregation of pre-euro national data fall prey of the Lucas Critique. Fourth, the relationship between money growth and inflation in a low inflationary environment is, at best, very weak. Fifth, in the context of globalization and financial liberalization, high money growth may lead to asset price inflation and worldwide inflation. Sixth, the composition of M3 exacerbates the risk that monetary tightening will actually inflate M3. The paper concludes by offering some policy recommendations.

Introduction

Money plays a relatively minor role in the formulation and implementation of contemporary monetary policy. Former Federal Reserve governor Larry Meyer categorically stated that “money plays no explicit role in today’s consensus macro models and it virtually plays no role in the conduct of monetary policy.”¹ This development coincides with the broad recognition among economists that inflation is ultimately a monetary phenomenon. Moreover, following the developments in monetary policy making over the

¹ See Papademos (2006) and Woodford (2006) for this citation. For a discussion on the role of money in today’s mainstream monetary models, see Woodford (2003).
past three decades, price stability is universally being recognized as the primary objective of monetary policy at almost all the central banks throughout the world.

The ECB is the only major central bank in the world that still assigns a prominent role to monetary aggregates in its monetary policy strategy. Similar to inflation targeting central banks, the primary objective of the ECB is to maintain price stability. In order to provide a nominal anchor, the Governing Council of the ECB defined price stability as the increase in HICP inflation for the euro area of below, but close to 2% over the medium term. As an intermediate target, however, the ECB adopted the so-called Two-Pillar Strategy (ECB, 2004).

The first pillar consists of the economic analysis, where a number of real and financial indicators are used to assess inflationary pressures from a short to medium term horizon. The second pillar is referred to as the monetary pillar, which the ECB uses to assess the inflationary risk over a medium to long term perspective. The monetary pillar is also used to cross-check the information derived from the economic pillar, as much relevant data as possible is considered. To further stress the importance attached to the monetary pillar, the ECB also assigned a reference value of 4.5% to M3 growth. This contrasts with the approach adopted by the Federal Reserve, which in 2006, announced that the “costs of collecting the underlying data and published M3 outweigh the benefits.”

The ECB justifies the importance attached to money on the basis of the widely documented long run relationship between money growth and inflation. Moreover, empirical studies before, and in the first years of EMU, indicated that money exhibited a stable relationship with its determinants (i.e. demand for money was stable) and also displayed leading indicator properties (i.e. it could be used to forecast future inflation)—the two key conditions for the inclusion of money in a monetary policy strategy.2

However, barely two years after the announcement of the ECB’s monetary policy strategy, a series of events consistently pushed M3 above its reference value. The stability of the demand for money broke down in 2001, with M3 growth averaging more than 7% between 2001 and 2006, and exceeding 10%.

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2 See Coenen and Vega (1999), Brand and Cassola (2000) and Calza et al., 2001 for a discussion on stable money demand.
Does the ECB Require a Separate Monetary Pillar?

in the beginning of 2007. These deviations of M3 growth did not lead to a burst in inflation, as the latter remained low and stable, in line with the ECB’s definition of price stability, even though there were international oil price hikes in 2005 and 2006.

More importantly, long term inflation expectations in the euro area remain well anchored. Viewed from this perspective, money growth exhibited limited, if any, information for future inflationary developments in the euro area. The objective of this paper is to assess the rationale behind the separate monetary pillar in the ECB’s monetary policy strategy, in light of the poor performance of monetary aggregates since the introduction of EMU. The paper is structured as follows. Section 2 provides an empirical evaluation of the performance of M3 in the euro area. Section 3 tests the stability properties of M3 velocity in the euro area. These properties underpin the validity of the reference value. Section 4 tests the relationship between money growth and inflation in a low inflationary environment. Section 5 provides quantitative evidence on the response of money growth following increases in the short term interest rates. Section 6 highlights the main lessons identified and proposes some policy recommendations.

An Empirical Evaluation of the Performance of M3 in the Euro Area

The relationship between M3 growth and inflation in the euro area since 1980 is shown in Figure 1. It shows that there was a close relationship between M3 growth and inflation during the 1980s and the first half of the 1990s. Both M3 growth and inflation were at double digit levels in the beginning of the 1980s, and the close relationship between them during this period may be associated with the process of disinflation in the run-up to EMU. This is consistent with the empirical evidence that periods of sustained high inflation are always accompanied by high growth rates of money, hence the dictum that inflation is always and everywhere a monetary phenomenon. It was in this context that in 1998, in the face of ‘extreme’ uncertainty, that the architects of the ECB assigned a prominent role to money (Issing, 2006).

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3 As measured by the ECB’s Survey of Professional Forecasters.
4 The euro area was only established in 1999, but the ECB was able to construct aggregated measures of critical variables going back till the 1980s.
The relationship between money growth and inflation is less evident when the most recent period of low and stable inflation is considered. Figure 2 illustrates the relationship between HICP inflation, M3 growth, the M3 reference value and the ECB’s interest rates since the start of EMU. Four interesting observations immediately stand out.

First, money growth exhibited volatile behaviour since the start of EMU, especially after 2001. Two different and distinct periods can be identified. The period between 2001 and 2003 was characterized by heightened financial, economic and geopolitical uncertainty. The high M3 growth reflected portfolio decisions during a typical ‘flight to safety’ behaviour, where euro area residents shifted their wealth from risky foreign assets into safe and

5 The Bundesbank was renowned for its credibility as an inflation fighter, with Jacques Delors once famously remarking that ‘not all Germans believe in God, but they all believe in the Bundesbank’. 
Does the ECB Require a Separate Monetary Pillar?

Figure 2
HICP Inflation, M3 Growth and Interest Rates Since 1999 (%)

![Graph showing HICP Inflation, M3 Growth and Interest Rates Since 1999 (%)](image)

Source: ECB

liquid domestic assets included in M3.\textsuperscript{6,7} Average M3 growth between mid-2001 and 2003 exceeded 7.5%, reaching a peak of 9% in 2003. The M3 series adjusted for the impact of these portfolio inflows showed that these inflows were substantial, with the gap between the officially adjusted and unadjusted M3 series peaking at almost 4.5 percentage points in 2003 (Fisher \textit{et al}, 2006).

After a brief spell in which the growth of M3 returned to its reference value at the end of 2003, M3 growth began to deviate again from the reference value in the beginning of 2004. Between 2004 and 2006, average M3 growth averaged more than 7%. Strong growth continued unabated in the first half of 2007, with growth in M3 exceeding 10%. The strong monetary dynamics during this period, however, were more fundamental in nature, being driven by a surge in loans to the private sector.

\textsuperscript{6} This period was characterized by the terrorist attacks of 9/11, the burst of the dot.com bubble, a spate of corporate scandals, and the military invasion of Afghanistan and Iraq.

\textsuperscript{7} M3 is made up of: (i) currency in circulation and overnight deposits, which constitute M1, (ii) deposits with an agreed maturity of up to 2 years and deposits redeemable at notice of up to 3 months, which constitute M2-M1 and (iii) marketable instruments such as repurchase agreements, money market fund shares and debt securities issued with a maturity of up to 2 years, which together constitute M3-M2.
Second, not much correlation can be observed between the ECB’s monetary policy stance and M3 growth. In particular, there were two instances where the ECB was faced with diverging information from the two pillars. In the wake of the portfolio inflows in 2001, and the subsequent strong M3 growth, the ECB decided to cut interest rates, as the data from the economic pillar was indicating weak economic growth. Many observers claimed that this move reflected the downgrading of the monetary pillar, and indeed, in 2003, when the ECB conducted a review of its monetary policy strategy, M3 was restricted to ‘mainly serve as a means of cross-checking’ the information from the economic analysis.  

The second occasion occurred in December 2005, when the ECB started the current monetary tightening cycle. Again, M3 figures were signalling future threats to price stability, while the economic data indicated that the recovery in economic activity was still weak. This time, the monetary pillar was given precedence over the economic pillar, raising debates about a revival of the monetary pillar.

Third, the relationship, if any, between M3 growth and inflation was very weak since the start of EMU. Inflation fluctuated around the 2% mark. Central bank credibility and commitment towards price stability ensured that inflation expectations remain well anchored. This is in line with current thinking in academia, in that a strong nominal anchor, credible policies and anchored inflation expectations are key in successfully maintaining low and stable inflation (Mishkin, 2007). This observation is also consistent with the findings of De Graauwe and Polan (2005), who argue that in a low inflationary environment, the relationship between inflation and money growth is weak. In particular, they show that volatile money growth in a low inflationary environment is a reflection of ‘noise’ from changes in velocity, rather than an indication of future inflationary pressures.

Fourth, periods of monetary tightening by the ECB, with the aim of dampening future risks to price stability, seem to have been associated with strong, rather than subdued, M3 growth. A priori, this may be due to the composition of M3, where the remunerated components i.e. bank deposits
and marketable instruments represent more than 50% of overall M3. In periods of monetary tightening, portfolio inflows into the remunerated components will actually boost M3. If this turns out to be correct, high M3 growth in periods of monetary tightening may be distorted by portfolio decisions, thus blurring the information derived from M3 growth concerning future risks to price stability.

These observations will in turn be discussed in more detail in the remaining sections.

**Is Velocity in the Euro Area Constant?**

The reference value is derived from the quantity theory of money, with the assumptions that (i) annual inflation should increase by close to 2% over the medium term, in line with the ECB’s definition of price stability (ii) medium term potential output is in the range of 2% to 2.5% per annum and (iii) velocity exhibits a medium term declining trend in the range of 0.5% and 1% per annum. The validity of these assumptions ensure that the reference value is consistent with the ECB’s definition of price stability and that, everything else held constant, persistent deviations from the reference value would signal future risks to price stability.9

The ECB made it clear from the outset, however, that it will not pursue a mechanical approach to deviations of M3 from the reference value i.e. M3 was not considered as an intermediate target, as in the traditional monetary targeting frameworks (ECB, 2004).

The validity of the ECB’s assumptions underpinning the M3 reference value also depends on whether the fundamental relations prior to the introduction of the euro have persisted through monetary union. After all, the introduction of a single currency and the transfer of national monetary policies to a single monetary policy may have entailed a structural break in the spirit of the Lucas critique (that parameters of macroeconomic models are unlikely to remain invariant in a changing economic environment). A simple graphical analysis of M3 velocity in the euro area (Figure 3) illustrates that there was a structural shift in velocity in 2001, and which was not accounted for in the derivation of the reference value.

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9 The ECB was also able to construct various ‘excess liquidity’ measures, such as the nominal and real money gap and the monetary overhang. See Masuch et al., (2001) for further details.
Econometric evidence confirms the graphical analysis, and show that there was indeed a structural break in M3 velocity in 2001.\(^\text{10}\) Based on the official M3 data, the decline in M3 velocity for the period between 2001 and 2006 was roughly 3.4%. Velocity for the M3 series adjusted for the impact of portfolio shifts declined by 3% during the same period. Both these estimates show that the decline was larger than that assumptions underpinning the M3 reference value concerning the medium term declining trend in velocity.

For the official M3 series, the above results imply that an annual M3 growth rate ranging between 7% and 7.5% will still be consistent with the quantitative

\(^{10}\) See Micallef (2007). Indeed, apart from the break in 2001, there was a further break in velocity in 1990, which also affected both the slope and intercept of M3 velocity. This is associated with two events: the start of Stage 1 of EMU, in which all capital restrictions were abolished, and the reunification of Germany. The pronounced dip in velocity during 1992-1994 is associated with the ERM crisis. Econometric evidence, however, indicates that this is not associated with a structural break in velocity per se, and could thus be interpreted as representing volatility from the events that occurred in 1990. The structural break in velocity in 1990 however casts doubt on the assumption of a linear trend in velocity over the two decades prior to EMU.
definition of inflation of close, but below 2% set by the ECB. This is, in fact, consistent with the empirical evidence observed in the previous section that M3 growth averaged 7.1% between 2001 and 2006 and that over the same period, inflation averaged 2.2%.

Even though the reasons behind this structural break in M3 are not known with certainty, there are reasons to believe that they are permanent rather than temporary in nature. Possible explanations raised in the literature include the possibility of cash hoarding, following the introduction of high denomination euro banknotes. The latter could also have affected the demand for euro in the worldwide underground economy, and a shift away from US dollar holdings. The international role of the euro has also entailed currency substitution in the countries neighbouring the EU and stimulated foreign demand, thus influencing euro velocity (IMF, 2005).

Rapid financial innovation and the changing nature of Europe’s traditional financial sector could also be another reason (Draghi, 2007). In particular, the increased liquidity in recent years may be due to the activities of hedge funds or the off-balance sheet vehicles created by the financial institutions (De Grauwe, 2007). If this is the case, then the increased liquidity is more related to private portfolio choices and may thus pose fewer risks to price stability. However, it could lead to asset price inflation instead, giving rise to possible periods of financial instability. The recent turmoil in international financial markets is a case in point. Viewed from this perspective, monetary aggregates could be more useful for financial stability purposes than for monetary policy purposes.

Institutional changes in payment systems brought about by the introduction of the euro and the advent of the single monetary policy may provide an additional explanation of the break in velocity. The single currency brought with it an integrated payment system, TARGET, a system of remunerated reserves, a network for the transmission of eligible assets used as collateral for ECB monetary operations purposes (CCBM), and a perfectly integrated money market. These developments in the payment infrastructures, which have enhanced efficiency, reduced transaction costs and created economies of scale, made it easier for financial institutions to manage liquidity. Moreover, further developments in this area are underway, with the ECB officially launching of TARGET2, planning for TARGET2-Securities and CCBM2, and acting as a catalyst for the introduction of SEPA (ECB, 2007). Thus, if
innovations in the payment systems are at the root of the change in liquidity preference, chances are that the structural break in velocity is more of a structural nature.

Econometric analysis indicated that even when accounting for the extraordinary events that occurred in 2001 by using the adjusted M3 series, the decline in velocity for the period under consideration would still be considerably below the range assumed by the ECB for the past two decades prior to EMU (Micallef, 2007). Moreover, the declining trend in M3 velocity was maintained after 2003, even though the effects of portfolio inflows in M3 receded and were reversed.

It can be shown that an increase in the reference value to account for the break in velocity would have a considerable downward impact on the liquidity measures constructed by the ECB, which are based on the assumption of a medium term trend decline in velocity of between 0.5% and 1%. For illustrative purposes, Figure 4 compares a typical (nominal) money gap—the gap between the actual M3 growth rate and the growth rate of M3 that would have resulted from the money stock growing at the reference value—for a reference value fixed at 4.5% for the period between 1999 and 2006 (M3_REF_OLD), and another hypothetical reference value that is raised to 7.5% after 2001 (M3_REF_NEW), in order to account for the structural break in velocity.

Figure 4
Difference in Money Gaps (%)
The accumulation of excess liquidity emanating from a fixed reference value, and hence signalling future risks to price stability, is greatly reduced if the structural break in velocity is taken into consideration. The adjusted hypothetical reference value stayed close to the zero line, which represents zero excess liquidity, throughout the whole period, even entering negative territory for a brief period between 2004 and 2005.

The structural break in velocity is also the reason behind the breakdown in the stability properties of the demand for money in the euro area. In fact, models of money demand specifications consisting solely of traditional variables i.e. real GDP and interest rates, the latter representing the opportunity cost of holding money, started performing poorly after 2001.

This raises the question as to whether the measurement of stability in euro area money demand using a historical aggregation of national data is correct. Some studies in the literature have long argued about the possibility that aggregating national data for the pre-EMU period could lead to an overestimation of money demand stability. The reasoning behind this argument is that in an environment of non-integrated financial and money markets, unsynchronized shocks in national money demand will, to a large extent, be averaged out in the aggregation process. Unstable national money demands before monetary union would still yield a stable money demand for the back-dated euro area aggregate. Once countries become more integrated, shocks will also become more synchronized, on account of the single monetary policy and a perfectly integrated money market after the introduction of the euro, thus affecting euro wide stability features. This aggregation phenomenon, together with the fact that financial innovation had a weaker impact in the euro area countries compared to other industrialized countries, such as the US, the UK and Japan, may have contributed to an enhanced stability in the euro area demand for money than would otherwise have been the case.

An unstable money demand may be problematic for the stability and interpretation of the various ‘excess liquidity’ measures constructed by the ECB. Most of these indicators, such as the real money gap, are used in studies that assign M3 with leading indicator properties (see for example Nicoletti-Altimari (2001) and Gerlach and Svensson (2001)). These indicators, however,
rely heavily on the stationary properties of the residuals from a money demand specification. Once cointegration between money and its determinants breaks down, the residuals will cease to be stationary.\textsuperscript{12}

This implies that these excess liquidity measures will lose their economic significance, as they will deviate persistently from the zero line, interpreted as zero excess liquidity. Such an ‘accumulated liquidity’ is not indicative of future inflationary pressures, but is merely the result of cointegration breakdown in the money demand function. In turn, this instability will also adversely affect the leading indicator properties of money.

**The Effects of a Low Inflationary Environment and Globalization**

One of the main propositions of the quantity theory of money is the existence of a proportional relationship between money growth and inflation, measured over a long period of time, with the causal relationship going from money growth to inflation. This proposition is one of the central pillars of macroeconomic theory and is illustrated in Figure 5 for a sample of 155 countries on the left and a sub-sample of low inflation countries (measured as those countries with an average inflation of 6\% per annum over the sample period) on the right, covering the years 1970-2005.

In the full sample, the observations are remarkably clustered around a 45 degree line, and thus indicative of the proportional relationship between money growth and inflation. This proportionality is however obtained due to the inclusion of high or hyper inflation economies in the sample. When the sample is restricted to include only the low inflationary countries, the proportional relationship becomes much weaker.

Turning specifically to the euro area, the long run relationship between money growth and inflation can be analyzed graphically by means of filtering techniques. It is important to note that these techniques are of little use to policymakers in real time, as they are highly inaccurate at the end of the sample period.

\textsuperscript{12} A variable is defined as stationary if its mean, variance and covariance are time invariant. In other words, the variable in question will exhibit mean reversion and the variance will have broadly stable amplitude.
Figure 5
Inflation and M1 Growth Rates in a Sample of 155 Countries and in a Sub-sample of Low Inflationary Countries

Source: IFS statistics, author’s calculations

Figure 6 illustrates the long run trend in M3 growth and inflation using the Hodrick-Prescott (HP) filter. It indicates that there was a close relationship between money growth and inflation at least until the advent of EMU. In particular, for the period between 1981 till the mid-1990s, the turning points in inflation were always preceded by turning points in money growth, indicating that money may have possessed leading indicator properties for inflation.

There is however a marked deterioration in the smoothed series of money growth and inflation once the post-EMU period (after 1999) is considered. The inflation rate remained practically constant at the 2% level, indicating the high level of credibility achieved by the ECB in maintaining a low and stable inflation rate, in line with its definition of price stability.

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13 This exercise is similar to that performed by De Grauwe and Polan (2005). In this case, the sample is extended to cover the first five years of this decade, which were characterized by low and stable inflation in the vast majority of countries. It thus covers the period 1970”’2005. INFLATION refers to the average inflation, measured by the consumer price index, over a period of 35 years. MONEY_GROWTH refers to the growth rate of M1 over the same period. Each country included has at least an average for a period of 10 years, which is indicative of the long run. Countries with less than 10 years of observations were excluded from the Figure. Moreover, average inflation rates exceeding 160% per annum were omitted from the Figure, as these would have compressed the remaining data.
On the other hand, the rate of money growth took on an upward trend from 1999 onwards, from levels consistent with the reference value to almost 8% by the end of 2006. This pattern created a divergent gap between the long term component of money growth and inflation after the introduction of the euro.\textsuperscript{14}

This behaviour is consistent with the cross-sectional observations. The close relationship between money growth and inflation during the 1980s till the mid-1990s may be mainly due to the disinflationary process that occurred during this period, where inflation was reduced from double digit levels in the beginning of the 1980s to levels below 4% in the mid-1990s. In times of high inflation, money growth and inflation goes hand in hand. However, in an environment of low inflation, whereby inflation was consistently below

\textsuperscript{14} A similar conclusion emerges if the relationship between inflation and money growth adjusted for the growth rate in output, rather than money growth per se, is considered. See Micallef (2007)
the 3% mark since the latter half of the 1990s, money growth and inflation were no longer closely related.

At this point, it is worth investigating the economic conditions where money would possess leading indicator properties for future inflation in any economy. It is more probable that money growth exhibits leading indicator properties in an environment of (i) high inflation (ii) non-credible monetary policies that are not committed to the maintenance of price stability and (iii) inflation expectations that are not anchored. In the spirit of the time inconsistency problem highlighted in the literature, a high rate of money growth in such an environment may represent an early warning signal to economic agents for inflationary pressures in the pipeline. Observing a high growth rate of money, economic agents will expect higher inflation, and will incorporate such expectations in their behaviour, which will ultimately be transmitted to higher prices. In this context, money growth will be useful in forecasting future inflation.

The situation is however very different in the current economic and monetary environment experienced in Europe. The ECB has been very successful in restricting inflation to a rate consistent with its definition of price stability and in particular, in anchoring inflationary expectations over the medium term horizon. This stems from the ECB’s acquired credibility as an inflation fighter and from its commitment to the maintenance of price stability. Economic agents expect a low inflationary environment, and in turn these expectations are reflected in their behaviour. For example, during the recent hikes in international oil prices in 2005 and 2006, inflation in the euro area remained broadly unchanged. Moreover, the credibility of the ECB’s commitment towards price stability was instrumental in avoiding second-round effects in wage bargaining, and avoided the spiralling inflation that characterized the 1970s. In such an environment, it is likely that high money growth will not retain its leading indicator properties for future inflation, but will simply reflect changes in velocity. The latter may be expected to vary with financial innovations and changes in the payment systems, and with country (or in the case of EMU, monetary union) specific developments.

The above hypothesis can be tested by Granger Causality tests. A variable \( y \) is said to be Granger-caused by \( x \) if \( x \) helps to forecast \( y \). The tested

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\(^{15}\) The statement ‘\( x \) Granger causes \( y \)’ does not imply that \( y \) is the caused by \( x \). Granger causality measures precedence and information content, but does not by itself indicate causality.
variables are money growth and inflation, and a low probability value i.e. lower than 5% or 0.05, indicates the rejection of the null hypothesis. The sample spans from 1981Q1 to 2006Q4 and is further divided in two sub-samples: a ‘high’ inflationary environment (1981Q1-1995Q4) and a ‘low’ inflationary environment (1996Q1-2006Q4). The results are illustrated in Table 1.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Null hypothesis</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULL</td>
<td>M3 growth does not Granger Cause inflation</td>
<td>0.03373</td>
</tr>
<tr>
<td>HIGH INFLATION</td>
<td>M3 growth does not Granger Cause inflation</td>
<td>0.00013</td>
</tr>
<tr>
<td>LOW INFLATION</td>
<td>M3 growth does not Granger Cause inflation</td>
<td>0.25179</td>
</tr>
</tbody>
</table>

Granger Causality tests confirm our previous hypothesis. For the full sample and high inflation sub-sample, the null hypothesis that M3 growth does not Granger Cause inflation is rejected at the 5% level of significance. For the high inflation sub-sample, the hypothesis is rejected at the 1% level of significance. This implies that during this period, and in particular during the high inflationary period, M3 growth did contain important information in forecasting inflationary developments. As expected, however, the low inflationary sub-sample shows a totally different picture. The null hypothesis that M3 growth does not Granger Cause inflation cannot be rejected even at the 25% level of significance, which is beyond any acceptable level of significance used in the literature.

To summarize, in the context of the euro area, it is likely that the high credibility acquired by the ECB in maintaining price stability and, most importantly, in anchoring the inflation expectations of economic agents at levels consistent with its definition of price stability, may have blurred the relationship between money growth and inflation.

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16 The choice of the sub-samples is somewhat arbitrary, and is somewhat motivated by the need to maintain adequate degrees of freedom in each sub-sample. The analysis in section 2 did confirm, however, than inflation stood at levels consistent with the ECB’s definition of price stability already in 1996, following a period of disinflation, and is thus consistent with the divisions of the sub-samples. Lag lengths of 5 were chosen on the basis of the AIC. The same conclusions were obtained using different, and in particular, longer lag lengths, given that it takes approximately 1 to 3 years for money growth to be transmitted to prices, according to the monetarist tradition.
In such a regime, inflation is determined exogenously from monetary dynamics, especially if the latter are highly influenced by the emergence of new financial players and an array of innovative financial instruments that make the traditional money supply figures harder to interpret. In this environment, a causal direction from money growth to inflation is likely to be weak.

Moreover, developments in the euro area should not be viewed in isolation but considered in an international dimension. In a world of financial liberalization and globalization, it is more likely that the propositions that emerge from the quantity theory will become more applicable on a global context, and less so in a national context. Two considerations need to be taken into account when analyzing monetary developments from an international dimension.

First, in a world of financial liberalization, it is not clear whether an increase in the money supply of one country would lead to rising inflation in that same country. It could transpire that high money growth in country X would instead contribute to rising inflation in country Y, or more generally, global money supply changes may be related to global inflation rates. This is especially true with the introduction and growth in the global scene of developing and emerging market economies, which are experiencing large increases in their money supplies and are heavily engaged in cross-border financial flows.

Second, high growth rates of money supply in one country may affect asset price inflation, rather than traditional measures of consumer price inflation in other countries. This implies that even though traditional measures of inflation, such as the HICP and consumer price indices, remain low, as was currently the case in recent years, other forms of asset prices experienced growth rates that may not be explained by underlying fundamentals. These measures of asset prices are usually excluded from traditional price indices, as their volatility would necessitate higher and more volatile interest rates, to the detriment of the real economy.

The recent carry trade phenomenon is a striking example of these global inter-linkages, and the imbalances that could ensue in third countries following an increase in the money supply in one country. The increase in the money supply brought about by the Bank of Japan’s quantitative easing strategy, in which nominal interest rates were slashed to zero per cent, were
not successful in creating inflation but rather led investors to borrow cheap money from Japan and invest it in other countries that offered more attractive interest rates. This phenomenon brought downward pressure on the Japanese yen, but upward pressures on the exchange rates of those countries that were afflicted by the inflows of these carry trades. In this case, rising money supply in Japan did not led to inflationary pressures in Japan, but instead created upward pressures on other countries’ exchange rates.

Another example is the downward impact on US Treasury bond yields brought about by the re-cycling of accumulated foreign reserves by central banks in oil-exporting and south-east Asian countries, which stimulated US consumption and financed the US current account deficit.

From a European perspective, these developments imply that less emphasis should be placed on the traditional broad measure of money growth, which is less than under the full control of the ECB. Rather, there should be a wider and more encompassing view of the implications of excess liquidity, including the liquidity originating in third countries, for key euro area macroeconomic variables and financial stability.

The Relationship Between M3 Growth and ECB Interest Rates

The analysis in section 2 showed that periods of rising interest rates by the ECB were associated with rising M3 growth. This observation is particularly pronounced in the current monetary tightening cycle, which began in December 2005. During this period, M3 growth not only showed no signs of slowing down, but even exceeded the 10% mark in the beginning of 2007.

This behaviour may be due to the specific composition of M3. A priori, the category M3-M1, which is more associated with portfolio motives, will be expected to increase as the central bank raises the short term interest rate, while M1, which is associated with transaction purposes, will be expected to decline. M3 thus comprises two distinct categories that are expected to move in opposite directions following an increase in the short term interest rate. If the remunerated category of M3 exercises a stronger influence than the most liquid category, an increase in the short term interest rate with the aim of maintaining inflation under control, possibly due to high M3 growth vis-à-vis the reference value, will result in even higher M3 growth.
Quantitative evidence on the above mentioned effects are obtained from impulse response functions from Vector Auto Regression (VAR) analysis. The VAR intends to capture the behaviour of the components of M3 and consequently includes M1, M3-M1, M3 and the short term interest rate. The data is monthly, spanning from 1994M1 to 2007M6. The results are illustrated in Figure 7.\textsuperscript{17}

The following conclusions are derived from the impulse response functions.\textsuperscript{18}

Figure 7
Response of the Categories of M3 Following a Monetary Policy Shock

\textbf{Response to Generalized One S.D. Innovations ± 2 S.E.}

- Response of M1 to SHORT
- Response of M3 - M1 to SHORT
- Response of M3 to SHORT
- Response of SHORT to SHORT

Source: Author’s calculations

\textsuperscript{17} All variables, except for interest rates, are in logs. The impulse response analysis is carried out using generalised impulse response functions. As the focus is on long run relationships between the variables, the VAR is estimated in levels rather than in first differences.

\textsuperscript{18} See Micallef (2007) for further details.
First, in the lower right hand quadrant, following a monetary policy shock, short term interest rates increase immediately and then follow a gradual decline towards the zero line, vanishing after 8 quarters and turning negative thereafter.

This suggests that, after some lags, interest rate increases will bring about lower inflation and real economic activity, which will prompt policy makers to follow a period of monetary easing.

In the upper left hand quadrant, the non-remunerated component, M1, undergoes an immediate decline, bottoming out after approximately 5 quarters and then follows a gradual increase, albeit remaining in negative territory. In the upper right hand quadrant, the remunerated component, M3-M1, follows a gradual increase, peaking after 6 quarters, after which it follows a gradual, albeit slow decline, turning negative after 14 quarters.

The dynamics of M3, illustrated in the lower left hand quadrant, are determined by the interplay of the two components, as indicated earlier. Following a monetary policy shock, M3 initiates a gradual increase after 2 quarters, peaking at around 6 or 7 quarters, as the remunerated components dominate the liquid, non-remunerated component. Subsequently, M3 follows a gradual decline, mainly due to the declining effects of the interest rate increases on the remunerated components. M3 reaches the zero line after 13 quarters, turning negative thereafter.

The overall conclusion is that a monetary policy shock, represented by a rise in the short term interest rate, will bring about an increase in M3 that lasts for about 13 quarters. This is consistent with the empirical evidence since the end of 2005, when the ECB started its current monetary policy tightening cycle. This may be explained by the fact that the popularity of marketable instruments in M3 has increased in recent years, but also by the possibility that the remunerated components in M3 may have become more sensitive to interest rate changes. The added sensitivity follows from the creation of more liquid and sophisticated money and financial markets after the introduction of the euro, and the emergence new financial players and instruments. This behaviour is also enforced by the high weight in M3 of the remunerated components, which stood at 52.5% at the end of 2006.

The above analysis questions whether a high growth rate of M3 may be fully indicative of future risks to price stability, especially in the light of the
distortion caused by inflows into the remunerated component of M3, mostly associated with portfolio motives, in periods of monetary tightening. These effects turn out to be rather persistent.

**Conclusion**

The ECB deserves credit for its excellent performance in maintaining a low and stable inflation in the euro area, in anchoring inflation expectations in line with its definition of price stability and in building a high degree of credibility, especially when considering that it was established less than a decade ago. Nonetheless, the performance of monetary aggregates has been problematic. The problem is more pronounced when the signals emanating from the monetary analysis diverge from those stemming from the economic analysis.

Six observations may be highlighted from this study. First, it is unlikely that a single indicator is able to incorporate all the relevant information needed to forecast future inflation, especially in a world of rapid financial innovation. Overall, M3 growth provided limited, if any, information about future risks to price stability since the introduction of the euro. It is more likely that monetary information must be extracted from an array of instruments. The information content of traditional measures of money supply, such as M3, however, has become harder to extract and more difficult to interpret.

Second, a structural break occurred in M3 velocity in 2001, which affected one of the main assumptions underlying the reference value. From 2001 onwards, M3 velocity declined on average by 3.4% per annum. If the reference value takes into account the structural break in velocity that occurred in 2001, to reflect the likelihood that the structural break was of a permanent nature, the reference value for M3 growth would increase to a range of between 7% and 7.5%. With this reference value, much of the risks to price stability derived from excess liquidity measures constructed by the ECB will disappear.

Third, caution must be exerted when interpreting results derived from the aggregation of pre-euro national data to obtain a longer series of euro area aggregates. Such an aggregation is however essential for regression analysis, especially for cointegration exercises that require long time series. Policy
implications from such studies, especially if they are determined almost exclusively from pre-EMU data, face the risk of being irrelevant for the purposes of the new post-EMU regime, since they fail to take into account the possibility of the Lucas Critique. Typical examples include the ECB studies on money demand specifications and leading indicator properties of money.

Fourth, in a regime of credible monetary policy, low inflation and anchored inflation expectations, it is likely that the causal relationship between money growth and inflation turns out to be weak. A proportional relationship between money growth and inflation, as derived from the quantity theory of money, is more likely to hold only in an environment of persistently high inflation. In a low inflationary regime, it is likely that inflation is determined exogenously of money growth, with anchored inflation expectations being key determinants for the inflation rate. With output also being determined exogenously of money growth over the long run—the neutrality of money condition—it thus follows that money growth will be inversely related to velocity. This statement is confirmed by euro area data: M3 growth started to deviate from the reference value since 2001, at the time of the identified structural break in M3 velocity.

Fifth, in the context of globalization and financial liberalization, it is more likely that the proposition of a proportional and causal relationship from money growth to inflation will become more applicable in a global context, but loses much of its significance when considered on a country-by-country basis. Moreover, it is likely that high money supply growth will affect asset price inflation, rather than the more traditional measures of inflation, possibly leading to financial stability concerns.

Sixth, the composition of M3 exacerbates the risks that a monetary tightening will actually inflate M3. Impulse response function from VAR analysis indicates that an increase in interest rates will bring about an increase in M3 that lasts for about 13 quarters. This implies that during a period of monetary tightening, headline M3 growth may be distorted by the effects of portfolio inflows into bank deposits and marketable instruments, and may thus not be indicative to future risks to price stability.

Two main policy implications are derived from the above observations. First, with the credibility achieved by the ECB and its ability in anchoring inflation expectations, the time may be ripe for the ECB to consider
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incorporating the two pillars into a single, coherent framework. One proposal, for example, could be the adoption of an inflation targeting framework, thus avoiding the distinction between the two pillars. Contrary to the current inflation targeting regimes, however, which relies heavily on inflation forecasts at the expense of monetary figures, monetary data will still be given an important, albeit not central, role.

Moreover, it is likely that a deeper analysis of the monetary data, such as the composition, counterparts and sector composition of money holdings, incorporated in a fully-fledged economic analysis, may prove to be more fruitful for the identification of medium term risks to price stability than the adoption of a reference value for money growth in a separate pillar. This strategy will also have the added bonus of avoiding communication problems to the ECB in having to justify its interest rates decisions to the markets and the general public in the face of diverging information from the two pillars.

Second, rather than using money growth for cross-checking from a medium to long term perspective the information derived from the economic analysis, the ECB should consider cross-checking with the inflation expectations per se. The previous analysis has demonstrated that expectations are key determinants for the maintenance of low inflation. These may prove superior to money growth as a medium to long term cross-checking device in that they are directly related to the targeted variable.

References


