On the recent divergence between measures of the money supply in the UK

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ABSTRACT

This paper presents evidence that the traditional high correlation between simple sum and Divisia monetary aggregates in the United Kingdom has broken down during the economic crisis. This divergence, coupled with the differential diagnostic values of these measures of money in the past, means that current debates about the appropriate stance of monetary policy should first consider what they regard as an appropriate measure of the money supply.

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[E]conomists sometimes disagree. And big disagreements are especially likely in weird times like the present, when many of the normal rules no longer apply.

—Paul Krugman, New York Times, May 29, 2009.

This paper briefly summarizes past work on the value of theoretically accurate aggregates like Divisia, and presents evidence that the traditionally high correlation between simple sum and Divisia monetary aggregates has broken down recently. Fig. 1 vividly illustrates the recent decoupling of these measures for the United Kingdom (UK). This divergence is of crucial importance to current debates about the appropriate stance of UK monetary policy during the global slowdown, and it has implications for the conduct of monetary policy in other nations if the divergence between monetary measures is mirrored elsewhere.

This issue is also important because recent discussions in the press have presented strongly-divided opinions on the policy of "quantitative easing", some of which predict substantial future inflation. The debate is sufficiently intense that Paul Krugman opened a recent column in the New York Times with the following:

Suddenly it seems as if everyone is talking about inflation. Stern opinion pieces warn that hyperinflation is just around the corner.

And markets may be heeding these warnings: Interest rates on long-term government bonds are up, with fear of future inflation one possible reason for the interest-rate spike.

Krugman (2009) goes on to disagree with inflationary projections, but his view is certainly not unanimously supported, even among professional economists. Some of the inflationary forecasts appear to be based on the logic of the Quantity Theory of Money in which money is neutral, and therefore they predict that the recent increases in the money supply will be purely inflationary in the long run. This paper argues that choices made about the measurement of money may be particularly important for assessing the appropriate stance of monetary policy at this critical time.

1. How to count money?

How much money is in circulation in the United Kingdom? The practicalities of answering this question depend on important features of the definition of money and judgments about how these features can best be accounted for.

On a daily basis, people and companies create portfolios of financial assets to meet their needs, and change these portfolios over time to maximize the utility derived from the holdings. These monetary assets serve diverse purposes, and thus yield different rates of return. For example, currency earns no interest and it has the highest possible liquidity. Unsurprisingly, currency is held primarily for transaction use. Other assets trade some liquidity for a higher interest rate.

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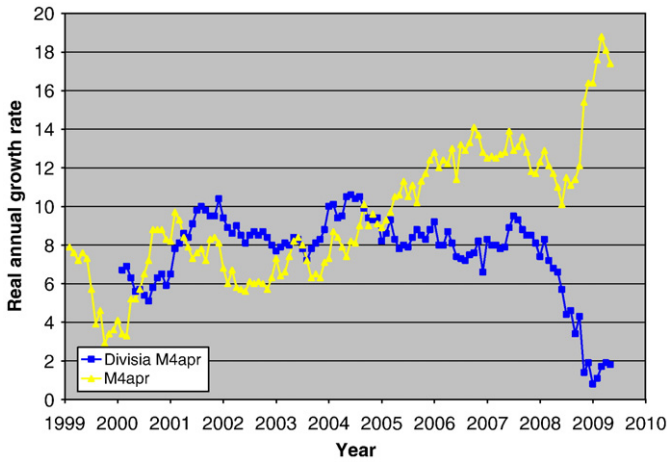
Fig. 1. Growth in simple sum and Divisia aggregates for the UK.

The economic literature focuses on two main monetary aggregation techniques: simple sum and Divisia. Simple sum monetary aggregates are based on adding up the face value of all monetary assets, thus treating all assets as perfect substitutes. This approach has been criticized in a number of ways for different reasons: failure to reflect distinctive features of monetary assets, inability to show that user-cost prices of the services of individual money assets change over time, failure to distinguish between income and substitution effects, and deterioration in quality as the level of aggregation increases.

Critics of simple sum monetary aggregation believe that valid aggregates must be constructed with weights that vary by asset and vary over time for any given asset. Barnett (1978) derives such a formula for the user-cost price of a monetary asset j during period t. As shown in Eq. (1), user cost $\pi_{j,t}$ is defined on the market yield $r_{j,t}$, and the yield available on a benchmark asset R_t that is held only to accumulate wealth.

$$\pi_{j,t} = \frac{\left(R_t - r_{j,t}\right)}{(1 + R_t)} \tag{1}$$

This approach has led to the construction of monetary aggregates based on the class of superlative quantity index numbers (Diewert, 1976), the most famous of which are called Divisia aggregates. Weights in the Divisia index are shares, computed with user costs serving as prices. User costs, being prices, measure marginal utilities, not average or total utilities, and are not themselves the weights. Weights are expenditure shares which depend on prices multiplied by quantities. In the case of money, prices are the user costs, of which interest rates are a component. The direction in which the shares change with changes in user costs depends upon whether the own price elasticity of demand is greater than or less than minus 1. For example, in the Cobb–Douglas case, shares do not change at all with interest rate changes since the own price elasticities of demand are equal to minus one. More generally, consumers make substitutions among alternative monetary assets as relative user costs change, which also changes the quantities they hold. A superlative index like Divisia internalizes these substitution effects and a simple sum index does not. The Divisia approach allows measurement of the income effects of changes in relative prices and is invariant to substitution effects. Divisia aggregates are more informative when computed at the broadest level of aggregation, since such aggregates capture the contribution of all monetary assets to the economy's monetary service flow (Poterba and Rotemberg, 1987; Barnett, 1997).

The Bank of England calculates a Divisia monetary aggregate based on Barnett's approach, and the growth rate of this aggregate is the share-weighted average of the growth rates of the component quantities.[1] This process is summarized in Eqs. (2–4) for n different monetary assets.

$$\frac{\Delta M_t^D}{M_{t-1}^D} = \sum_{j=1}^{n} S_{j,t} \frac{\left(m_{j,t} - m_{j,t-1}\right)}{m_{j,t-1}} \tag{2}$$

$$S_{j,t} = \frac{1}{2}\left(W_{j,t} + W_{j,t-1}\right) \tag{3}$$

$$W_{j,t} = \frac{m_{j,t}\left(R_t - r_{j,t}\right)}{\sum_{i=1}^{n} m_{i,t}\left(R_t - r_{i,t}\right)} \tag{4}$$

The Divisia weights are defined as the chained two-periods average of the weights on the jth component, $W_{j,t}$, the numerator of which in turn depends on the level of the jth money holding $m_{j,t}$, the interest rate on the jth asset $r_{j,t}$ (net of tax), and the rate associated with the benchmark asset, R_t. The denominator of $W_{j,t}$ is the total foregone interest income associated with holding monetary assets instead of the benchmark asset at time t. The Bank of England uses an envelope approach to estimate the benchmark rate (Hancock, 2005, pp. 40-41). Under this approach the component that pays the highest interest rate in a period is treated as if it was the benchmark asset during that particular period. The resulting upper envelope is actually a proxy for the true benchmark rate of return which necessarily is somewhat higher than the upper envelope since the rates of return along that envelope are attained by assets that are not pure investments providing no monetary services.

2. Limited influence of Divisia aggregates

The Divisia index formula has been around since the 1920s, and Divisia monetary aggregates have been available since Barnett (1980), but their penetration into the collective psyche of policymakers and pundits has been limited. Divisia aggregates have been produced for many countries, and many theoretical extensions have been made during the last decade, including the integration of risky contemporaneous interest rates and multilateral aggregation over different countries.[2] Even so, Divisia aggregates are only reported on a regular basis by the Federal Reserve Bank of St. Louis and the Bank of England.[3] The majority of central banks continue to use simpler and easier aggregation methods in the construction of their monetary policies, and there are only two mentions of the word "Divisia" in a search of the Financial Times archives since January of 2004.

Perhaps this lack of influence is because the effort required to justify anything other than a simple sum measure of money seems disproportionate to the gain when the correlation between the measures is so high. For example, the Bank of England currently reports monthly Divisia M4 data beginning in January of 1999, and the correlation between this and the Bank of England's simple sum measure of M4 was 0.988 through December of 2007.

In this environment, perhaps one could be forgiven for behaving as if Divisia and simple sum aggregates were essentially the same thing, but the strong linkage between the measures is not always evident in the short run. These periods of divergence have provided useful opportunities to assess the relative merits of different aggregation approaches.

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[1] Previous work using the UK Divisia series includes Belongia and Chrystal (1991), Drake and Chrystal (1994,1997) and Drake (1996).

[2] Countries include Japan, the Netherlands, Canada, Australia, and Switzerland, among many others. See Barnett and Chauvet (2009) for references to this literature.

[3] The method for constructing aggregates for the USA is currently under review to reflect reductions in data available for some components, and as such the Divisia aggregates for the USA are only available through February 2006.

Barnett (1997) uses the case of the so-called "Monetarist Experiment" in the United States as just such an illustration. Paul Volcker decreased the rate of growth of the money supply in the early 1970s in order to bring down inflation. The policy succeeded in ending the growing inflation, but it was unexpectedly followed by a recession. Barnett's analysis of the simple sum aggregate dynamics revealed no reason for the recession, but the Divisia aggregates suggested that the money supply growth was half that in the officially-stated figures. This suggested that monetary policy was actually much tighter than suggested by the simple sum measure of the money supply, and thus provided an explanation for the recession.

The superior performance of Divisia aggregates on the way into the recession was reinforced soon thereafter. There was an immense spike in simple sum M2 growth in late 1982–early 1983 resulting from the authorization of money market deposit accounts and super-now accounts in December 1982. The annual rate of simple sum money growth jumped from under 10% to over 30% even though Divisia monetary measures were largely unaffected by this financial innovation. Fig. 2 illustrates the breakdown in the correlation between Divisia and simple sum M2 in the United States during this period. Economists like Milton Friedman, basing their views on simple sum aggregates, argued that the country faced a new round of inflation and recession, while economists like Barnett had no such concerns. Predictions based on Divisia aggregates were again more accurate than those using simple sum aggregates.

3. Recent divergence of simple sum and Divisia measures of money

The strong correlation between simple sum and Divisia measures of the money supply has recently broken down in the UK. For example, the correlation between the levels of simple sum M4 and Divisia M4 in the UK was only 0.08 during 2008. Fig. 3 illustrates this divergence by looking at the correlation between the levels of these monetary aggregates over time. While the growth in simple sum M4 has nearly doubled in the last year, the growth in Divisia M4 is only just above zero (see Fig. 1), and the correlation between Divisia and simple sum measures clearly begins breaking down partway through 2008. It seems clear that while the Bank of England has been pursuing a policy of "quantitative easing" in the simple sum sense, they have in fact only just avoided contractions in the supply of Divisia money.
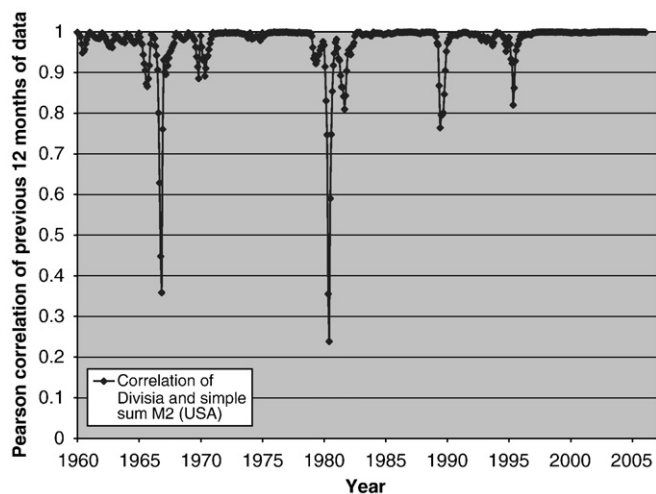

Fig. 2. Correlation between levels of simple sum and Divisia aggregates for the USA.
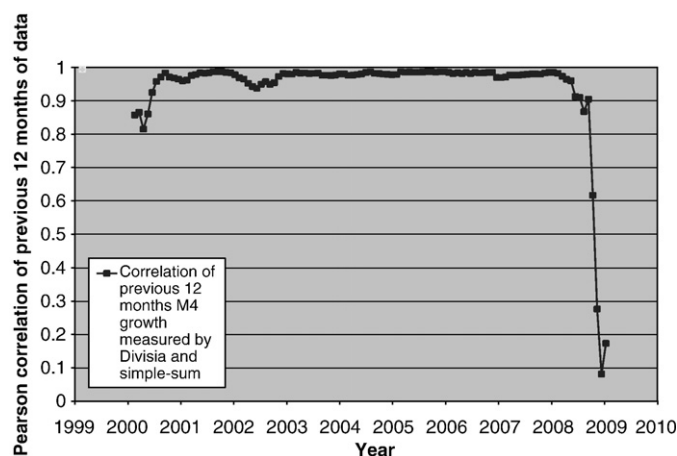

Fig. 3. Correlation between levels of simple sum and Divisia aggregates for the UK.

4. Implications

The measures of the money supply discussed in this paper offer different perspectives on the current state of the UK economy. One depicts an economy with an ample supply of liquidity while the other suggests that the UK economy is still facing severe monetary restrictions on growth. One seems to suggest that the seeds of future expansion in nominal GDP, be this through price and/or real output changes, have already been laid, while the other suggests no such grounds for optimism.

Barnett (1997) has argued that many of the lags in the relationship between monetary policy and economic activity which have been attributed to unstable money demand actually reflect the imprecision of the simple sum monetary aggregates used to model economic activity. If correct, the failure to base current policy decisions on Divisia aggregates could prove problematic as policy decisions should be based on the best information available, especially in times of economic turmoil.

The implications of this paper extend beyond UK economic policy. The methods for calculating Divisia aggregates are under modification in the United States, and this means Divisia aggregates are not available at this time of great economic turmoil. We would welcome the completion of the revision of the United States Divisia data, as well as the publication of Divisia aggregates for other countries. This data could usefully inform important decisions about the stance of monetary policy as the global economy recovers. The current divergence between the simple sum and Divisia aggregates also presents another opportunity to verify the findings of Barnett (1997), and potentially reinforce the reputation of Divisia aggregates as the appropriate tool for measuring money at the times when policy matters the most.

Acknowledgments

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