

Assessing UK money supply measures in light of the credit crunch

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Abstract

Following the credit crunch renewed attention has been given to the relationship between the money supply and the operational efficacy of the Bank of England. We present a theoretical definition of the money supply developed by Frank Shostak, called “Austrian money supply” (MA) and present calculations for the UK economy. We find preliminary evidence that MA provides a constructive interpretation of broader macroeconomic activity and warrants further attention from academics and policymakers

Key words: asset bubble, credit creation, liquidity, monetary policy, money supply

JEL classification: B53, E41, E51, E52

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“Credit creation is not just an important macroeconomic variable, it is *the* important macroeconomic variable” George Cooper (2008, p.125)

Introduction

Following the 2008 credit crunch renewed attention has been given to the ability of central banks to effectively monitor the quantity of money in circulation. This bucks the trend of declining interest in monetary measures and warrants a reassessment of some seminal questions. Any measurement of the money supply must ultimately rest on a sound definition of *money*, however this is routinely taken for granted. This article contests the orthodox treatment of money supply measures by policymakers, by contrasting current measures of the narrow and broad money supply (M0 and M4) with a measure pioneered by Frank Shostak (Shostak 2000), which we label “MA”. We find evidence that MA is a more useful means to interpret broader macroeconomic activity and warrants further attention from academics and policymakers. Section 1 provides a coherent and robust definition of money. Section 2 looks at various types of financial asset in light of the definition to determine what should and should not constitute being part of the money supply. Section 3 applies these distinctions to the UK and presents the UK MA. Section 4 concludes.

1. Definitions of money

It is worth considering whether the measurement of the money supply is a futile endeavour. At least two important aspects of money imply difficulty in measurement – its emergent properties, and its inherent subjectivism.

Carl Menger provided the seminal account of the origins of money in 1892 (Menger 1892). In it, he describes how money emerged as a consequence of its “saleability”. A barter economy was unable to support a growing market economy, and a single commodity – universally valued - emerged to satisfy the so-called double coincidence of wants. Thus money emerged as a social institution to facilitate economic exchange, and it

is this key characteristic that drives the definition.¹ Our definition of money comes from Rothbard:²

“Money is the general medium of exchange, the thing that all other goods and services are traded for, the final payment for such goods on the market” (Rothbard 1978, p.144)

Although its use as a medium of exchange is the primary function of money, this also allowed money to serve secondary (and derivative) uses such as a store of value or units of account. However this emergent property can make the boundary between what constitutes money and what doesn't appear blurred. Indeed as Horwitz says, “financial assets have degrees of “moneyness” about them, and... different financial assets can be placed along a moneyness continuum” (Horwitz, 1990, p.462). Although this might make the classification of “money” more onerous, the existing practice of measuring the money supply predicated an attempt to provide a less arbitrary definition. And yet even though the emergent properties create a continuum of moneyness, these same properties tend to result in a single asset being used in exchange. The fact that the value of money stems from its use in exchange suggests that people will coordinate around relatively few currencies.

The second reason why money is hard to measure is the inherent subjectivity. If an entrepreneur chooses to retain cash balances it is because he deems that to be the most profitable use of his scarce resources. The option to buy goods or lend the money is

¹ On this see Menger and Mises, “And so it has come to pass, that as man became increasingly conversant with these economic advantages, mainly by an insight become traditional, and by the habit of economic action, those commodities, which relatively to both space and time are most saleable, have in every market become the wares...Money has not been generated by law. In its origin it is a social, and not a state institution” (Menger 1892); “There would be an inevitable tendency for the less marketable of the series of goods used as media of exchange to be one by one rejected until at last only a single commodity remained, which was universally employed as a medium of exchange; in a word, money” (Mises 1980, p. 45)

² “As the general medium of exchange, money is a good universally and routinely accepted in exchange by market participants... the one good that is traded for all other goods on the market” (Salerno 1987, p.1)

always available – at the right price. Therefore it is misleading to deem cash balances “idle” or bemoan “hoarding” - the value of money, like the value of any other commodity, is subjective, and stems from its *availability* (Hutt 1956, Horwitz 1990). The whole point of a medium of exchange is that it is ready for use, and the only difference between money that is “in circulation” or “idle” is the fraction of time in which it changes ownership. This point drives straight to the heart of Keynesian orthodoxy that finds relevance in the *motivation* that people have when holding cash balances and other liquid assets. In reality the typical distinction between transaction, precaution and speculation are not mutually exclusive, and “in analyzing them, it is less important to keep them distinct than to keep track of the common element that binds them – *the adaptation of business dealings to uncertainty*” (Hart and Kenen_1948³).

Despite these difficulties, there are two main reasons why efforts to measure the money supply make sense. Firstly, by grounding the concept of money in a tight definition it is possible to make judgments about whether assets constitute being part of the money supply in a non-arbitrary manner. Secondly, measures of the money supply currently exist and to some extent the debate is not about the idealised ability to form monetary aggregates, but *given* that aggregates are used, which are the least flawed. In practice that which serves as the generally accepted medium of exchange tends to be easier to identify than it might appear.

In March 2009 the Bank of England approached a lower bound for setting the Bank Rate (0.5%) and to inject liquidity into the economy engaged in quantitative easing. Consequently the “one target one tool” approach of managing the Consumer Price Index through interest rates was replaced with a broader attention to the quantity of money. According to the Governor, Mervyn King, “when we looked at the numbers we said... that we thought that both broad money and the growth of nominal demand in the economy were running at a growth rate which was too low to enable us to meet the

³ Cited in Salerno 1987, footnote 28, p.6, emphasis in original

inflation target and see economy recovery.”⁴ This demonstrates that despite theoretical and empirical doubts about the ability to define and measure the money supply, these instruments are of direct policy significance.

In order to operationalise the definition of money, we identify the following characteristics that would constitute whether an asset is part of the money supply:

- A. A claim transaction - the depositor does not relinquish ownership of the asset
- B. Redeemable for cash at par - the cash value does not fluctuate
- C. Redeemable on demand - the saver does not need to give advanced notice
- D. Routinely accepted - commonly agreed to be “legal tender”
- E. The final means of payment - it fully discharges a debt

2. Money supply measures

Before wading too deep in empirical associations, it’s important to stress the difficulties in identifying robust statistical relationships. Arguments remain about whether key indicators are leading or lagging, and what the stylised facts *are*, “these characteristic qualitative features of most business fluctuations have not corresponded to persistence regularities of the *quantitative* relationships that constitute the main focus of modern business cycle analysis” (Friedman 1986). Indeed in the US in the early 1980s the statistical relationship between M1 growth and major economic indicators (such as GDP) began to fail as people moved money from savings accounts into NOW accounts⁵. According to The Federal Reserve “M2 has been downgraded as a reliable indicator of financial conditions in the economy, and no single variable has yet been identified to take

⁴ Comments made to a Treasury select committee in late March, cited in “Money supply supplants rates on Bank’s agenda”, *The Times*, by Norma Cohen

⁵ The former are part of M2 whereas the latter are also in M1. On the other hand, M1 has been misleadingly low due to “sweeps”, which occur when banks shift funds from checking accounts (M1) into savings accounts without reserve requirements.

its place”⁶. It is commonly held that in the 1980s and 1990s financial deregulation led to greater instability in the demand for money, thus making it harder to track. According to some “the reliability of various money measures as useful indicators on which to base policy has become seriously compromised” (Carlson and Keen 1996, p.15). Indeed the Federal Reserve abandoned M1 targets in 1987, and M2 targets in 1992. In March 2006 they stopped publishing M3 statistics. The Bank of England abandoned M0 in May 2006. These actions all call into question the usefulness of money supply aggregates, but what if the aggregates were the wrong ones?

Our claim is that the failure of previous measures is due to the detail of their composition rather than a fundamental problem with finding monetary aggregates. Typically the definition of money stems from an arbitrary mixture of various liquid assets that happen to correlate with national income. But if any mixture of liquidity is accepted, can’t retail good inventories be included? A basket of commonly used shopping may well be as liquid as stocks or bonds, yet without a tight definition of the money supply it’s hard to justify their exclusion (see Baxendale 2005). According to Salerno,

“Measures of the U.S. money stock in current use in economic and business forecasting and in applied economics and historical research are flawed precisely because they are not based on an explicit and coherent theoretical conception of the essential nature of money. Given the all-pervasive role of money in the modern market economy, existing money-supply measures therefore tend to impede, rather than to facilitate, a clear understanding of the past or future development of actual economic events.”

Salerno 1987, p. 1⁷

⁶ Comments by Alan Greenspan to a Congressional Testimony, July 1993

⁷ This view is supported by Shostak, “for the mainstream, the definition of money is established through an arbitrary mixing of various liquid assets and then correlating this mixture with another dubious statistic labelled national income” Shostak 2000, p.69

In terms of prevailing US measures, M1 contains items such as currency in circulation, travellers checks, demand deposits (i.e. checking account balances), and “other checkable deposits”. M1 is typically about 10% of GDP. M2 also includes savings account, money market deposit accounts, time deposits under a certain amount, and retail market money mutual funds. MZM is a newer measure, which focuses on money with zero maturity (it is essentially M2 less small time deposits but with institutional MMMFs) and is produced by the Federal Reserve Bank of St Louis. M3 – an even broader measure – includes large time deposits, balances in institutional money market funds, but excludes US government assets or foreign banks and official institutions. Note that the broader the measure, the less liquid the assets, and thus “money” is being defined more in terms of its function as a store of value than as a medium of exchange. This creates a notorious degree of arbitrariness in terms of where the line gets drawn between the degree of liquidity to include.

Looking more specifically at the United Kingdom, M0 comprises of cash in circulation outside the Bank of England plus banks’ operational deposits at the Bank of England. This was a measure of narrow money, which was replaced in May 2006 by “Notes & Coin and Reserve Balances”. Reserve balances are held by private banks at the Bank of England, and bear interest. Due to the fast pace of financial innovation it had become increasingly easy for people to substitute between narrow money (liquidity) and broad money (interest bearing assets), leading the Bank of England to view little middle ground between M0 and M4. According to a popular economics textbook, “Once we leave cash in circulation, the first sensible place to stop is M4” (Begg et al, p.442). However the convention of this dual narrow/broad approach takes for granted the theoretical validity of the categories being incorporated. We follow seminal works by economists that attempt to measure the money supply based on a clear definition of the defining characteristics of money. For example, the “True Money Supply” (TMS) is compiled and made available by the Ludwig von Mises Institute, Alabama. This follows Salerno (1987).⁸ The other main Austrian measure is the “Actual” or “Austrian Money Supply”

⁸ Also see Rothbard (1978): “*Ma* (*a* = Austrian) = total supply of cash-cash held in the banks + total demand deposits + total savings deposits in commercial and savings banks

(AMS), presented by Shostak (2000). The benefit of an Austrian approach is to apply a coherent theoretical definition of money. Using our previous definition of money we can make judgments about various asset classes:

Currency in circulation (cash)

The simplest place to start is the notes and coins held in the pockets and shoeboxes of countries citizens. This is the chief component of the money supply – it is a universally accepted means of payment. Cash provides the “physical embodiment of the generally accepted medium of exchange” (Salerno 1987, p.2).

Demand deposits (checking account)

Irving Fisher made a distinction between cash (M) and demand deposits (M¹), however these deposits should be included in the money supply since they are redeemable for cash at par on demand. If a consumer transfers cash from under the mattress to a checking account, there is no change in the money supply (one component falls, another rises).⁹ As Salerno states, “checkable deposits held at federally-insured banks and thrifts are readily acceptable in exchange as perfect substitutes, dollar for dollar, for Federal Reserve notes” (Salerno 1987, p.2)¹⁰

+ total shares in savings and loan associations + time deposits and small CDs at current redemption rates + total policy reserves of life insurance companies—policy loans outstanding—demand deposits owned by savings banks, saving and loan associations, and life insurance companies + savings bonds, at current rates of redemption.” (Rothbard 1978, p.153).

⁹ In a world of fractional-reserve banking, however, demand deposits become a crucial source of monetary expansion since banks will lend out some of that checking account. This doesn’t alter the savers legal right to withdraw their asset at par and on demand, but does increase the amount of money in the economy.

¹⁰ Only under 100 percent reserve banking are demand deposits cash redeemable, but this doesn’t matter. Provided that agents treat deposits as redeemable they are part of the money supply (see Rothbard p.146) “*so long as demand deposits are accepted as equivalent to standard money, they will function as part of the money supply*” (Rothbard 1978, p.145, emphasis in original)

Savings deposits (savings count)

A distinction needs to be made between claim and credit transactions (Mises 1980). A claim transaction occurs when the owner of a given amount of money stores it in a bank, but retains ownership of the entire sum. This supposedly occurs in current accounts, where the owner is entitled to withdraw their deposit at any time. By contrast a credit transaction occurs when the owner of the money relinquishes immediate ownership, permitting the bank to act as an intermediary and lend it out. This occurs in savings accounts, where ownership is transferred from lender to borrower, and withdrawals can only be made following a given time period. Another term for a “claim transaction” is a *demand* deposit, whilst a “credit transaction” is *term* deposit. According to Salerno (1987) “Savings deposits, whether at commercial banks or thrift institutions are economically indistinguishable from demand deposits and are therefore included in the TMS. Both demand and savings deposits are federally insured under the same conditions and, consequently, both represent instantly cashable, par value claims to the general medium of exchange” (Salerno 1987, p.2) Rothbard points out that the legal incidence isn’t as important as the economic reality, and the subjective beliefs of savers. If the 30-day notice is not enforced – and savers don’t expect it to be enforced – those savings should constitute the money supply. He claims that only a “*genuine* time deposit...not being redeemable on demand, would instead be a credit instrument rather than a form of warehouse receipt” (Rothbard 1978, p.149, emphasis in original).

However according to Shostak, the key point is that banks *could* invoke a waiting period before savings accounts can be accessed; crucially “when a depositor places his money in a savings or fixed-term deposit, he temporarily relinquishes his ownership. This, however, is not the case with demand deposits” (Shostak 2000). This takes us back to the definition of money as a medium of exchange – if an asset is not directly transferable it

will not be “routinely exchanged” and thus not be money.¹¹ Shostak rightfully excludes savings deposits because they are credit transactions. The key point is that although people can draw a check on a savings account, to meet that obligation they must liquidate part of their savings by transferring assets into a checking account. The savings account does not act as a final payment on goods and services. If financial innovation results in a savings account that can be drawn upon directly, this would no longer constitute “savings” as we’re using the term, and become de facto demand deposits. Whereas for Salerno savings are part of the money supply because they are “at all times transferable, dollar for dollar, into “transactions” accounts” (Salerno 1987, p.3), for Shostak and us they only enter the money supply if and when they are so transferred. Ultimately people do not settle bills with a savings account-to savings account transfer.

The issue of savings accounts provides an example of the problems posed by the subjectivism of money. For Rothbard if the general public believe (falsely) that money in their savings accounts are instantly redeemable and act in accordance with this belief, does this mean we should treat it as part of the money supply? We would contend that money isn’t what people believe is purchasing power, but what is routinely accepted by others. This provides the binding constraint, since merchants would only accept “savings” that have been converted into either cash or a demand deposit.¹²

Money market mutual funds (MMMF), retail market funds and other securities

Crucially, the money supply is “all claims to dollars at fixed par values” (Rothbard 2005, p.182). MMMF’s are not money because they are a form of investment that has a

¹¹ (See footnote 10 of Salerno 1987, where he refers to White, "Definition and Identification of Money," p. 310, and Yeager, "The Medium of Exchange," pp. 40-46, 53-56). “The nub, however, is that savings deposits do not confer an unlimited claim” (Shostak 200, p.73)

¹² In another passage Rothbard seems to accept this: “They continue as equivalent to money only so long as the subjective estimates of the seller of goods on the market *think* that they are so equivalent and accept them as such in exchange” (Rothbard 1978, p.145, emphasis in original)

fluctuating price, thus are not redeemable at par. If an investor wishes to liquidate a MMMF they must instruct a fund manager to sell a portion of their holdings and then transfer the proceeds. Since these proceeds will fluctuate according to market conditions it cannot be considered a final means of payment.

Shostak (2000) raises the issue that money market mutual funds (MMMF) can be withdrawn on demand, but as Salerno points out “they are neither instantly redeemable, par value claims to cash, nor final means of payment in exchange” (Salerno 1987) – and thus not part of the money supply. Indeed it would be double counting to include MMMFs in the definition of the money supply since money isn’t created when a deposit is made – they are a neutral asset class. In addition to this retail market money funds are clearly not part of the money supply since short-term debt (e.g. Treasury bonds or commercial paper) are not routinely used as a media of exchange). Similarly shares are not part of the money supply since they can only be sold to the market at fluctuating rates and are thus not liquid enough to constitute “money”.

Certificates of deposit (CDs)

According to Rothbard small-denomination CD’s are redeemable at fixed rates (albeit with a penalty discount), and he suggests including the instrument at the penalty level as part of the money supply. For the US economy this also implies that federal savings bonds (and other assets that are redeemable at a fixed rate such as cash surrender values of life insurance policies) should go in. The crucial issue is whether there is indeed a fixed time frame that prevents the asset holder from liquidating the value.¹³

Retail goods

¹³ But note that according to Salerno, “the ultimate decision to exclude the item was also heavily influenced by the practical problem of obtaining the data necessary to permit a reasonable estimate of its value in current dollars, i.e., net of penalty assessments” (Salerno 1987, p.4)

The example of retail goods provides a curious critique of many attempts to measure the money supply. *If* liquidity is the main criteria (which is the case with stocks or bonds) then it becomes hard to see why retail goods shouldn't also be included. The reason is because they are sold for money, and thus cannot actually *be* money.

Domestic government deposits

According to traditional measures if the government raises £1m through taxation, when the money is transferred out of their deposit accounts this reduces the money supply by £1m. If the money has simply been transferred from private to public accounts there should be no change in the overall money supply – the money is still in circulation. As Shostak points out, “in reality, however, the money is now available for government expenditure, meaning that money held in government deposits should be part of the definition of money” (Shostak 2000). We are concerned with “the total stock of money owned by *all* economic agents” (Salerno 1987, p.5, emphasis in original).

Foreign government deposits

If foreign banks hold checking accounts in domestic institutions, these constitute part of the money supply, since they're denominated in sterling. Obviously *time deposits* should not count for reasons mentioned above.

Travellers' checks

Travellers checks are a credit transaction, and therefore should not be counted in the money supply. “Cashing a traveler's check means that AMEX or VISA will transfer money from their deposits to the holder of the check, which will not change the amount of money in the economy“ (Shostak 2000). Also, they are not routinely accepted as a means of final payment, and “travelers' checks issues by nonbank financial institutions... are excluded... because they neither are riskfree claims to immediate cash nor serve as final means of payment” (Salerno 1987, p.2) Traveller's checks allow the existing money

stock to operate more effectively, but they do not increase the availability of the media of exchange.¹⁴

3. The UK MA

We follow Shostak (2000) and define the money supply as having the following components:

1. Cash
2. Demand deposits (with commercial banks and thrift institutions)
3. Government deposits (with banks and the central bank)

In contrast to M0 and M4 we present “MA” as an “Austrian” measure of the money supply for the UK economy, and as shown in Table 1 the total value of MA as of March 2009 was £116,973m (\approx £117bn).

Table 1: Austrian money supply (MA) [Last updated: March 2009]

Component	Series name/code (Source: Bank of England)	Latest Period	Latest value (£m)
1. Cash	“Monthly average amount outstanding of total sterling notes and coin in circulation outside the Bank of England total (in sterling millions) not seasonally adjusted” LPMAVAA	31/3/09	53,008
2. Demand deposits with commercial banks and thrift institutions	Monthly amounts outstanding of UK resident banks' (inc. Central Bank) sterling retail deposits from private sector (in sterling millions) not seasonally adjusted	31/3/09	852,968

¹⁴ Finally, sweeps should be part of the money supply, but can be difficult to find accurate measures.

	LPMVQXW		
3. Government deposits with banks and the central bank	Monthly amounts outstanding of monetary financial institutions' sterling deposits from Central Government (in sterling millions) not seasonally adjusted LPMVWLS	31/3/09	30,091
Adjustment ¹⁵			- 819,094
Total MA			£116,973m

It is important at this point to note some data availability constraints. In July 2008 the Bank of England reclassified £14bn of interest bearing assets into non-interest bearing ones¹⁶. In his data series Shostak thus uses retail banks deposits as a proxy measure for “demand deposits”, and focuses on monthly changes from the pre-July 2008 measures rather than the absolute values. This is why such a large adjustment is required, because MA can no longer be measured directly.¹⁷

However despite these concerns the MA provides some important results. Figure 1 shows the two predominant measures of the UK money supply (M0 and M4)¹⁸ together with MA. This demonstrates that MA is a broader measure than M0 (since it also includes demand deposits and government deposits) but significantly more liquid than M4. A more relevant comparison is shown in figure 2, which charts the year on year change of

¹⁵ See comments in text

¹⁶ Formally the demand deposit section could be taken from the following series, “Monthly amounts of UK residents banks (inc Central Bank) sterling non-interest bearing deposits (inc. transit and suspense) from private sector”(LPMAUYA). But following the decision to lump £14bn of assets into this measure it is no longer appropriate.

¹⁷ By following Shostak’s method we replicated his measure of the Austrian money supply and this data is available on request. There is a period in late 1999 – early 2001 where our replication overestimates the official data. This is due to massive increases in government deposits recorded during this period, which were adjusted by Shostak. Aside from the fact that a perfect replication is not the objective of this paper, we acknowledge that such adjustments constitute the added value of the analysis provided by Shostak. More importantly, this also demonstrates the limitations provided by the existing data.

¹⁸ Although M0 was discontinued we use this to label the narrow measure of the money supply out of convention

all three measures. Both conventional measures exhibit little deviation over the 10-year period of study, demonstrating why money supply measures have lost favour as a means of interpreting economic activity. However MA provides some immediate points of interest. The period around the “dotcom bubble” can clearly be detected with over 25% growth rates in the quantity of money, and following this a deflationary period in early 2003. The build up to the present financial crisis coincides with sustained positive growth (above the rate of consumer price inflation) that collapsed in early 2008 and remains negative throughout that year. Even a cursory inspection of the series suggests it is worth further attention.

This paper intends to provide an interpretation of recent economic history through the lens of a new measure of the money supply. Carlson and Keen (1996), and Teles and Zhou (2005) provide a more formal approach to justifying attention on a new monetary aggregate, MZM (money of zero maturity). Interestingly MZM is a similar measure to MA in that it focuses on highly liquid assets, but no measure exists for the UK at present. This points to the lack of data that mitigates the confidence we have in compiling such “novel” series, and the inherent difficulty of relying on central bank data that is compiled with little attention to the theoretical considerations that concern us. We therefore feel it would be inappropriate to pursue a similar approach and instead the methodological goal is more focused on broad relationships than to provide a robust statistical test. In short, our focus is on the theoretical validity of the measure and the data is provided as a cautious justification of its relevance. Even at this level of abstraction the results are notable. Figure 3 takes “Real MA” (the MA measure adjusted for CPI) and plots against Industrial Production. Figure 4 correlates Real MA to GDP, where we have incorporated an arbitrary 12-month lag. Figure 5 shows Real MA against retail sales, also with a 12-month lag. On all counts MA offers close approximations for economic activity. The failure of Long-Term Capital Management following the Russian crisis of 1998 can be observed with a monetary deflation in that quickly turned into a massive expansion in the money supply during the dot com boom. At its peak the MA was running at over 25% a year, the subsequent bursting of this bubble led to a prolonged decline in the growth rate of MA (including a massive drop following September 11th 2001) and subsequent deflation in 2003. The most remarkable observation is the consequence of the steady

expansion during 2006 and 2007. In January 2008 the MA went from a 10% year on year growth rate to -4%, demonstrating the sharp contraction that resulted in Bear Stearns and Lehman Brothers. Contra M0 and M4 this monetary deflation continued throughout 2008 reaching lows of -10% in October.

4. Conclusion

This article investigates an alternative measure of the money supply, MA. Despite difficulties in data availability, a brief comparison with relevant economic indicators demonstrates that in contrast to M0 and M4 monetary aggregates *can* have an empirical manifestation. As policymakers increasingly target money growth instead of interest rates there will be increased attention to measures of the money supply. It is important to recap on the purpose of money supply measures. Traditionally these have been deemed to play a crucial role in explaining the future path of the real economy over the shorter term, as well as being the root cause of price inflation. Although existing monetary measures have been less than exemplary for forecasting, our contention is that this is primarily due to theoretical issues regarding the choice of measure. By providing a brief history of the present we see that MA deserves appropriate consideration and further scholarly research.

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Appendix

Figure 1: UK money stocks

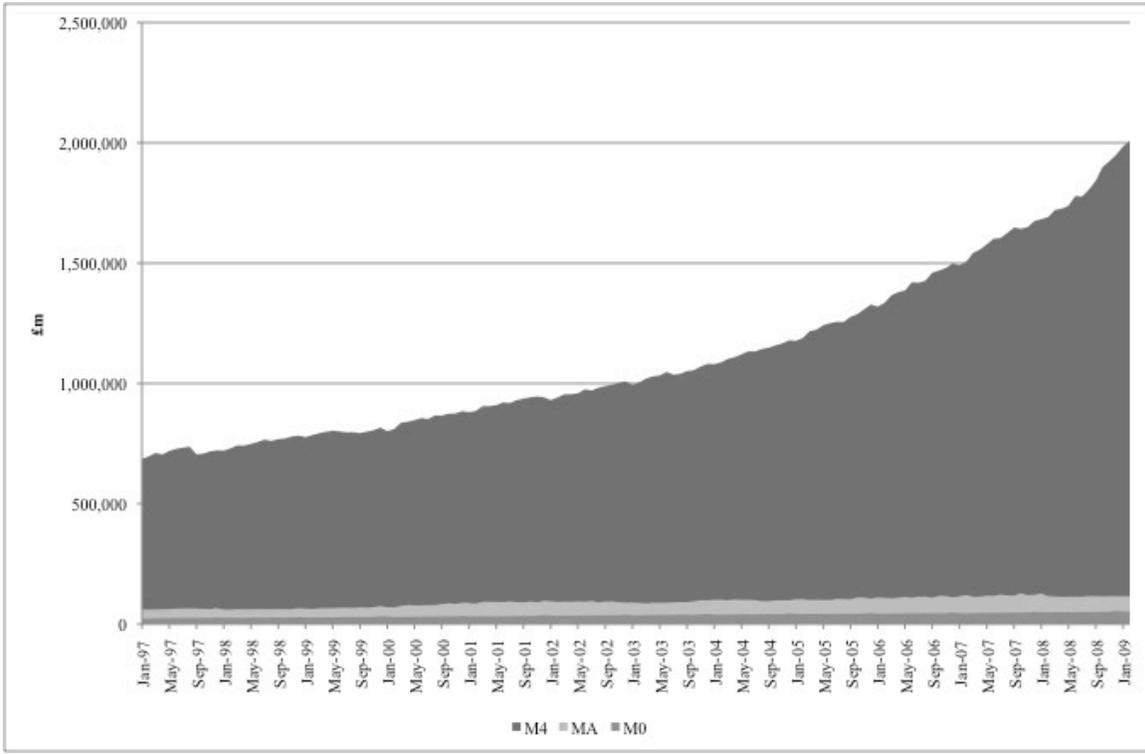


Figure 2: Change in UK money stocks

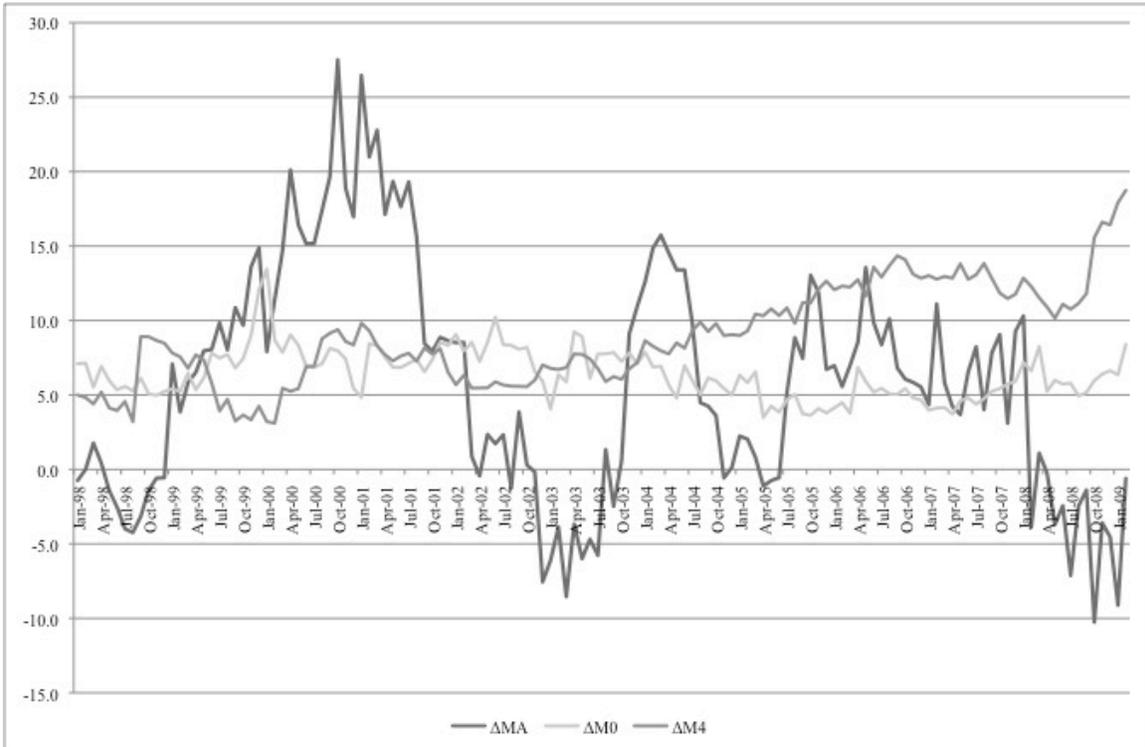


Figure 3: Real MA vs. Industrial Production

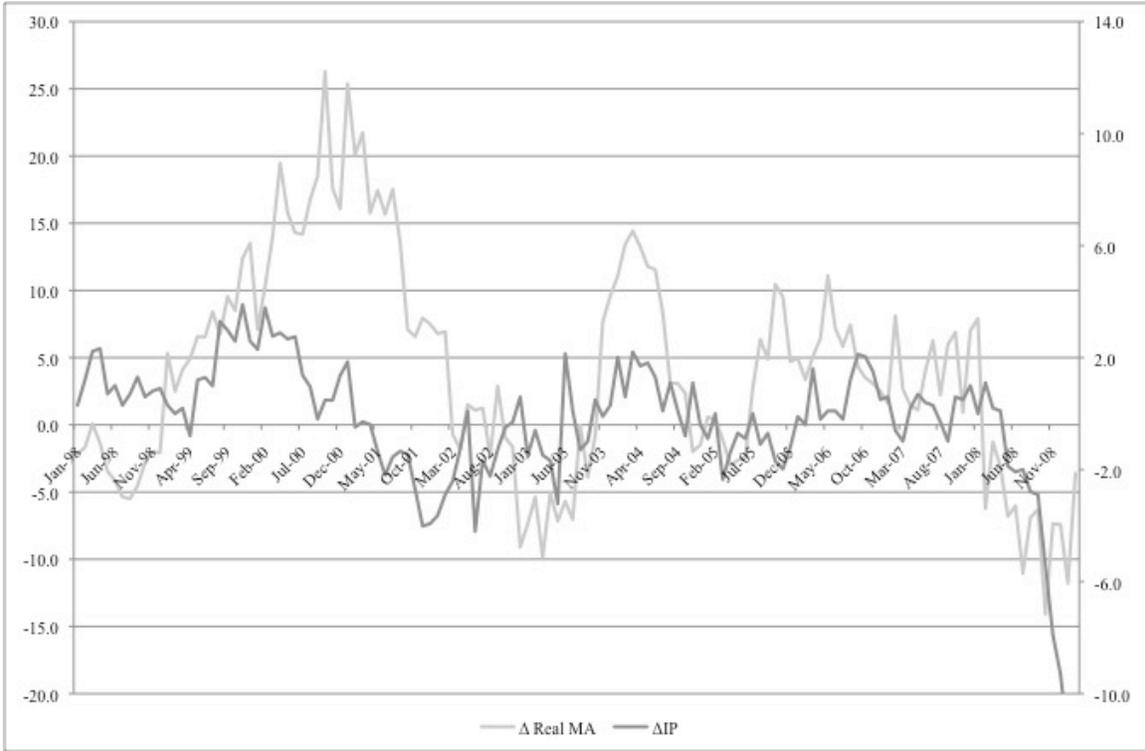


Figure 4: Real MA vs. GDP (12 month lag)

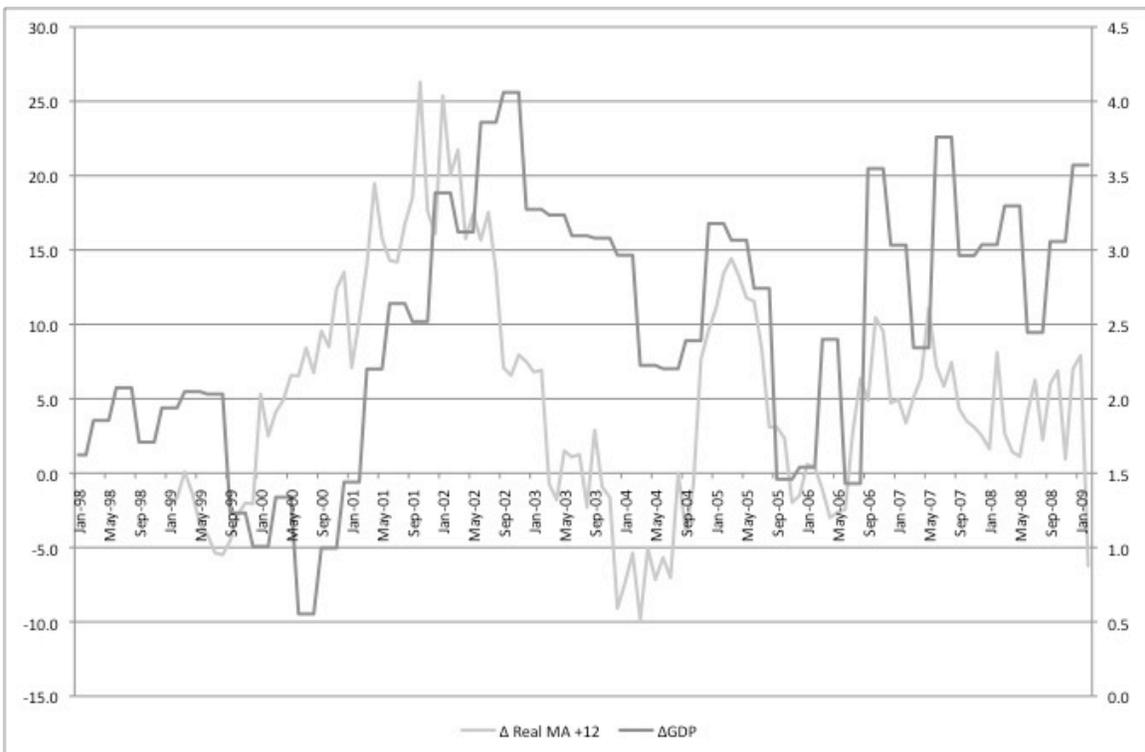


Figure 5: Real MA vs. Retail sales (12 month lag)

