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Have central banks forgotten about money?

The case of the ECB, 1999 – 2014

Juan Castañeda and Tim Congdon

INSTITUTE OF
INTERNATIONAL
MONETARY RESEARCH

Analysis and insight into trends in money and banking,
and their impact on the world's leading economies

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In his 1970 Institute of Economic Affairs pamphlet on The Counter-Revolution in Monetary Theory Milton Friedman, who was to be awarded the Nobel prize for economics six years later, wrote,

"Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output. ... A steady rate of monetary growth at a moderate level can provide a framework under which a country can have little inflation and much growth. It will not produce perfect stability; it will not produce heaven on earth; but it can make an important contribution to a stable economic society."

Have central banks forgotten about money?: The case of the European Central Bank, 1999 – 2014

Juan Castañeda and Tim Congdon

The role of monetary policy in modern liberal democracies is controversial, but everyone agrees that central banks should prevent macroeconomic shocks rather than cause them. A policy regime should be designed to minimize macroeconomic instability. Ample empirical evidence, based on a well-established body of economic theory, identifies consistent medium- and long-run relationships between, on the one hand, growth of the quantity of money and, on the other, increases in nominal national income.[1] This paper will argue, from the experience of the Eurozone after the introduction of the single currency in 1999, that maintaining steady growth of a broadly-defined measure of money is crucial to the achievement of stability in demand and output. Monetary analysis is effective in interpreting the cyclical upheaval in the Eurozone's Great Recession in late 2008 and 2009. Further, over the last decade monetary instability in the Eurozone periphery's member states has been of exceptional severity. Oscillations in the rate of change in the quantity of money have been fully comparable with those seen in other notorious episodes of macroeconomic trauma, including the USA's Great Depression between 1929 and 1933 as documented in Friedman and Schwartz's 1963 classic study, *A Monetary History of the United States 1867 – 1960*.

The paper is structured as follows. The opening section recalls key points of the relevant body of theory, in order to introduce a review in the next section on the empirical relationship between money growth and increases in nominal national growth for the Eurozone as whole. The third section sketches the role of money (meaning "the quantity of money") in the evolving monetary-policy strategy of the European Central Bank. A salient message is that in the Eurozone's first four years the ECB monitored broad money growth as part of a "two-pillar" strategy, in accordance with the Bundesbank's long-standing and successful practice. It may not, strictly speaking, have targeted a money aggregate, but a "reference value" for M3 was set and followed. However, even this diluted kind of money-based policy-making was dropped in 2003. The loss of the quantity-of-money "pillar" was followed by a sharp acceleration in money growth, and a marked and consequent upturn in asset price inflation.

Although the Eurozone was initially less affected than the USA and the UK by the paralysis in wholesale money markets from August 2007, in autumn 2008 the tightening

of bank regulation under G20 auspices led to a plunge in money growth.[2] The quantity of money actually fell in the year from the second quarter of 2009. Even five years later – in mid-2014 - it was little more than 5 per cent higher than it had been at the worst point in the Great Recession. The imposition of more rigorous bank regulation was far more important in policy-making than recognition that the quantity of money might affect macroeconomic conditions. The narrative suggests that three distinct sub-periods with markedly different policy-making approaches can be identified in the decade and a half under discussion. They are from January 1999 to May 2003, from May 2003 to October 2008, and from October 2008 to the start of 2015.[3] The different approaches reflected a lack of consistent thinking in the ECB leadership, and money growth and macroeconomic conditions were affected by this incoherence.

The fourth section of the paper examines money trends in two specific Eurozone member states, Greece and Ireland. As will emerge, very large swings in money growth occurred, with catastrophic repercussions on output, employment and living standards. The conclusion argues that the Eurozone's macroeconomic experience confirms the validity of a monetary interpretation of national income and wealth. By implication, the abandonment of the monetary pillar in 2003 was a serious mistake. Consideration should be given to the restoration of a money reference value or even to the introduction of a formal money target. At the least, ECB officials need to clarify their understanding of the relationship between regulatory actions on the one hand, and the growth of bank balance sheets and the quantity of money on the other.

Money's position in the economy: general remarks

The relationship between money growth and the change in nominal national income has been thoroughly studied and confirmed in many countries over numerous long runs. A widely-held view is that "excess" money growth – growth in the quantity of money that is well ahead of contemporaneous growth in real output – leads to inflation. Treatments by Irving Fisher, Patinkin, Friedman and many others share the common background of the quantity theory of money. A stylized argument assumes that the demand-to-hold-money function is stable, and that the arguments in it apart from national income and wealth are constant.[4] Given this assumption and starting from an equilibrium in which money demand equals the quantity of money actually in existence, a step increase in the quantity of money must be followed in due course by an equi-proportional increase in both national income and wealth.

This comparative-static result ("the proportionality thesis") is fundamental to the subject and familiar from a large literature. It has been accompanied by an unsettled and rather disorganized discussion of the processes by which the economy returns to equilibrium after the shock. In Friedman's papers, some of which now command almost iconic status, an initial jump in the quantity of money provokes a range of portfolio adjustments by companies and individuals. The prices of assets and goods rise, and keep on rising, in transactions that taken together are a multiple of national income in

value.[5] The increase in the price level (and perhaps some advance in real output too) continues until the desired ratios of money to incomes and wealth are achieved.

The practical meaning of the assumed stability of money demand is that, once the period of adjustment is over, the desired ratios ought to be the same after and before the shock. Money and nominal national income must therefore rise together with, more or less, the same percentage increase. Since the adjustment processes take time, the real-world relationship between money and national income should be evaluated over the medium to long term. Of course, in order to make the analytical approach manageable, the appropriate measures of money, national income and the price level need to be chosen. A particularly important issue is the extent to which the prices of assets should be incorporated in the overall price level, since asset prices and such well-known inflation yardsticks as the consumer price index are not correlated in the short run.[6] These questions are not trivial, and the answers to them will determine both the scope and the limits of the current analysis. For reasons discussed elsewhere in a new book on *Money in the Great Recession*, a broadly-defined concept of money (M3) is the most appropriate and is used throughout the current paper.[7]

In real-world applications of the theory numerous difficulties and complications confuse the issue. The arguments in the money demand function other than income and wealth, notably the relative attractiveness of money and non-monetary assets, are forever changing. Meanwhile banking institutions and arrangements, which affect behavioural parameters, evolve in response to new technologies and regulations. If standard theory were the whole story, the velocity of circulation would be much the same decade after decade, but that is rarely a verdict allowed by the data. Instead careful scrutiny of banking and macroeconomic information is required to identify new influences on the demand to hold money balances. In Friedman's words, "...on an empirical level, [the quantity theory] has increasingly become the generalization that changes in desired real balances [that is, changes which will affect equilibrium velocity]...proceed slowly... [S]ubstantial changes in prices or nominal income are almost always the result of changes in the nominal supply of money."[8] A further warning has to be given. For the Eurozone in the period under examination, analysis is beset by problems, partly because the introduction of the single currency in 1999 was a remarkable experiment. As it was the first time in the late twentieth century that several countries had pooled their monetary sovereignty by sharing the same money, statistical data became subject to series breaks, while many new institutional and behavioural uncertainties were created.

Money trends in the Eurozone as a whole: 1999 – 2014

At any rate, abundant data are available for the quantity of money and nominal national income, and permit an initial appraisal. Table 1 gives key information on the changes in the quantity of money and nominal GDP for the Eurozone over the whole period. It is immediately evident that hopes of an almost constant velocity of circulation

are disappointed. The ratio of money to GDP (that is, the inverse of velocity) rose appreciably in the almost 16 years under review. In a typical year the ratio of money to GDP increased by over 2 per cent, not much less than the average annual growth rate of nominal GDP of 3.2 per cent. On the face of it, the change in the desired ratio of money to income was not much less important than money itself in accounting for the behaviour of nominal GDP. But can the rise in the ratio of money to income be explained in choice-theoretic terms, as a response to institutional developments and changes in the opportunity cost of money holding? If so, the central contention of the quantity theory of money – the proportionality thesis – might remain valid in an underlying sense.[9]

Table 1: Key features of Eurozone monetary trends, 1999 - 2014

	Levels, in billions of euros	
	Quantity of money (M3)	**Nominal gross domestic product**
1999 Q1	4,459.60	6,337.80
2014 Q4	10,313.60	10,174.50
Average annual growth rate, %,		
1999 Q1 - 2014 Q4	5.4	3.2
Ratio of money to nominal GDP:		
1999 Q1	0.704	
2014 Q4	1.032	

Source: IMF database and author's estimates

An important influence on the rise in the money/income ratio may have been that the introduction of the euro in the 1990s constituted a major de-regulation of the entire European banking system. Preparations for the new currency were accompanied by the abolition of exchange controls, the ending of bank regulations that had once been specific to member states and the harmonization of central bank cash reserve requirements at a much lower cost to the banks than before.[10] This de-regulation encouraged more intense competition, and hence a narrowing of margins between deposit and lending rates. As many businesses (and even some individuals) simultaneously hold deposits and have outstanding bank loans, the narrowing of margins enhances the attractiveness of banking services and raises the equilibrium ratio of bank intermediation to GDP. The effect applies particularly to non-bank financial institutions, the profitability of which is much influenced by the terms that banks offer. In the UK and other countries financial liberalization has been associated with both significant rises in the ratio of

bank intermediation to GDP and markedly higher expansion of money balances in the non-bank financial sector than in other parts of the economy.[11] If these arguments were correct, two patterns might be expected. First, the rise in the money/income ratio would be expected to be most pronounced in the early years of the single currency, as agents took advantage of the opportunities created by banking liberalization. Secondly, the money holdings of companies – especially financial companies – ought to have risen more rapidly than the money holdings of households. Can supporting evidence be found?

Chart 1: Ratio of quantity of money (M3) to nominal GDP in Eurozone, 1999 - 2014

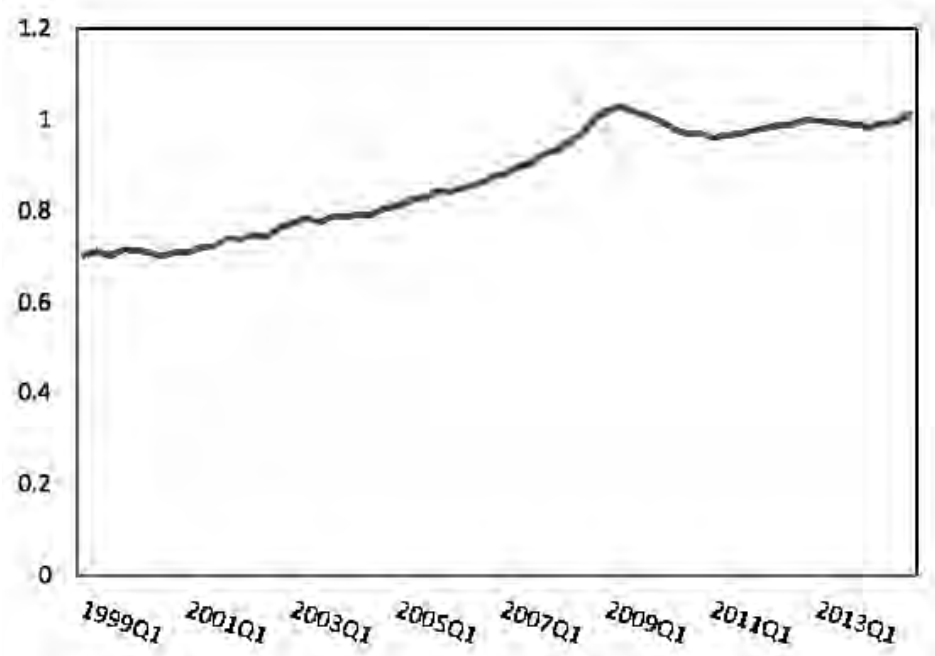


Chart 1 shows the timing of the rise in the ratio of money to income. Clearly, more than all of it occurred between 1999 and 2008, with a peak value (of just over one) in the fourth quarter (Q4) of 2008. This is consistent with the hypothesis that the increased competitiveness of the banking system after the euro's inception lay behind the change in the money/income ratio, even if it is not a rigorous proof of that hypothesis. Chart 2 gives numbers for the change in the money holdings of different types of agent, although – unfortunately – the statistics (which come from the ECB's database) begin in January 2002 rather than in January 1999.[12] Again, the facts agree

with the possibility that the new currency represented a major de-regulation which promoted more money holding. As expected, non-financial companies increased their money holdings relative to turnover (that is, to nominal GDP roughly speaking) more rapidly than households increased theirs relative to incomes, while financial companies' money balances climbed even more quickly relative to GDP.

Table 2: Growth rates of different sector's money holdings, 2003 - 14

M3 money, in billions, of euros, held by

		Companies			
	Households	Non-financial	Pension funds & insurance companies	Financial, excluding PFICs	All companies
January 2003	3,815.2	1,095.9	204.1	454.0	1,754.0
January 2015	6,377.7	2,085.4	376.4	1,039.3	3,501.1
% annual compound rates of change, Jan 2003 - Jan 2015					
	4.4	5.5	5.2	7.1	5.9

Source: Company reports and accounts, as collated by REFS. REFS is a company analysis service prepared for institutional investors and now published by JD Financial Publishing Ltd. in London.

The increase in financial companies' money may have reflected a widely-noticed long-run tendency for financial assets (which is usually the relevant variable in determining financial sector money demand) to grow faster than national income and output. This tendency is sometimes denigrated as artificial "financialization", on the grounds that the financial sector adds less genuine value added than indicated by the incomes received by its workforce.[13] Whatever the truth of the allegation, the behaviour of Eurozone financial sector money accords with the notion that an intensification of banking system competition may have stimulated the propensity to hold money. To anticipate discussion in the next section, it is worth pointing out that the years 2003 – 2008 not only saw unduly high money growth for all Eurozone people and companies, but were also characterised by extremely rapid rises in the financial sector's money balances. If pension funds and insurance companies are excluded, the compound annual growth rate of financial sector money between January 2003 and October 2008 was an extraordinary 17.9 per cent. This was well above the compound annual growth rate in the same period of household money which, at 6.9 per cent, was quite high enough.[14]

One final body of information may be of interest in this context, the comparative experience of the Eurozone's member states. Doubts might be raised about the

meaningfulness of national money data in a multi-nation currency union, because – for example – currency passes from hand to hand between residents of several member states. The notion of the "residence" of a money-holder becomes elusive. The difficulties are likely to be greatest for nations known to have disproportionately large financial centres, since such centres may be the location of so-called "brass-plate companies" of which the beneficial owners are non-residents. However, starting from January 2002 the International Monetary Fund has compiled broad money estimates for Eurozone states. As far as the IMF is concerned, these states still have identifiably national banking systems, and distinct governments that are accountable for bank regulation and deposit protection on a local basis. Table 3 sets out information for the 2002 – 14 period on the rates of growth of money and nominal GDP for the 12 member states that joined the Eurozone at its inception.[15] Table 4 shows the ratio of money to nominal GDP at the beginning and end of the period for the same countries.

Table 3: Growth of money and nominal GDP in Eurozone member states, 2002 - 2014

	Average annual % rate of change	
	M3 quantity of money	Nominal GDP
Germany	4.8	2.3
France	5.6	2.5
Italy	5.7	1.6
Spain	5.3	3.1
Netherlands	5.5	2.5
Belgium	5.4	3.2
Austria	6.1	3.2
Greece	3.2	1.2
Finland	6.9	2.8
Portugal	2.1	1.7
Ireland	6.3	3.2
Luxembourg	*3.0*	*5.8*
Eurozone as a whole	5.2	2.6

Notes: Period is from Q1 2002 to Q4 2014. Data are from IMF database, with numbers in table estimated by the author.

Table 4: Ratios of broad money balances to GDP in Eurozone member states

	January 2002	December 2014	*% change in ratio of money to GDP over 2002 - 14 period*
Germany	0.659	0.895	35.8
France	0.658	0.950	44.4
Italy	0.550	0.893	62.4
Spain	0.844	1.091	29.3
Netherlands	0.838	1.165	39.0
Belgium	0.919	1.187	29.2
Austria	0.692	0.894	29.2
Greece	0.923	1.059	14.7
Finland	0.525	0.773	47.2
Portugal	0.908	0.948	4.4
Ireland	0.703	1.010	43.7
Luxembourg	*8.124*	*5.155*	*-36.5*
Eurozone as a whole	0.738	1.014	37.4

Notes: Period is from Q1 2002 to Q4 2014. Data are from IMF database, with numbers in table estimated by the author.

The information in these two tables may still not convince economists sceptical about the quantity theory. Nevertheless, certain features of the data imply that money and national income are related, and that quantity-theory reasoning has analytical value. One message from Table 4 is that Luxembourg, the smallest nation in the Eurozone which has specialized on financial intermediation, was and remains an outlier with an unusually high ratio of money to national income.[16] This conforms to expectations and warns that national money stocks could be affected by changes in the country in which companies (and hence their bank deposits) are registered. Italy presents an interesting contrast with Luxembourg. It is widely believed to suffer greater tax evasion than other countries, discouraging the holding of assets in places easily tracked by the authorities. At the start of the period under review the ratio of money balance to Italy's GDP was almost the lowest in the Eurozone and less than a fourteenth that in Luxembourg.

Despite these and other differences, all the Eurozone's nations (apart from Luxembourg) have seen an increase in the ratio of money to GDP in the single currency period. If Portugal, Greece and Italy are also excluded as being affected by special anxieties over their banking systems in the closing years of the 2002 – 14 period, the change in the ratio of money to GDP is close to the Eurozone average (of 37.4 per cent) for every Eurozone member state. There is also a reasonable correlation between the average annual rates of change of M3 broad money and nominal GDP in the 12 countries, although – once again – it is best to eliminate Luxembourg from the exercise.[17] A fair generalisation from this and earlier information is that changes in the quantity of money have an important bearing on changes in national income in the Eurozone, in accordance with economic theory. While alternative views might be expressed, the hypothesis that macroeconomic developments can be interpreted from a quantity-theory perspective is legitimate.

Monetary policy-making in three phases: 1999 – 2014

The time has come to consider the role of money in the ECB's strategy. As adumbrated earlier, the discussion can be split into three, reflecting the changing emphases of the ECB's economics research team and Governing Council.

1. A successful strategy: the monetary pillar retained, from January 1999 to May 2003

Confidence in the relationship between a broadly-defined money measure and nominal gross domestic product was basic to the design of the ECB's monetary strategy in its early years. In the post-war decades before the euro's introduction, Germany's central bank, the Bundesbank, had by far the most impressive record in the containment of inflation of all the EU's central banks. It therefore set the intellectual pace in monetary policy thinking at the outset of the Eurozone. It had achieved its success by implementing a target for broad money growth, and was open and explicit about its methods in its publications. Given the background, it was logical that the ECB's first chief economist

was Otmar Issing, who had previously been chief economist at the Bundesbank. In the late 1990s he played a vital role in the organization of ECB research and policy advice. His 2008 book, *The Birth of the Euro* explained the preparations and options for the ECB's strategy.[18]

At its start the euro had no performance record, and it was essential to remove uncertainty and gain credibility. As noted above, the euro was a radical experiment. The Eurozone's member states shared the same money, but they did not share fiscal institutions. The powers to raise taxes and even to issue debt instruments were dispersed among the 11 nations. In this potentially fragile context with a wholly new configuration of powers and responsibilities, the decision to adopt the Bundesbank's much-admired monetary strategy was the safest option. It was widely expected that large behavioural shifts in the early stages of the new currency might be accompanied by high volatility in money growth. The ECB therefore announced not a binding target for broad money growth, but a "reference value". The reference value was for a rate of increase in broad money consistent with the ECB's definition of price stability. (This was for an annual rise of under 2 per cent in the "harmonised index of consumer prices, over the medium term.)[19] Even though, strictly speaking, the reference value was not a strict policy commitment, the exercise was intended with great seriousness. Issing and his colleagues were anxious to prevent unduly high growth of M3 growth, as they believed it would be a reliable leading indicator of inflation trouble. As the ECB stated in the January 1999 issue of its *Monthly Bulletin* , "substantial or prolonged deviations of monetary growth from the reference value would, under normal circumstances, signal risks to price stability over the medium term. This feature requires both that a stable relationship between money and the price level exists, and that monetary growth is a leading indicator of developments in the price level".[20]

Within this strategy the ECB pursued what it termed "two pillars" of analysis, one was the monetary pillar with its M3 reference value, and the other was more eclectic and included a range of data, including "the output gap".[21] The ECB's first President, Wim Duisenberg, said in 1998 that he could not indicate which of the two pillars was the "stronger" or "thicker", as they both mattered.[22] As announced by the ECB in December 1998, the first reference value (4.5 per cent) was the result of applying the money quantity equation, given expectations for output growth and money velocity in the Eurozone in the medium to long run. In the event annual M3 growth in the opening years of the twenty-first century was well above 4.5 per cent, but the inflation numbers were pleasingly low and benign, and in accordance with the ECB's notion of price stability. In the years to January 2000, January 2001, January 2002 and January 2003 M3 advanced by 6.0 per cent, 6.6 per cent, 8.0 per cent and 7.0 per cent respectively. Critics of the monetary pillar pointed out that the expectations of inflation held in financial markets, as implied by bond yield differentials, were for inflation to remain in line with the ECB's objective. The money overshoot appeared not to bother market participants.[23]

2. A new approach from May 2003: the monetary pillar downgraded

In 2003 money growth decelerated, falling back towards the 4.5 per cent reference value. However, after reviewing its monetary strategy the ECB Governing Council decided in May 2003 to downgrade the role of monetary pillar. Its statement was subtle and apparently even-handed, and said that the ECB was still pledged to the two pillars of analysis. Nevertheless, the preparation of annual reference values for M3 was to be dropped. A shift in emphasis away from money and towards other indicators was under way. Issing remained on the ECB's executive board until 2006, but the tradition of Bundesbank-influenced broad money targeting was being de-emphasized.

Prominent academics praised the ECB's decision to snub money targeting and criticised the ECB for ostensibly retaining an analytical interest in M3 trends. The academic opponents of the money pillar came particularly from a New Keynesian position, which (as discussed as discussed by Philip Booth in his contribution to *Money in the Great Recession*) is often represented in a three-equation model that nowhere mentions the banking system or the quantity of money.[24] New Keynesianism thus ignores the quantity of money, instead highlighting the importance of "the rate of interest" (usually meaning the money market rate set by the central bank in real terms) to the macroeconomic conjuncture.

An example of a paper advocating the elimination of the quantity of money from monetary policy-making and thinking was David Romer's much-cited 2000 contribution 'Keynesian macroeconomics without the LM curve' to the *Journal of Economic Perspectives*. Romer was particularly hostile to broad measures of money. While agreeing that central bank operations in money markets can impact on the amount of high-powered money and hence the money market rate, he said that "the appropriate measure of money is not clear" in textbook IS-LM analysis. He scorned the credit counterparts approach to the analysis of money growth. The new approach he favoured – of focussing on the real interest rate – would, to quote, allow the observer "to dispense with the confusing and painful analysis of how the banking system 'creates' money".[25]

The usefulness of monetary aggregates in policy-making had been denied in other influential academic articles just before and during the euro's introduction. In 1998 Michael Woodford, a celebrated monetary economist at Columbia University, published a paper on 'Doing without money: controlling inflation in a post-monetary world' in the *Review of Economic Dynamics*. According to the paper's abstract, economies would over time increasingly economize on the use of cash. In a supposed "cashless limit" inflation would become "a function of the gap between the 'natural rate' of interest, determined by the supply of goods and opportunities for intertemporal substitution, and a time-varying parameter of the interest-rate rule indicating the tightness of monetary policy".[26] It followed that central banks, in the intellectual avant garde pioneered by Woodford and his associates, could target inflation without paying any attention to the banking system or the quantity of money. Woodford's 2003 book on *Interest and Prices*

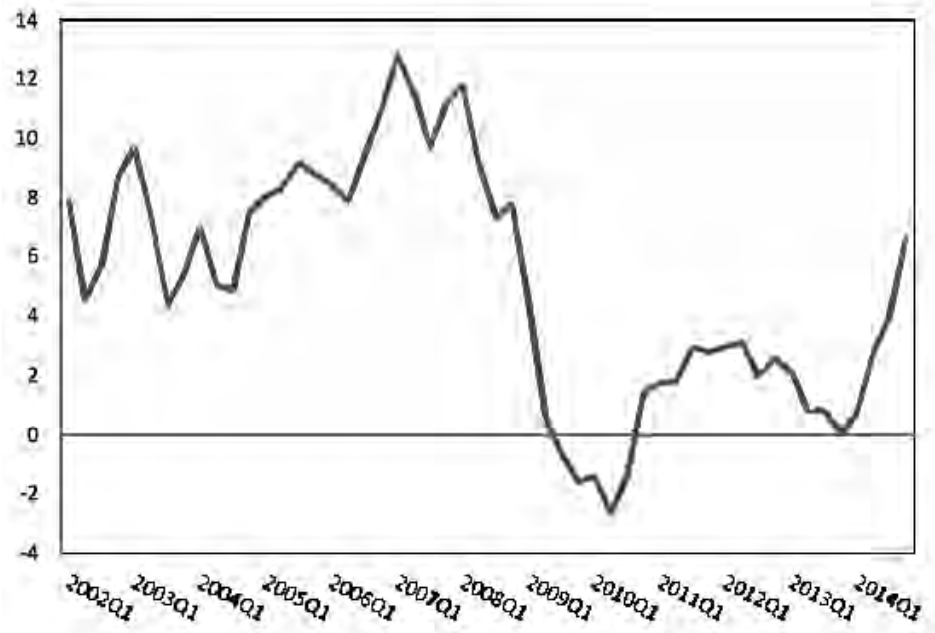
was widely hailed as a path-breaking work which might justify a future Nobel prize for its author. Its title recalled Wicksell's 1898 *Geldzins und Güterpreise*, which translates as *Interest and Prices*. The omission of the word "money" was seen as a deliberate slight to Patinkin's 1956 *Money, Interest and Prices*, a book often understood to be a classic development of quantity-theory ideas. In 2007 Woodford received the Deutsche Bank Prize in Financial Economics, which is awarded to "renowned researchers who have made influential contributions to the fields of finance and money and macroeconomics, and whose work has led to practical and policy-relevant results".[27]

The work of Woodford and other New Keynesians did indeed have practical, policy-relevant and far from negligible results. First, the communication policy of the ECB changed. The introductory statements of the President of the ECB at monthly press conferences (that is, those held after Governing Council meetings) increasingly gave priority to "economic" analysis and downgraded "monetary" research.[28] Second, and much more fundamentally, the downgrading of monetary aggregates led to monetary conditions that were too loose for too long. Chart 2 shows the annualized growth rate of M3 in six-month periods over the 13 years inclusive from the start of 2002 to the end of 2014. It is immediately apparent that the highest growth rates in these 13 years were from late 2006 to early 2008, when they were in double digits almost without interruption. As the trend growth rate of Eurozone output was thought to be little more than 2 per cent a year, a double-digit annual growth rate of quantity of money implied an acceleration in inflation to rates well above the 2 per cent price stability limit. That was true, even if a persisting rise in the ratio of money to income neutralised part of the risk.

Admittedly, inflation at the consumer level still remained moderate in 2006 and 2007. It needs always to be remembered that money is held partly within financial portfolios, where agents are balancing money and non-money assets, while the lags between changes in money and in the prices of goods and services can be (in Friedman's phrase) "long and variable". The inflation pressure arising from excess money growth can surface in asset markets rather than in markets for goods and services. In practice, the high money growth of 2006 and 2007 affected asset prices most visibly and directly, and also boosted economic activity. House prices and stock markets soared, notably in the countries of the so-called Eurozone periphery, as will be discussed in more detail in the next section. Output in the Eurozone grew by 3.2 per cent in 2006 and 3.0 per cent in 2007. These were the highest figures so far in the twenty-first century and well above the numbers recorded in neighbouring years. The fastest money growth in the Eurozone's existence occurred in conjunction with marked asset price buoyancy, and above-trend growth in demand and output. This cannot be a coincidence. Critics of money targeting – such as Woodford and Romer – may have been right to question the precision of the relationship between changes in the quantity of money and changes in the price level of goods and services. But they went too far. The relationship between money and prices may have been less certain in the short run than expected, but that did not mean there was no relationship at all.[29]

Chart 2: Figure 4.2 M3 growth in the Eurozone, 2002 - 14

- Annualised rate of increase in last six months, %



3. The response to crisis: tighter bank regulation takes precedence, from autumn 2008 to end-2014

By mid-2007 the ECB Governing Council had become concerned about the medium-term dangers of above-target inflation. To the few observers who still tracked movements in the quantity of money, that could not have come as a surprise. But the focus of senior figures in international financial policy-making was about to shift towards a different and quite separate threat. In August 2007 the global wholesale money markets – the markets in which banks borrow from and lend to each other in many currencies, including the euro – closed down to new business. Senior bank executives were fearful that their counter-parties had under-estimated the fragility of some liquid assets, even including asset-backed securities carrying triple-A credit ratings. Banking systems in the advanced world seemed to be over-leveraged and, at least potentially, of doubtful solvency. As the euro-denominated inter-bank market had grown explosively since the start of the single currency in January 1999, and as banks in the Eurozone periphery were heavy new borrowers on this market, the ECB was anxious that some Eurozone banks might be hit by a sudden curtailment of credit lines.

The ECB reacted swiftly and effectively.[30] In the days following 8 August, which

was the first to which the term "crisis" might be applied, it made borrowing facilities available on an immense scale to all Eurozone banks. The facilities were not at a penalty rate, but carried a cost close to the 4 per cent official minimum bid rate. The ECB's *Monthly Bulletin* called the extension of these facilities "a fine-tuning operation", but the numbers were vast, with €94.8 billion being provided on 9 August, €110 billion on 10 August, €310 billion on 13 August, and similar amounts on several days in the rest of the month. The aims – which were achieved – were to keep money market rates close to the official policy rate (that is, 4 per cent) and to ensure that all banks could fund their assets, even if inter-bank lines were being cut. The ECB was well aware that its conduct was exceptional and of an emergency kind, and the operations became known as the "non-standard measures".[31]

The non-standard measures involved transactions between the central bank and the commercial banks. They did increase the monetary base, but had no direct, first-round effect on non-banks' deposits (that is, on the quantity of money). However, the ECB's vigorous lending to cash-short banks did matter to monetary growth. If the ECB had not organized the non-standard measures, banks with net indebtedness to other banks would have been forced to shrink assets (by selling securities or cancelling loans), and that would have led to reductions in bank deposits on the other side of the balance sheet. In the event Eurozone banks, including banks in the Eurozone periphery, coped easily in late 2007 and early 2008 with their funding issues. Indeed, in the twelve months from September 2007 to August 2008 inclusive, new credit extended to the Eurozone's private sector was *higher* (€1,329.2 billion) than in the previous twelve months (€1,223.1 billion).[32]

Even as late as the autumn of 2008 the ECB expanded its lending to the banks, by the implementation of the new fixed-rate lending facilities (with full allotment and no penalty rate), and by easing rules on the eligibility of loan collateral. Over the 18 months from August 2007 the ECB was a prompt and efficient lender of last resort. It is widely judged to have been better than, for example, the Bank of England in handling the inter-bank liquidity problems from August 2007.[33] It also prevented the failure of a large, specific institution, unlike the US Federal Reserve which let Lehman Brothers go under in September 2008. For much of 2008 the global financial crisis was seen as a specific crisis of Anglo-American capitalism, while the Eurozone was better placed.

This favourable assessment turned out to be premature. The collapse of Lehman Brothers was followed by a sequence of high-level meetings under the auspices of the G20 nations, but with recommendations to the Bank of International Settlements (BIS), the International Monetary Fund and the European Commission (and so to all EU member states). The meetings arrived at agreements to enforce a tougher regulatory regime on the banks. In future banks were to operate with higher ratios of capital to assets, less inter-bank funding and higher proportions of liquid assets to total assets. (The changes taken together might be termed "the New Regulatory Wisdom". The NRW has costs as well as benefits, as discussed by Sir Adam Ridley in chapter 5 of Money in the Great Recession, which is the second in the Institute of International

Monetary Research's series of research papers.) The package of reforms was set out in a document known as "the Basel III Accord". This was finally approved in November 2010 by the G20, but already by then it was in the process of implementation. Indeed, Eurozone finance ministers decided at their Ecofin meeting in December 2008 that plans to recapitalize the banks should go ahead "without delay".[34]

No thought whatsoever seems to have been given to the implications of the regulatory upheaval for the rate of growth of the quantity of money. The monetary pillar had become invisible. Policy-makers' priority was to make the banks safe and robust, and less reliant on central bank support if inter-bank funding were interrupted again. Like Romer in his 2000 article, they may have found the discussion of how the banking system creates (or destroys) money "confusing" and "painful". In fact, the large-scale and hurried bank recapitalization endorsed by regulatory officialdom had catastrophic implications for money growth in the Eurozone, as elsewhere. Of course, senior officials were operating in panic conditions and some allowance might be made for that, but they seem to have lost altogether an understanding of relationships that are basic to monetary economics.

If banks' share prices are depressed by weak market confidence (as they certainly were in late 2008 and 2009), they are likely to react to demands for an increase in capital/asset ratios by reducing their assets or, at the very least, halting balance-sheet growth.[35] The asset reduction can be effected by sales of securities or by pulling in loans and cancelling them. If securities are sold to non-banks, non-banks pay for them by drawing on their bank deposits which disappear from the economy; if loans to non-banks are repaid, the usual procedure is for non-bank borrowers to sell some assets, which initially adds to their deposits (at the expense of other agents' deposits), and then to use the deposits to pay off the loan. In both cases money balances are destroyed. Furthermore, the first-round effect of bank capital-raising is also to lower bank deposits and destroy money. (Investors typically pay for new securities issued by the banks by drawing on deposits. Payments from deposits of course reduce the level of deposits and hence the quantity of money.)

Contrary to Romer's claims, analyses of how banks create (and destroy) money are essential to good monetary policy-making. The ECB's actions had contradictory and paradoxical results. The ECB's lending facilities (the "fine-tuning operations" and the like) enabled the banks to operate despite the tensions in the inter-bank money markets. They "accommodated" existing bank business and were neutral or slightly positive for money growth. On the other hand, the European Commission and national financial regulators – acting in concert with the ECB – were increasingly requiring banks to maintain higher capital buffers and to fund assets more conservatively. Harsher bank regulation disrupted business models and was negative for money growth.

In practice, the negative forces overwhelmed the positive. Broad money growth collapsed. The month of October 2008 registered an exceptional 1.6 per cent upward blip in M3. But, from then on, the regulatory blitz led to a virtual cessation in Eurozone banks' new credit extension to the private sector. Whereas new credit had soared by

€1,329.2 billion in the twelve months to August 2008, it was to increase by only €195.5 billion in the twelve months to August 2009. Meanwhile enforced bank capital-raising cut into money holdings, as investors acquired newly-issued securities. In the six months from October 2008 M3 rose 1.0 per cent (that is, at an annualised rate of 2.0 per cent); in the next six months, from April 2009, M3 dropped by 0.8 per cent (that is, at an annualised rate of 1.6 per cent). Broad money growth of almost 9 per cent in the year to October 2008 contrasted with money growth of little more than nil in the year to October 2009.

The Eurozone's macroeconomic conjuncture changed drastically. Stock markets, and indeed asset markets in general, came under downward pressure. Eurozone residential property increased in value at a compound annual rate of 5.9 per cent in the first nine years of the single currency and reached an all-time peak in the third quarter of 2008. But between the second quarter of 2008 and the first quarter of 2010 they declined by 4 per cent, with much worse experience in some of the periphery economies. To the extent that loan collateral was provided by houses, these falls implied deterioration in the quality of banks' loan portfolios and were a further threat to their profitability and capital strength. The drops in asset prices, which were undoubtedly related to the squeeze on money balances, contributed to a deep contraction in Eurozone GDP of 4.4 per cent in 2009.

The ECB tried to alleviate persisting tensions in the inter-bank market by again expanding its lending facilities to the banking sector in May 2009, with the application of new twelve-month maturity repos. But a rethink about the wisdom of the "non-standard measures" seems to have begun at some point in mid-2009. The surge in ECB lending to Eurozone banks since August 2007 had been accompanied by a large increase in the monetary base. Jurgen Stark, who shared a Bundesbank background with Issing and had succeeded him as the ECB's chief economist in 2006, became concerned. His worry was that at some future date the rise in the monetary base would provoke a similarly large rise in the quantity of money and hence generate unacceptably high inflation. He managed to convince Jean-Claude Trichet, the ECB's President, and a majority of the Governing Council that the non-standard measures should be withdrawn. To quote from the editorial in the ECB's November 2009 *Monthly Bulletin*, "the Governing Council will make sure that the extraordinary liquidity measures [taken since mid-2007] are phased out in a timely and gradual fashion". That was necessary, according to the bulletin, "in order to counter effectively any threat to price stability over the medium to longer term".[36]

In a speech to the European Parliament on 16 March 2010 Stark said that the phasing-out of the non-standard measures had begun in December and would soon intensify. Very cheap borrowing facilities for the banks, at a mere 1 per cent rate, would soon disappear, while the term to maturity of the loans would be shortened. In Stark's words, "we decided to return to variable rate tenders in the regular three-month operations towards the end of April". For many banks in the Eurozone periphery the loss of the ECB credit lines was traumatic, since they still lacked the credibility in the

inter-bank market to obtain enough funds to support their assets. If they asked their own customers (companies and households) to repay loans, they might breach legal agreements as well as forfeit goodwill. In effect, loan portfolios were illiquid. The banks therefore reacted to the withdrawal of the ECB loans by selling the most liquid assets they held, namely government securities. The spring of 2010 therefore saw substantial falls in the prices of bonds issued by governments in the Eurozone periphery, initiating what became known as "the Eurozone sovereign debt crisis". By far the most vulnerable country was Greece. Ahead of joining the single currency project in 1999 and 2000, it had deceived the European Commission and financial markets by understating its budget deficits and public debt. The drop in the price of its government bonds meant a surge in the yield, which then set the cost of servicing maturing debt. At the worst moments, in late April 2010, the yield of Greek government debt exceeded 30 per cent.

Whatever the uncertainties about its exact size, there was little doubt that the public debt was more than national income. Unless something were done, the debt interest on Greece's public debt would in due course move to above 20 per cent of GDP. This would be plainly unsustainable and indeed so intolerable that Greece would have to leave the Eurozone. On 10 May 2010 the ECB announced the Securities Markets Programme which gave the Eurosystem (that is, the ECB working with the Eurozone national central banks) the authority to purchase large quantities of government bonds. Purchases of Greek sovereign paper came first, but over the next 18 months purchases were also made of Irish, Italian, Portuguese and Spanish government bonds. These purchases – which totalled over €200 billion by late 2011 – were not intended to boost the quantity of money, but to stabilize bond yields. On the Governing Council Stark and Axel Weber, attending as the President of the Bundesbank, voted against the Securities Market Programme, but were outmanoeuvred and outvoted.[37] Representatives from France and the Mediterranean countries had little interest in the Bundesbank tradition of monetary targeting, and were instead anxious to keep their banks afloat. The danger was that banking systems would have losses running into tens of billions of euros on assets – claims on European governments, after all – which only a few years earlier had been regarded as totally safe.

It can be argued that the sovereign debt crisis was precipitated by the withdrawal of the non-standard measures, even if the underlying problems were credit excesses and fiscal profligacy in the debtor nations. But Stark, Weber and other senior figures from Germany were opposed to the restoration of large-scale credit facilities at easy terms from the ECB. A high proportion of the Eurozone's banks were nervous about their ability to fund existing assets, while the entire Eurozone banking system had to adjust balance sheets to the newly-rigorous Basel III rules. The M3 measure of money fell by 2.5 per cent from April 2009 to July 2010, and had only just returned to its April 2009 figure by autumn 2011.

The debate within the ECB between representatives of German monetary thinking and a more widely-held financial pragmatism became even sharper. Weirdly, the ECB increased its main policy rate twice (by 50 basis points in total) in April and July 2011,

despite a depressed macroeconomic environment and while broad money growth was very weak. In countries on the Eurozone periphery persistent recession undermined tax revenues and widened budget deficits, exacerbating the sovereign debt crisis. Suggestions were made for a scheme of Outright Monetary Transactions to replace the Securities Markets Programme. The OMT involved, yet more frankly than the SMP, long-term central bank finance for governments, including governments of doubtful credit-worthiness. On 9 September 2011 it was reported that Stark would leave the ECB, ostensibly for "personal reasons", but in fact because of disagreement with the OMT proposal. On 1 November Mario Draghi, governor of the Bank of Italy, replaced Trichet as ECB President. In December Draghi announced the return of massive, low-cost and long-term (three-year) ECB credit facilities for banks, up to an amount of almost €500 billion. In February 2012 the programme was enlarged to over €1,000 billion, with the facilities becoming known as the "long-term refinancing operations" or LTROs. In the media they were dubbed more colloquially "the Draghi bazooka". The truth was that these were the non-standard measures in a new guise and on a larger scale.

The Draghi bazooka enabled most banks in the Eurozone periphery time to reorganize their affairs and to survive, but for many of them the three years to the end of 2014 were a difficult period of balance-sheet contraction and incomplete recapitalization. M3 grew, but only sluggishly. It went up by 3.0 per cent, 1.0 per cent and 3.6 per cent in the years to December 2012, 2013 and 2014 respectively. But – as will soon emerge – these figures concealed severe monetary retrenchment in the weakest states on the Eurozone periphery, and an extreme contrast between these states and a relatively comfortable situation in the Eurozone core. The ECB research department continued to monitor the behaviour of money, although the weight of monetary analysis as distinct from more general economic analysis declined over the years. Much of the research was of great complexity, showed no understanding of the importance of money to the determination of national income and wealth, and failed altogether to recognise the simplicity and power of the basic theory at work.[38] The intellectual muddles were associated with often bitter wrangling between the representatives of different monetary-policy traditions and banking constituencies. By the end of 2014 the Bundesbank's long commitment to the monetary pillar was far from dominating the ECB's research agenda or policy thinking.

Table 5: Money growth patterns in the Eurozone

All figures are of % compound annual rates of growth of M3 in the sub-periods under review, apart from length of sub-periods.

	From Q1 1999 to Q2 2003	From Q2 2003 to Q3 2008	From Q3 2008 to Q4 2014
Length of sub-period (in quarters)	17	21	25
The entire Eurozone	7.0	8.4	1.8
Seven nations of Eurozone core		7.8	2.8
Five nations of Eurozone periphery		10.3	-0.2
Germany		5.5	3.8
Core, ex-Germany		9.2	2.2

Source: IMF database and author's calculations
Note: M3 money stocks in countries were added together to obtain M3 measures for the core and periphery. The core nations were Germany, France, the Netherlands, Belgium, Austria, Finland and Luxembourg; the perpihery nations were Italy, Spain, Greece, Portgual and Ireland.

The time has come for a quick summary of the money growth outcomes in the three sub-periods discussed above. Table 5 shows the money growth rates for the Eurozone as a whole for all three sub-periods, and for the core and periphery nations as a group in the last two sub-periods, and also for Germany and the rest of the core.

Money growth in Germany was stable during the first decade and a half of the single currency, and Germany enjoyed satisfactory macroeconomic performance. But in the periphery the annual rate of M3 growth ran at a compound 10.3 per cent in the five years (that is, our second sub-period) in which the monetary pillar no longer had a reference value on which policy-makers could focus, and slumped to virtually nil during and after the Great Recession (our third sub-period). A fair verdict is surely that ECB policy-making was pro-cyclical rather than anti-cyclical, with money growth too expansionary in the years immediately before the onset of crisis in late 2008. The experience of two particularly hard-pressed nations on the periphery – Ireland and Greece – will now be considered in more detail.

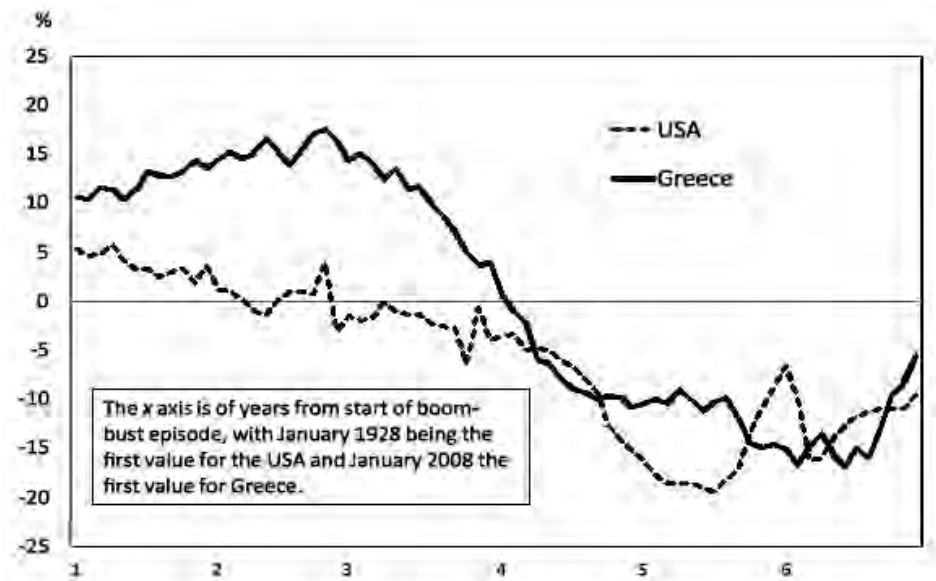
Money growth in Greece and Ireland in the crisis period

The importance of Friedman and Schwartz's *A Monetary History of the United States 1867 – 1960* to thinking about the Great Depression has long been recognized. Despite the disagreements that followed its publication, a great majority of economists accept that the extreme instability in money growth in the USA's Great Depression ought

never to be repeated.[39] It will now be shown that the amplitude of fluctuations in the annual rates of change in broad money were larger in Greece and Ireland in the run-up to and during the Great Recession than in the USA in the run-up to and during the Great Depression.

Chart 3: Two episodes of extreme monetary instability - the USA's Great Depression and Greece's Great Recession

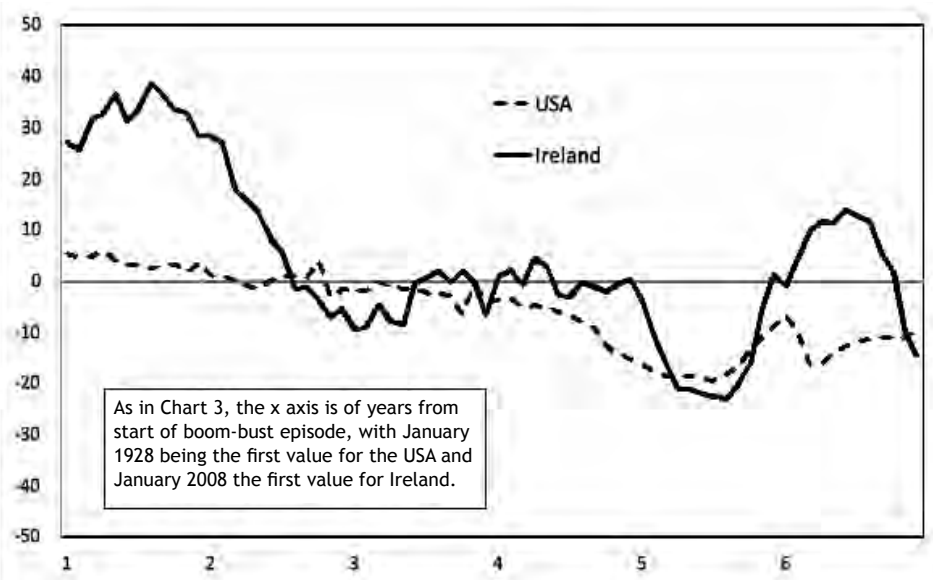
Annual changes in broad money, monthly data, %



The sources for the comparison are the monthly series for the quantity of money in the appendices to Friedman and Schwartz's 1963 volume, and the monthly M3 data from the IMF database for Greece and Ireland. The American money concept chosen for the current exercise is the sum of currency held by the public and commercial bank deposits, that is, broad money as usually understood. 1927 and 1928 were the final years of "the Roaring Twenties", with marked appreciation in share prices amid general prosperity. The plunge in the USA's quantity of money, as defined here, began in November 1929, just after the first crash in the stock market. It continued until spring 1933, when broad money stabilized for about a year ahead of very rapid growth in 1934, 1935 and 1936. So the boom-bust period associated with "the Great Contraction" (to use Friedman and Schwartz's term) might be seen as falling in the seven years 1927 to 1933 inclusive. As the exercise under consideration is concerned mostly with changes rather than levels, and as it should start from a relatively strong period for the economy, the level of broad money is obtained for these seven years. Annual changes are then

calculated with the first value being for January 1928. The resulting series is shown as a dotted line in Chart 3.

Chart 4: Two episodes of extreme monetary instability - the USA's Great Depression and Ireland's Great Recession Annual changes in broad money, monthly data, %



Like other Eurozone countries, Greece and Ireland were little affected by the global crisis in 2007 and early 2008. As in the USA in 1927 and 1928, asset prices enjoyed marked appreciation amid general prosperity. Nevertheless, Greek and Irish money growth in 2007 and 2008 was much higher than in the USA in the 1920s. At any rate, M3 numbers can be assembled for the seven years 2007 – 2013 inclusive, and annual changes calculated for the six years 2008 – 2013 also inclusive. The resulting series for Greece and Ireland are presented in two charts, in Chart 3 and Chart 4, and contrasted with the annual changes in broad money in the USA over the 1928 – 1933 period of exactly eight decades earlier. The main point is obvious from visual inspection. Instability in money growth was far more pronounced in Greece and Ireland in the Great Recession than in the USA in the Great Depression. More formal calculation delivers the same result. The standard deviation of the annual rates of change of US broad money in the six-year 1928 – 33 period, using monthly data, was 7.48. On the same basis and over the six-year 2008 – 13 period, it was 12.17 for Greece and 16.35 for Ireland. On this criterion, monetary mismanagement in these two Eurozone member states was more severe in the Great Recession than in the USA in its most notorious

episode of central bank incompetence. Of course, all sorts of excuses and special factors can be invoked. Even so, the money data had a grim message for the citizens of the two nations.

One pointer to the wider misery was a surge in youth unemployment, which exceeded 30 per cent in Ireland at the worst of the crisis and was much worse in Greece. In 2014 less than 15 per cent of Greeks between the ages of 15 and 24 had a job, while over a half of those in the 25 – 29 year age bracket were still not in employment.[40] In 2014 the House of Lords published a report with the title, *Youth unemployment in the EU: a scarred generation?,* with the Eurozone periphery being the focus of attention.[41]

Conclusion: the case for a money reference value or target

The quantity of money matters in the design of a monetary policy regime, if that regime is to be stable or even viable on a long-term basis. The passage of events in the Eurozone since 1999 has shown, yet again, that excessive money growth leads to both immoderate asset price booms and unsustainably above-trend growth in demand and output, and that big falls in the rate of change in the quantity of money damage asset markets, undermine demand and output, and cause job losses and heavy unemployment. This is nothing new. The ECB did not sustain a consistent strategy towards money growth and banking regulation over its first decade and a half. The abandonment of the broad money reference value in 2003 was followed in short order by three years of unduly high monetary expansion and then, from late 2008, by a plunge in money growth to the lowest rates seen in European countries since the 1930s. The resulting macroeconomic turmoil was of the sort that would be expected by quantity-theory-of-money analyses, including such analyses of the USA's Great Depression as in Friedman and Schwartz's *Monetary History of the United States*.

Three lessons might be drawn from these developments. First, the stance of monetary policy cannot be assessed merely from the level of interest rates. Apart from a few months in late 2011 when an ill-judged increase in interest rates was engineered by the ECB, three-month euro inter-bank rate has been under 1 per cent continuously from July 2009 to the time of writing (September 2016). Anyone trying to judge monetary policy from "the interest rate" (whatever that is) by itself would say that monetary policy has been exceptionally easy. But nations in the Eurozone periphery have been afflicted by a seemingly chronic malaise which again makes relevant Keynes' concern in his 1936 *General Theory* of a semi-permanent high-unemployment equilibrium. The behaviour of the broad money aggregate has been a better guide to the meaning of monetary policy.

Second, the monetary base *by itself* is also unsatisfactory as a measure of monetary policy. Many textbooks assert that changes in the monetary base are accompanied by equi-proportional changes in the quantity of money, and that the quantity of money then exerts its usual effects on financial markets and macroeconomic outcomes. But since 2008 large increases in the Eurozone's monetary base have had no follow-

through into broad money, which – as just noted – has seen the lowest rates of increase that Europe has recorded since the 1930s. In 2011 Jurgen Stark appears to have lost credibility with his colleagues by adhering too dogmatically to a base-multiplier view of money supply determination. (As noted in the introduction, other prominent monetarists – including even Milton Friedman – have alienated potential support for a quantity-theory approach by insisting on the rigidity of the link between the base and the quantity of money. No such link was found in the Eurozone in the 1999 – 2014 period.) The behaviour of the base and the money multiplier can of course account for changes in broad money in an arithmetical sense, but the Eurozone's experience confirms that this does not imply a causal connection.

Third, money targeting must be sustained over the long term if it is to work. Some economists – including, as we have seen, Romer and Woodford – repudiated money early in the single currency's existence on the grounds that a one-to-one relationship had not held between changes in money and nominal national income. But money is relevant to asset prices as well as the prices of goods and services, while a change in the desired ratio of money to income does not mean that no relationship at all holds between money and income. As noted, by 2008 the fast broad money growth of the preceding three years had started to alarm the ECB about future inflation risks. The three-year lag may seem long, but it was not out of line with UK's experience in its boom-bust cycles.[42] Occasional fluctuations in the velocity of circulation do not justify neglecting money data altogether.

The ECB did a good job in the period of most severe crisis with lender-of-last-resort loans (or "emergency liquidity assistance", as such loans now tend to be called) to banks that had dfficulty funding their assets.[43] The work continues to this day (September 2016), with large facilities still outstanding to banks in Spain, Italy, Greece and Portugal.[44] But top ECB officials did not seem to understand in late 2008 that a sudden demand for higher capital/asset ratios in the banking system would check the growth of banks' assets and hence cause a big decline in the rate of broad money growth. Their goal was to comply with demands from international regulatory bodies, such as the Bank for International Settlements and IMF. They were seemingly indifferent towards, or even ignorant of, the impact of the move to higher capital/asset ratios on the quantity of money. It is of the first importance that bank regulators become fully informed of the effect of their actions on the credit counterparts to money growth, no matter jibes from Romer and others that such analysis is "confusing and painful".[45]

The plight of the Eurozone periphery in the most problematic phase argues that some countries might have been well-advised to leave the Eurozone for a few years, so as to facilitate the alignment of their costs and prices to those in the well-managed core nations.[46] But the implied currency devaluation would have had the immediate consequence of increasing the cost to banks (in Spain, Italy and son on) of repaying their loans to the ECB, as well as creating a tangled legal mess. In retrospect, it is clear that the paralysis in the global inter-bank market from August 2007 was an "asymmetric shock" which hit periphery nations (with many banks that were net debtors to other

banks) much harder than core nations (where a majority of banks were creditors in the inter-bank market).[47]

Glaring imbalances between the macroeconomic performances of the core and periphery nations then emerged and perhaps were unavoidable to some extent. However, the decision to jettison the broad money reference value in 2003 was the prelude to the worst of the over-borrowing and financial excess in the 2005 – 08 period. Both the quantity theory of money and a large body of practical knowledge argued that a plunge from explosively rapid rate of money growth to money stagnation from late 2008 onwards would result in macroeconomic agony. The ECB's Governing Council took the decisions both to drop the money reference value in 2003 and to move quickly to higher capital/asset ratios from 2008. Friedman said of the Federal Reserve's conduct in 1930 and 1931 that it exercised its responsibilities "so ineptly as to convert what would otherwise have been a moderate contraction into a major catastrophe". At the start of the twenty-first century the ECB's research department had the benefit, compared with the Federal Reserve in the Great Depression, of over 70 years of advances in macroeconomic thinking. But monetary instability in some Eurozone member states in the 2008 – 13 period was greater than in the USA when the Fed was at its most criticised, unpopular and unsuccessful.

References

[1] See, for example, Michael Bordo and John Landon-Lane 'Does expansionary monetary policy cause asset price booms?: some historical and empirical evidence', NBER *Working Paper no. 19585* (Cambridge: National Bureau of Economic research, 2013).

[2] In theory banks had several years to adjust to the new regulations, which were themselves only in draft form in late 2008. In practice they hurried to comply, leading to large-scale asset disposals and early balance-sheet retrenchment.

[3] The paper ends with the adoption of "quantitative easing" in February 2015, which was accompanied by higher money growth and better macroeconomic conditions.

[4] The literature is enormous and discussed elsewhere in this volume. Milton Friedman's entry on 'The quantity theory of money' in *The New Palgrave* would be widely viewed as a good attempt at a definitive treatment. See Peter Newman and others (eds.) *The New Palgrave: Dictionary of Money and Finance* (London and New York: Macmillan and Stockton Press, 1992), pp. 247 – 64.

[5] Again, the literature is enormous, with the account of the so-called "real balance effect" , pp. 3 – 33, in the second edition of Don Patinkin's *Money, Interest and Prices* (New York: Harper & Row, 1965) being a celebrated, if controversial statement of the position. For a more synoptic treatment, see preface to part five, 'How does the economy work?', pp. 325 – 29, of Tim Congdon *Money in a Free Society* (New York: Encounter Books, 2011).

[6] Large divergences between movements in asset prices and goods prices are indeed intrinsic to some monetarist accounts of the transactions mechanism. See pp. 190 – 94 in Philip Booth's chapter 8 in Tim Congdon (ed.) *Money in the Great Recession* (Cheltenham, UK, and Northampton, USA: Edward Elgar Publishing, 2017).

[7] See pp. 7 – 8 in the Introduction to Congdon (ed.) *Money in the Great Recession*.

[8] See Friedman's entry in *The New Palgrave: Dctionary of Money and Finance*, p. 249.

[9] The quantity theory allows equilibrium velocity to be changed by non-monetary forces, such as changes in payments technology. In the period under discussion, it would remain valid in an underlying sense if an average annual growth rate of, say, 10.4 per cent – 5 per cent higher than that actually recorded – would have been accompanied by an average annual rate of increase of 8.2 per cent – also 5 per cent higher than that actually recorded.

[10] On 1 January 1999 banks in the Eurozone received interest on their cash reserves, whereas previously in some countries they had been required to maintain cash reserves on a non-interest-bearing basis at well above levels needed for bank settlement obligations.

[11] An increasing ratio of bank intermediation to national output is indeed a characteristic of long-run economic growth in all economies. Asli Demirguc-kunt and Ross Levine *Financial Structure and Economic Growth: A Cross-Country Comparison of Banks, Markets, and Development* (Cambridge, Mass.: MIT Press, 2004) is the usual reference today, but the idea goes back to Adam Smith.

[12] The series begin in January 2002, when euro-denominated banknotes were introduced. The first annual change is therefore for January 2003.

[13] Critiques of "financialization" often come from left-wing, even Marxist sources. See, for example, Ozgur Orhangazi 'Contradictions of capital accumulatioon in the age of fnancialization', pp. 248 – 65, in Turan Subasat (ed.) *The Great Financial Meltdown* (Cheltenham, UK, and Northampton, USA: Edward Elgar Publishing, 2016).

[14] The tendency for financial sector money to grow faster than whole-economy money was also observed in the UK over several decades, reflecting the institutionalization of asset ownership. See Tim Congdon *Money and Asset Prices in Boom and Bust* (London: Institute of Economic Affairs, 2005), pp. 32 – 37.

[15] Apart from Greece (which joined in 2001), all 12 countries belonged to the Eurozone from the start of the euro (if only in scriptural form) on 1 January 1999. After 2007 seven further small or relatively

small nations also joined, Slovenia, Cyprus, Malta, Slovakia, Estonia, Latvia and Lithuania. Because of their quantitatve insignificance, the seven post-2002 members are not analysed here. Note that the IMF database publishes broad money series on a Euro-wide basis (that is, banks registered in one country have deposit liabilities across the Eurozone, which are included in the money concept for the country of registration) and on a residence basis. Apart from Luxembourg, the differences are small.

[16] Luxembourg was once regarded as a centre of tax evasion, See p. 183 of Stephen Valdez and Philip Molyneux *An Introduction to Global Financial Markets* (London : Palgrave, 8th edition, 2016) for a description of the stereotypical tax-evading "Belgian dentist". The introduction of the EU's Savings Directive in 2005 was intended to stop these practices.

[17] If Luxembourg is excluded, a simple ordinary-least-square regression of the numbers in Table 3 (with the changes in nominal GDP regresssed on the changes in M3) yields a t statistic on the regression coefficient of above 2.8 and a coefficient of determination (or r2) of 0.47. If the intercept term is suppressed, the t statistic on the regression coefficient rises to over 15 and the r2 to 0.96.

[18] Otmar Issing *The Birth of the Euro* (Cambridge: Cambridge University Press, 2008), pp. 52 – 130.

[19] See Issing 'The ECB's monetary policy strategy: why did we choose a two-pillar approach?', pp. 260 – 69, in Andreas Beyer and Lucrezia Reichlin (eds.) *The Role of Money: Money and Monetary Policy in the Twenty-First Century* (Frankfurt: European Central Bank, proceedings of the 4th ECB Central Banking Conference, 9-10 November 2006). See particularly p. 262.

[20] See the article 'The stability-oriented monetary policy strategy of the Eurosystem', *Monthly Bulletin* (Frankfurt: European Central Bank, January 1999 issue), pp. 35–50. The quotation is from p. 48.

[21] The "output gap" (the difference between the actual and trend level of output, expressed as a percentage of trend output) was important to the economic analysis, as it played an important part in the New Keynesian model. But it had to be estimated by ECB research economists and was in fact not directly observable, unlike M3 and other money aggregates.

[22] Issing *Birth of Euro*, p. 99.

[23] "For much of the 2001 – 04 period, the main reason for deviations of M3 growth from the reference value has been the impact of portfolio shifts, which are identified and quantified outside the money demand model. This has led to greater emphasis being placed on the M3 series corrected for the estimated impact of portfolio shifts in both the external and internal communication of the monetary analysis." See Bjorn Fischer, Michele Lenza, Hugh Pill and Lucrezia Reichlin 'Money and monetary analysis', paper presented at the 4th ECB Central Banking Conference on the role of money, 10 – 11 November, 2006. The quotation is from p. 10 of the paper. The estimates of the portfolio shifts can be found in the ECB's *Monthly Bulletins* for May 2003 and January 2005.

[24] See Philip Booth 'Monetary policy, asset prices and financial institutions', pp. 185 – 207, in Congdon (ed.) *Money in the Great Recession*.

[25] David Romer 'Keynesian macroeconomics without the LM curve', *Journal of Economic Perspectives*, vol. 14, no. 2, spring 2000, pp. 149 – 69. The quotations are from p. 162.

[26] Michael Woodford 'Doing without money: controlling inflation in a post-monetary world', *Review of Economic Dynamics*, vol. 1, no. 1, pp. 173 - 219. The quotation is from the abstract.

[27] The quotation is from the Wikipedia entry, as at September 2016, on the Deutsche Bank Prize.

[28] See the evidence in Helge Berger, Jakob de Haan and Jan-Egbert Sturm 'Does money matter in the ECB strategy?', *International Journal of Finance and Economics*, vol. 16, no. 1, pp. 16 – 31.

[29] A common problem here is that statistical work finds that the quality of money demand functions deteriorated in the 1980s and 1990s, compared with earlier decades, at least partly because of financial deregulation. The functions' closeness of fit (as measured by the coefficient of determination and standard error of estimated equations) and the significance of coefficients (measured by t statistics) were less satisfactory than before, although – almost invariably – the regression coefficient on the income term was positive and took a value not far from one. Money relationships were then said to have

"broken down", and advice was given to senior policy-makers, many of them naïve about statistical methods, that they could ignore money. But the positive, almost unitary value of the regression coefficient on the income term still implied that large fluctuations in money growth would be associated with large fluctuations in the growth of demand, income and output. See Congdon *Money in a Free Society*, p. 319, for a discussion of the misunderstandings in this área.

30 See Brett Fawley and Christopher Neely 'Four stories of quantitative easing' *Federal Reserve Bank of St. Louis Review*, no. 95 (1), January/February 2013, pp. 51–88, for a detailed comparison of the programmes and facilities offered by the US Fed, the Bank of England, the Bank of Japan and the ECB, as they tackled the financial crisis from 2008 to 2013 in somewhat different ways.

31 The ECB's measures were in a well-established tradition that the central bank should act as lender of last resort to a solvent banking system subject to a run, as proposed by Bagehot's 1873 *Lombard Street*. Ironically, the central bank known as the most important historical sponsor of this approach, namely the Bank of England, was reluctant to adopt the Bagehot prescription in the Northern Rock crisis of September 2008. See Steve Hanke 'The Basel rules and the banking system: an American perspective', pp. 164 – 77, in Congdon (ed.) *Money in the Great Recession* for further discussion.

32 The numbers are from the ECB's database, which differentiates between credit to "general government" and to "other Euro area residents". These "other residents" are taken to be equivalent to the private sector.

33 Timothy Geithner *Stress Test: Reflections on financial crises* (London: Random House Business Books, 2014), p. 132, and Ben Bernanke *The Courage to Act* (New York and London: W. W. Norton & Co.), p. 164.

34 The quotation is from the Ecofin meeting press release (2 December 2008). As discussed extensively elsewhere in this volume, notably in part two, the rationale for the capital-raising programme was not obvious and lacked long-run historical precedent. Capie and Wood have shown that in the nineteenth century, well before the Basel rules had been introduced, banks did adapt their levels of capital to the level of risk in the markets. (Forrest Capie and Geoffrey Wood *Do we need regulation of bank capital? Some evidence from the UK* [London: Institute of Economic Affairs, March 2013, 'Current Controversies' series, no. 40.) They question the purpose of the new, restrictive bank regulation. In their words, "The support of the British government, the EU and the Bank for International Settlements for higher capital requirements to prevent failure is…misguided…Talk of the separation of different types of bank recognises the importance of failure…Once banks are forced by the possibility of failure to take responsibility for their actions, they are best placed to judge their own capital requirements. Under this new system, if they do not do so sensibly, they will not be in the business of banking for long."

35 The point does now seem to be understood in some parts of the ECB. To quote from a recent research paper, "…the effects of dampened credit and asset price growth on predicted crisis probabilities can be sizeable…During recession periods, an uncontrolled asset-side deleveraging response to increased capital requirements could induce even more recessionary pressure." See Markus Behn, Marco Gross and Tomas Peltonen 'Assessing the costs and benefits of capital-based macroprudential policy', ECB *Working Paper Series* (Frankfurt: ECB), no. 1935 (July 2016).

36 ECB *Monthly Bulletin*, November 2009 issue, p. 6.

37 Hans-Werner Sinn *The Euro Trap* (Oxford: Oxford University Press, 2014), pp. 261 – 65. See also see Fawley and Neely, 2013, p. 81.

38 Of course, the phrase "the simplicity and power of the basic theory at work" is contentious. Nevertheless, the robustness of the link between money and other macroeconomic variables in the first 15 years of the euro's existence is readily interpreted with the ideas set out by Friedman, Patinkin and many others over centuries. See the references in footnotes 4 and 5 above.

39 Randall Parker (ed.) *The Economics of the Great Depression: a Twenty-First Century Look Back at the Economics of the Interwar Era* (Cheltenham, UK, and Northampton, USA: Edward Elgar, 2007), pp. 13 - 15, and see also Parker's subsequent interviews with 12 prominent macroeconomists.

40 Confederation of European Trade Union/ETUI *Benchmarking Working Europe* (Brussels: ETUI,

2014), p. 37.

41 House of Lords EU Committee *Youth unemployment in the EU: a scarred generation?* (London: The Stationery Office), 12th report of the 2013/14 session.

42 See footnote 9 on p. 243 of Tim Congdon *Keynes, the Keynesians and Monetarism* (Cheltenham, UK, and Northampton, USA: Edward Elgar Publishing, 2007).

43 For a recent discussion of the pros and cons of last-resort loans (or "emergency liquidity assistance"), see Forrest Capie and Geoffrey Wood 'Financial crises from 1803 to 2009: the crescendo of moral hazard', pp. 325 – 42, in their volume *Money over Two Centuries* (Oxford: Oxford University Press, 2011).

44 The net indebtedness of banks in these four countries to the ECB was €722.2 billion in July 2016, according to the Osnabruck University's Euro Crisis Monitor (www.eurocrisismonitor.com).

45 It is perhaps worth noting that Romer is by no means alone in his aversion to credit counterpart analysis. See Leland Yeager and Robert Greenfield 'Money and credit confused: an appraisal of economic doctrine and Federal Reserve procedure', pp. 179 – 95, in Leland Yeager *The Fluttering Veil: Essays on Monetary Disequilibrium* (Indianapolis: Liberty Fund, 1997), reprinted from a 1986 article in the *Southern Economic Journal*, for a critique of such analysis from economists with an avowed interest in the quantity theory of money. The debate between the base multiplier approach to money determination and credit counterpart analysis was mentioned in the Introduction to Congdon (ed.) *Money in the Great Recession*, on pp. 8 – 12.

46 Pedro Schwartz, Francisco Cabrillo and Juan Castaneda 'Saving monetary union? A market solution for the orderly suspension of Greece', pp. 123 – 46, in Philip Booth (ed.) *The Euro – the Beginning, the Middle … and the End?* (London: Institute of Economic Affairs, 2013).

47 Concern about asymmetric shocks was one theme in the British Eurosceptic critique of the single currency project in the 1990s. However, the risks of asymmetric shocks in currency unions was noticed in the academic article usually seen as the intellectual justification for currency unification, that is, Robert Mundell's 'A theory of optimum currency areas' *American Economic Review*, November 1961.

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Changes in the price level – through either inflation or deflation – have diverging effects on different people and companies. They can result in arbitrary shifts in income and wealth distribution, and cause social upheaval. As the great economist, John Maynard Keynes, said in his famous 1923 *Tract on Monetary Reform*

'...a change in the value of money...is important to society only in so far as its incidence is unequal. Such changes have produced in the past, and are producing now, the vastest social consequences, because, when the value of money changes, it does not change equally for all persons or for all purposes...Each process, inflation and deflation alike, has inflicted great injuries.'

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