# Lucas Papademos: The role of money in the conduct of monetary policy

Speech by Mr Lucas Papademos, Vice President of the European Central Bank, at the Fourth ECB Central Banking Conference "The role of money: money and monetary policy in the twenty-first century", Frankfurt am Main, 9 November 2006.

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## I.     Introduction

The choice of the topic of this conference, "The role of money in monetary policy", may, at first sight, appear somewhat strange for a central banking conference, as it might suggest some uncertainty or even doubt about the role of money in monetary policy. But is it really possible for a policy described as "monetary" to be formulated and implemented without money playing a central role in it? Indeed, the suggestion that monetary policy can be conducted without assigning a prominent role to money seems like an oxymoron – a statement containing apparently contradictory terms, if not worse: for the literal meaning of the Greek word "oxymoron" is "pointedly foolish".

Yet in recent years, a large and influential body of academic work has disregarded or deemphasised the role of money as a determinant of inflation, even in the long run. The theory of monetary policy has often focused on the links between the policy-controlled interest rate and the paths of the price level and real output in theoretical frameworks, in which money plays no essential role, if any, in the transmission of the effects of policy and, consequently, in its conduct. The monetary policy reaction functions employed in theoretical analyses do not typically involve measures of the quantity of money, either as an intermediate policy objective or as an indicator that may provide useful and timely information relevant for determining the appropriate policy stance.

Parallel to these theoretical developments, and in the environment of relatively low inflation that has prevailed over the past ten years, the role of money in the conduct of policy by many central banks has diminished or has even been ignored. Lawrence Meyer, a former member of the Board of Governors of the Federal Reserve System, summarised these developments: "[…] money plays no role in today's consensus macro model, and it plays virtually no role in the conduct of monetary policy, at least in the United States." Larry was careful to include this qualification at the end of his statement. For as you very well know, there is another major central bank that does assign a prominent role to money in its policy strategy. A role that, I will argue, is justified by both theory and empirical evidence, and which has served us very well in the conduct of our policy since the establishment of the ECB. On this last point, we have no doubt. In fact, we have organised this conference because we are interested in promoting scholarly debate on these important issues in an open and transparent manner. We believe that we can all benefit by sharing our experiences and learning from each other.

In my remarks, I would like to share with you some thoughts on four issues pertaining to the role of money in the design and implementation of monetary policy. These issues relate to the theoretical arguments, the empirical evidence, the uncertainty and practical considerations facing policy-makers that have a bearing on the role of money in the conduct of monetary policy. In addition, I will briefly address the role of money in performing the central banking task of safeguarding financial stability.

## II.     Theoretical arguments

What are the basic principles and theoretical arguments supporting the view that money is the fundamental determinant of the price level over the medium and long term, and that money and its counterparts – notably credit – play a key role in the transmission of the effects of monetary policy to the economy? The essential role of money as the fundamental determinant of the price level can be established – and has been established – in the context of a microeconomic general market-equilibrium framework and a stylised consensus macroeconomic model. At a microeconomic level, and under certain plausible and rational assumptions concerning agents' preferences and optimising behaviour, the conditions for equilibrium in the product, services, labour and asset markets determine the relative prices of goods and services, the real wage (in terms of a general price index), and the spectrum of the relative real rates of return on all assets, including the associated risk premia. The determination of the general price level, and its rate of change, requires control of the nominal quantity of base money or of some other monetary aggregate that can be effectively controlled by the central bank. This result reflects the role of money both as a medium of exchange and as a unit of account.

Under price and wage flexibility, and in the absence of any nominal rigidities, the price level will promptly and fully respond to a change in the money stock. More generally, the determination of the price level by the nominal quantity of money will be established in the long-run equilibrium.

At an aggregate, macroeconomic level, the fundamental proposition concerning the link between the supply of money and the price level is captured by the quantity theory of money. In the context of this simple theory, the causality of the link is clear. The point that I would like to stress, however, is that the causal relationship between the stock of money and the price level is in principle also valid, at least in the long-run equilibrium, in more general and sophisticated macroeconomic frameworks, which incorporate alternative hypotheses concerning the factors and processes that determine the level and the dynamics of aggregate demand and supply and, consequently, the evolution of the price level over time.

One such general framework is what could be called the consensus macroeconomic model, which was developed in the 1980s and has been widely accepted as a useful stylised framework for monetary analysis, at least until the late 1990s. It is useful to briefly discuss the role of money in the transmission of the effects of monetary policy in the context of this framework for three reasons: first, because it incorporates many of the advances in macroeconomic theory made over the past 20 years, reflecting different approaches to, or schools of thought on, the functioning of the macroeconomy; second, because in a general sense, it underpins most of the macroeconometric models currently used by many central banks; and, third, because it provides a benchmark for comparison with the latest generation of macroeconomic models developed in recent years for the analysis and assessment of monetary policy.

This consensus theoretical framework for monetary analysis is the outcome of a synthesis that combines three elements: first, the insights and basic characteristics of the New Classical models of Robert Lucas (1972, 1976) and the real-business-cycle models of Kydland and Prescott (1982) and others, including the emphasis placed on forward-looking "rational" expectations; second, the inclusion of institutional factors, staggered wage and price contracts and market imperfections, which have been associated with the work of Phelps, Calvo, Fischer and Taylor, and which result in nominal rigidities in a Keynesian tradition that have important implications for the dynamic response of real output and the price level to shocks and to a change in the monetary policy stance; third, the elaboration, in certain extensions of this framework, of the economy's financial structure, which would allow for a richer representation of the potential channels through which monetary policy can affect economic activity and the price level, for example via wealth effects, variations in asset prices, credit and liquidity constraints and other "financial frictions".

In this general and eclectic theoretical framework, money plays an important role in the transmission of the effects of monetary policy, and in the conduct of policy. Aggregate demand, as determined by the conditions for simultaneous equilibrium in the product, money and financial markets, depends on the real value of the quantity of money, which influences aggregate spending both directly and indirectly via the level of real interest rates. In general, short-term and long-term market rates and bank lending rates need not move in parallel when monetary conditions change, differing only by constant risk premia and intermediation costs, but they may vary over time in response not only to transitory shocks but also to other factors, including changes in liquidity conditions. A change in the nominal quantity of money affects both real output and the price level over time, but progressively and ultimately it affects only the price level. Money is neutral and super-neutral in the longer run. The impact of money on real output and the price level over short-term and medium-term horizons, and the speed at which a change in money growth affects inflation, depend on behavioural and institutional factors and, most importantly, on the way inflation expectations are being formed and influenced. The extent to which expectations are formed "rationally" and the nature and modalities of the associated learning processes play a crucial role in determining the magnitude of, and the time lags in, the effects of a change in the monetary policy stance on the price level and aggregate output over time.

Two conclusions with implications for the conduct of monetary policy emerge from these theoretical considerations. The first relates to the central bank's strategy and policy implementation. Because expectations play an important role in the transmission of the effects of monetary policy and because expectations should, by and large, be formed "rationally", in the sense that they take into account all relevant available information concerning the factors and policies that may affect future price developments, the quantitative definition of the price stability objective of the central bank, the strategy it adopts in pursuing this objective, and the credibility with which policy is conducted all influence expectations and, thus, the effectiveness of the monetary policy itself. The ECB's quantitative definition of price stability and its commitment, in the context of its strategy, to achieving this objective

are reflected in the effective anchoring of inflation expectations in the euro area at a level in line with our quantitative definition of price stability.

A second conclusion concerns our ability to capture empirically, and in a reliable manner, the role of money in the monetary transmission process, and the implication of this for the central bank's monetary policy strategy. The model I referred to implies that the long-term relationship between money growth and inflation is theoretically robust, that is, independent of, and consistent with, the model's behavioural or structural features that may reflect alternative hypotheses. However, over short and medium-term horizons, the effects on future price and output developments of a change in the monetary policy stance, and of monetary conditions in particular, cannot be settled a priori on theoretical grounds. The magnitude and time profile of these effects is an empirical issue that must be assessed on the basis of the evidence available. But as the response of the economy to a change in policy rates and/or the quantity of base money reflects the influence of various factors and past policy actions that may have varied over time, and are likely to differ across countries, the estimation of these effects is not straightforward, especially for relatively low rates of inflation. Indeed, the estimated parameters of traditional macroeconometric models cannot be expected to be invariant over time. This is not only because they will not be invariant to the central bank's strategy or policy rule, as Lucas (1976) has emphasised, but also because other factors and processes, such as technological advances, productivity gains, financial innovations and possibly changes in preferences reflecting demographic developments are likely to exert an ongoing, and difficult to precisely identify, influence over time on the dynamic response of the economy to a monetary policy change.

The latest generation of macroeconomic models for monetary analysis, developed in recent years and referred to as "new Keynesian" or "new neoclassical" models, can address some of these challenges, particularly those stressed by Robert Lucas. These models are conceptually appealing as they also emphasise the role of forward-looking rational expectations and nominal rigidities and, furthermore, are based on more rigorous microfoundations. The derived macroeconomic relations, linking policy objectives to instruments, reflect explicitly the optimal behaviour of economic agents and they can be considered truly structural in the sense that their parameters are invariant to monetary policy changes[1]. These types of models have been employed to argue, as Michael Woodford did forcefully this afternoon, that monetary policy can be effectively conducted to control price and output developments without any use or reference to monetary aggregates. For money plays no essential or active role in the monetary transmission mechanism, it reacts only passively to price developments – which are influenced directly only by the monetary policy interest rate – without any feedback effects on the economy. So money does not matter.

One feature of an analytical framework in which money plays no meaningful role and of a policy strategy in which the policy-rate is set without taking into account monetary developments is the possibility that the central bank may fail to anchor inflation expectations effectively. This is a troubling possibility, which would imply increased output and price volatility that would impair the central bank's ability to pin down the price level efficiently. Christiano, Motto and Rostagno gave a pertinent example. But the issue is more general and deserves further reflection.

The strong conclusions on the irrelevance of money in the conduct of monetary policy derived from the New Keynesian models are not a consequence of the key and attractive features of those models – the role of expectations and the more solid microfoundations – but they reflect underlying assumptions concerning the role of money and of financial intermediaries in the economy. One such simplifying but limiting assumption is that real money balances do not affect aggregate demand directly. Another is that financial intermediation, which is important for credit provision and liquidity creation, has no effects on economic activity and prices other than those resulting from changing lending rates which move in parallel with all market rates. In these markets, there are no informational asymmetries or liquidity and credit constraints affecting the behaviour of economic agents, which is not the case in the real world. And movements in asset prices, that in reality can be affected by liquidity conditions, do not affect directly or via wealth affects spending decisions. I am sure that as the new framework for monetary policy analysis is extended, to allow for a sufficient degree of realism on the role of money and its counterparts – notably credit – in the economy, the relevance of money in the conduct of monetary policy will be revealed and restored. Research carried out at the ECB and elsewhere aims at incorporating a richer financial sector into dynamic stochastic general equilibrium models, in order to

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[1] They, of course, will not be invariant to changes in the economy's structure or agent's preferences.

study the role of financial variables in the conduct of monetary policy. And we should be looking forward to the findings of this research.

It is, of course, legitimate to ask whether these additional refinements that I am suggesting will turn out to be quantitatively significant. My expectation – and, I should say, my rational expectation based on the observation and assessment of economic reality – is that they are likely to be important. But the extent of their relevance in practice can only be judged on the basis of the available evidence, which can perhaps be better assessed in the context of the new theoretical framework and the associated dynamic stochastic general equilibrium models being developed.

## III. The empirical evidence

So far, I have argued that theory clearly suggests that money does play a role, but I have also pointed to potential challenges in identifying in practice and estimating with sufficient accuracy the effects of money on the economy over time. What does the empirical evidence available tell us? Is it robust and useful? What are the implications of this evidence, especially in the euro area, for policy?

A first and important finding is that there is strong and robust evidence concerning the long-term relationship between money and prices, based on data collected for many countries and over long periods of time. One such study, which estimates this relationship on the basis of a methodology that should make the estimates independent of country-specific events and of the sample period, finds that the correlation between inflation and the growth of money is close to 1, as suggested by theory. The existence of a strong and stable long-term relationship between inflation and money growth is documented by many other studies, including a number of major studies at the ECB based on euro area data. It is also interesting to note that the relationship between inflation and money growth is particularly close for high-inflation countries, as illustrated in a book co-authored by one of our distinguished guests, Chairman Bernanke. These findings are, of course, important and consistent with theory. But because robust correlations and long-term relationships need not imply causality, and because we are also interested in the links between money and prices over shorter time periods, we have to examine other types of evidence.

One approach employed in recent empirical studies to study the impact of monetary phenomena on the economy is based on vector autoregressions (VARs), which were pioneered by Sims (1972, 1980) and further developed and extensively applied by Professor Christiano and his colleagues. This approach has the merit that it is not constrained by a particular specification of the underlying structural relationships, and it provides evidence on the intertemporal response of the price level and output to a change in the monetary policy stance. Although the empirical results based on this approach are subject to several caveats, I would like to point to two findings from extensive research carried out at the ECB. First, there are remarkable similarities in the price level and output responses of the euro area and the US economies to a change in the monetary policy stance, although the exact time profiles of the dynamic effects differ and cannot be estimated with great precision. Second, a reduction in the policy rate or an increase in the monetary base induces a very gradual positive adjustment of the price level that is long lasting, while it leads to a temporary increase in output which reaches a peak after a period of between one and two years, but eventually diminishes to zero. These time patterns of output and price responses are consistent with the theoretical paradigm of the monetary transmission mechanism that I previously reviewed, and with simulations of the effects of monetary policy based on highly stylised dynamic general equilibrium models calibrated for the euro area economy.

This brings us to the evidence available on the role of money, as captured by the macroeconometric models currently employed by many central banks, including the ECB. The pertinent evidence is not encouraging, but this is not entirely surprising in the light of the arguments previously made and the results of vector autoregressions. The relationship between monetary and price developments involves considerable time lags, which reflect the various channels of the transmission of the effects of monetary policy. The short to medium-term dynamics of inflation, which are captured by the existing structure of this type of model, tend to be dominated by the impact of economic factors and shocks, such as changes in the price of oil or indirect taxes, especially in a low-inflation environment. It could thus be argued that the success of past monetary policy in keeping trend inflation at a low level has made it more difficult to estimate, in the context of this type of model, the short-term links between money and price developments. At the same time, econometric models focusing on the medium to long-term links between money growth and inflation have been able to capture statistically significant

empirical relationships that can help us to predict long-term inflation and assess the risks to price stability emanating from monetary developments.

## IV.       The conduct of monetary policy

What does all this imply for the ECB's choice of monetary policy strategy and the conduct of its single monetary policy? There is one logical conclusion, based on theoretical considerations, the empirical evidence and the current state of analytical tools: the sensible approach to assessing the outlook for and the risks to price stability over all pertinent horizons, but especially over the more policy-relevant medium term, is to analyse and combine all available information in a conceptually appropriate and consistent manner. This conclusion is further supported by the nature and extent of the uncertainty faced by policy-makers:

1.       uncertainty about the impact of ongoing processes, such as technological advances and financial innovations, on the economic structure;

2.       the associated uncertainty concerning the estimated values of key economic concepts, such as the economy's potential growth rate, the neutral real rate of interest or the non-inflationary rate of unemployment;

3.       uncertainty about the way in which economic agents form expectations;

4.       uncertainty relating to the robustness and completeness of the estimated quantitative approximations of the theoretical paradigms that may be employed in policy analysis; and

5.       uncertainty about the accuracy of data, especially on a real-time basis.

And needless to say, uncertainty was heightened – for the ECB – during the transition to the euro and the conduct of the single monetary policy. Taking all of this into account, the choice of our policy strategy – employing both economic analysis and monetary analysis, and using the latter to cross-check over the medium- and long-term the assessment resulting from the former – was the right one. It has served us well. My view on the assessment of the appropriateness and effectiveness of a monetary policy framework is summarised in the old saying that "the proof of the pudding is in the eating." And I would contend that, over the past seven years, the pudding has been very satisfying. Otmar Issing, who played a central role in shaping this strategy, will elaborate on this tomorrow, and I should not say much more. I would, however, like to briefly make some points relating to the future.

As shown in the paper presented earlier today by my ECB colleagues (Fischer, Lenza, Pill and Reichlin), the monetary analysis carried out at the ECB has evolved over time and is fairly comprehensive, going beyond the standard assessments based on the quantity theory of money and the stability of money demand. It employs a variety of tools in a manner that is not mechanical but combines judgement and analytical rigour in reaching a money-based assessment of the risks to price stability. The main conclusion from our experience with monetary analysis is that, on the whole, it helps us to extract useful information from monetary aggregates about the inflation outlook and the associated risks. This information has proven relevant and has made a decisive contribution to monetary policy decisions.

There is, however, more work to be done towards deepening and refining our monetary analysis. This will involve not only improving the pertinent analytical tools and examining more thoroughly developments in the components and counterparts of money, but also a more comprehensive use of the signals contained in money data to extract information on the current state of the economy, and which can be useful for forecasting inflation: money and credit aggregates can play an important role in providing timely information about variables which are measured with a lag, and about variables that are not observable, or shocks hitting the economy that may be correlated with monetary developments. Some work that has been done in this area is very promising. The general aim of this research agenda is to get more value from money.

At the same time, we will also enhance the tools employed in our economic analysis by introducing a new euro area-wide model (a state-of-the-art dynamic stochastic general equilibrium model of the euro area economy), which is based on more solid microfoundations, in line with the latest theoretical advances. This model has the potential to incorporate in a substantive way the role and effects of money and credit in the monetary transmission mechanism. Perhaps, in the future, we will be in a position to develop and reliably estimate a single empirical approximation of a general theoretical framework in which money is of central importance. When this is done, it may be possible to merge

the two pillars of our analysis into a single one. But this will be a larger pillar in which money will continue to play a prominent role in guiding our monetary policy decision-making.

## V.      Money and financial stability

A final issue that I would like to briefly address concerns the role of money and credit – the usefulness of monitoring and assessing monetary and credit developments – in the performance of another major central bank task, namely the safeguarding of financial stability. This issue is important in its own right, but it is also linked to the conduct of monetary policy, since price stability and financial stability are intertwined and should be mutually reinforcing. In recent years, extensive work has been undertaken at the BIS, the ECB and elsewhere that demonstrates that excessive monetary and credit growth can provide useful early signals concerning the potential emergence of asset price bubbles, and that excessive liquidity growth has been associated with asset price boom episodes that have sometimes been followed by post-boom recessions. These findings are obviously important for the role of money and credit in the monitoring and assessment of financial stability, but they are also relevant for the conduct of monetary policy.

A recently expressed view is that a narrow focus of monetary policy on price stability in the short term might pose risks to price stability in the longer run, if the potential consequences of financial instability for long-term price developments are overlooked. The ECB's monetary policy strategy, with its medium-term orientation and the important role it assigns to monetary analysis for assessing medium- to long-term price developments, allows us to address challenges that may arise from financial imbalances and potential instability in the financial markets. Monetary analysis can help us to identify distortions and imbalances in the financial system, and the implied potential risks to long-term price stability, in a timely manner. Moreover, market expectations of the monetary policy response to these long-term risks to price stability should help to contain evolving financial imbalances and thereby mitigate the vulnerability of the financial system. There is, therefore, no conflict between the conduct of a monetary policy focused on the preservation of price stability over the medium and longer term, and the safeguarding of financial stability. On the contrary, price stability and financial stability should be mutually reinforcing. And the monitoring and assessment of monetary and credit developments contribute to this, which reinforces what I said before: there is "value in money".

However, it is worth keeping in mind the implications of the rapidly changing global economy. Its structure and functioning is affected not only by (i) productivity developments related to technological advances; and (ii) the process of globalisation, but also by financial innovation and the increasing complexity of financial instruments. All these factors have a bearing on the dynamics of the inflationary process and the evolution and information content of monetary and credit aggregates. It is therefore essential that we continue to monitor these developments, and keep our antennas alert for monetary and financial signals that can be of use in assessing medium- to long-term trends in consumer and asset price developments and their potential interaction. Needless to say, it is not easy to interpret this information in the context of the ongoing structural changes in the real economy and financial markets that are difficult to identify and measure in real-time. But we have to. I am convinced that the information value that can be provided by money will remain important, but it also requires careful analysis and interpretation.

## VI.      Concluding remarks

According to an old saying, "The best advice about money is not to talk about it". Well, I obviously did not heed this advice, as I have talked about money quite extensively. But I felt it necessary to treat "money" comprehensively in my remarks, because it is money – according to an ancient compatriot of mine – money that "holds all things together". Around 330 B.C., Aristotle recognised that "all goods must therefore be measured by some one thing […] that holds all things together." He emphasised that "Money has become a sort of representative of demand by convention; […] it exists not by nature, but by law. And it is in our power to change it and make it useless." In modern democracies, the power – and the responsibility – to ensure that money retains its value is vested in independent central banks. And it is precisely because we take this responsibility very seriously that we want and need to talk about money, and the value we get out of money for our analysis, and for the pursuit of our price stability objective.

Thank you very much for your attention.