Divisia money

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This article reviews the Bank's measure of Divisia money — a gauge of the money supply that gives greatest weight to those components most used in transactions — and explains some recent changes to its calculation. These changes aim to make the Bank's series more theoretically appealing and to make use of some recently developed statistics. Five improvements have been made. First, a new approach has been introduced to determine the benchmark interest rate. Second, new effective interest rate data have been incorporated. Third, the level of aggregation has been changed slightly. Fourth, non break-adjusted levels are now used as the denominator in the Divisia calculation. Finally, a series for aggregate Divisia excluding other financial corporations, and a set of monthly series, have been introduced. In this article we begin with a discussion of the purpose of Divisia money, then we set out the changes that have been made, and the motivation behind them. Throughout we describe the impact of the changes on the Bank's series.

The purpose of Divisia money[1]

When measuring the supply of money in an economy, we often use simple aggregates of broad money like M4. M4 adds together notes and coin in circulation, and all of the deposits held with UK monetary financial institutions (MFIs).[2] These deposits range from current accounts at banks to savings deposits at building societies. This straightforward sum has the advantage of being a simple measure that is easy to understand. It also has an accounting interpretation, as each unit of money has an equal financial value, whatever the form in which it is held.

However, economists are often interested in money as an indicator of near-term economic variables, such as future expenditure or inflation.[3] A simple aggregate like M4 gives equal weight to each component of money — notes and coin, bank current accounts, bank time deposit accounts and so on. But this may not always be appropriate. Some components may be more important than others for particular purposes, so different forms of aggregation may be more useful for certain types of analysis.

Money has three broad purposes. It is used as a unit of account, as a store of value, and as a medium of exchange. Most of the difference in the interest earned on the components of broad money is due to differences in their usefulness for money's third purpose — as a medium of exchange, or usefulness in transactions. Divisia money uses a form of aggregation that takes this into account and weights the components of money according to their usefulness in transactions. For example, notes and coin are very useful for making transactions, and pay no interest, while building society deposits pay relatively more interest, but are less useful for making transactions. Thus Divisia money might be expected to have stronger short-term links to aggregate spending than would a simple nominal aggregate like M4, and so may be a useful aggregate for policymakers to monitor.

To calculate a Divisia index for money we need to make two key assumptions.[4] First, it is assumed that relatively illiquid deposits such as building society deposits are less likely to be used for transaction purposes than liquid measures such as notes and coin. And second, it is assumed that higher interest rates are paid on less liquid deposits. In other words, it is assumed that the higher the relative return on an asset, the less useful it is for transaction purposes. To calculate Divisia money, we aggregate the rate of growth of various components of

(1) Divisia money calculations were originated by Barnett (1980). For more on the theory behind, and calculation of, the Bank's Divisia money series, see Fisher *et al* (1993a,b).
(2) The monetary financial institutions sector comprises the central bank, other banks and building societies.
(3) For more on the use of Divisia in forecasting economic variables, see Janssen (1996).
(4) A Divisia approach can be taken to the indexation of any variables; it is not specific to money.

money using a weight[1] based on their relative returns.[2] This allows us to derive an index that is a proxy for balances held for use in transactions.

To construct a weight for any single component of money, we need two pieces of information.[3] First, we need to know the interest rate paid (net of tax) on that component. Second, we need to know the *benchmark rate*. The benchmark rate is an important concept in Divisia calculations, and is the interest rate paid on the *benchmark asset*. A benchmark asset is one that has no value for transaction purposes; it is solely used as a store of value. We subtract the interest rate paid (net of tax) on each individual component of money from the benchmark rate to calculate that component's weight. These weights are known as the user cost of holding each asset, because there is a cost (in terms of the interest foregone) associated with not holding the benchmark asset.

Once we have weights for each component of money, we can then calculate the growth rates of Divisia money.[4] These growth rates give an indication of the rate of growth of balances used for transaction purposes. Thus if notes and coin grew faster than bank time deposits, then the higher weight on notes and coin in the Divisia measure — representing their greater usefulness in transactions — would mean that Divisia money would be growing faster than the simple aggregate.

Changes to the Bank's measure of Divisia money

There are a number of difficulties specific to Divisia that the Bank looked at when revising its measure. Broadly speaking, these difficulties fall into four categories: the choice of the benchmark asset and rate; the interest rates paid on individual Divisia components; the appropriate level of aggregation; and problems of 'break-adjustments'. In this section we briefly consider each of these in turn. We then spell out how the Bank's new approach to calculating Divisia addresses these problems, and detail the differences between the new and old Divisia measures. We also describe the series

that have been published since January following the Bank's review of Divisia money.

The benchmark asset and the envelope approach

The first difficulty concerns how to choose our benchmark asset. The optimal benchmark asset should provide at least as good a store of value as the components of the money supply, but have no use for transactions. This implies that in equilibrium the rate of return on such an asset should be greater than the return on any components that are useful in transactions. In practice this may not be the case if some of the benefits of holding the asset are not fully captured by the interest rate — for example free financial advice may be available for holding balances in some accounts. Indeed, it is hard to find an asset that matches all of the requirements for a good benchmark asset. Until recently we proxied the benchmark rate with an artificially constructed interest rate: the interest rate on three-month Local Government (LG) bills[5] plus an arbitrary 200 basis point adjustment.[6] But the 200 basis point adjustment was *ad hoc*, and moreover, LG bills are no longer issued. So this was obviously not a perfect solution.

Two alternative approaches were considered. The first was to find an asset that fitted the characteristics of a good benchmark asset, which could replace the old benchmark. The second was to use an 'envelope approach'. Under an envelope approach, it is assumed that the benchmark asset is the M4 component that pays the highest interest rate.

The drawback of the first approach is that, without an arbitrary adjustment, none of the benchmark assets which might serve our purposes would remain above the rates on all component assets all of the time. This would lead to negative user costs and so negative weights for some assets, which would imply that the wrong benchmark asset had been chosen. This problem does not occur with an envelope approach. In that case, if the asset yielding the highest rate changes, then the benchmark asset automatically switches to reflect this change in the relative usefulness of the assets in

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(1) Other weighting methods could be developed, which would for instance link the weight to the past correlation of a component asset with aggregate spending.
(2) Technically, Divisia money weights together the changes to component assets according to the rate paid on them, and so allows intra-marginal units to have different values for liquidity services.
(3) For more details of this calculation see the appendix.
(4) The Bank publishes a monthly and quarterly measure of UK Divisia money in *Bank of England Monetary and Financial Statistics*, and on the Bank's website. We publish the aggregate measure (as an index and as a growth rate), a sectoral breakdown and a breakdown of the level of, and interest rates on, each component asset.
(5) Previously known as Local Authority bills.
(6) The adjustment ensured that the benchmark rate was indeed always higher than the return on any component of M4.

transactions. We therefore decided to use an envelope approach in the new Divisia series.

For households, we continue to include the rate on LG bills in the envelope while they were in issuance until 1993, and include Tax Exempt Special Savings Accounts (TESSAs) separately from other bank and building society deposits since their introduction in 1991. In the new series, since 1991 the household benchmark rate has been the TESSA or Individual Savings Accounts (ISA) rate after ISAs replaced TESSAs in 1999. This seems satisfactory: because of their tax treatment these accounts are largely held to satisfy a savings motive. Chart 1 shows that the change to using the envelope approach makes little difference to household Divisia growth rates.

For companies, we include in the envelope the rate paid on each component of corporate M4. In the new measure, the benchmark rate switches over time between the rate paid on building society deposits and on bank time deposits. Moving to an envelope for the Divisia

measure for private non-financial corporations (PNFCs) and other financial corporations (OFCs) leads to a small change in the PNFC measures, and a larger change in the OFC series (the red lines in Charts 2 and 3). The most significant of these changes are in the distant past, and their impact on the aggregate measure is small (Chart 4).

Quoted and effective interest rates

A second problem is which interest rates to use. For each component of M4, we need to try to measure the interest rate paid on the marginal unit held, so that the rate is just sufficient to induce the depositor to continue to hold the existing balances in that form. In the past, we have used quoted interest rates, which measure the average interest rate offered on new customers' deposits. However, these suffer from the drawback that deposits from existing customers may yield a different rate, and the rate paid on similar accounts may differ — for example depending on the size of the deposit or the number of withdrawals. For instance, a bank may offer a
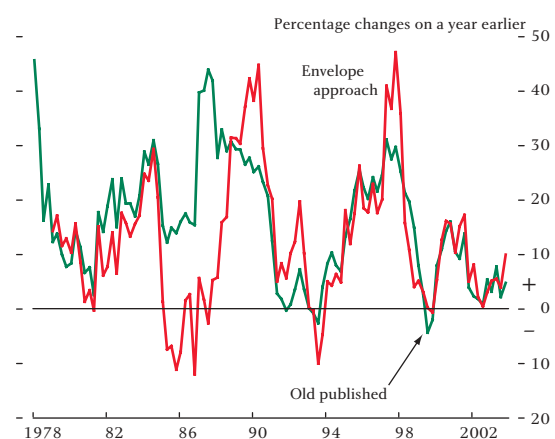
Chart 1
Household Divisia: effect of envelope approach
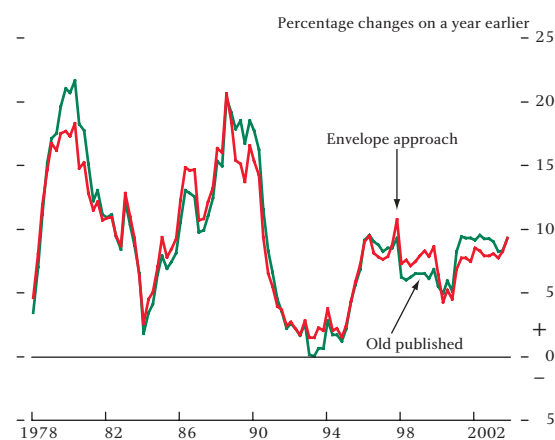
Chart 2
PNFC Divisia: effect of envelope approach
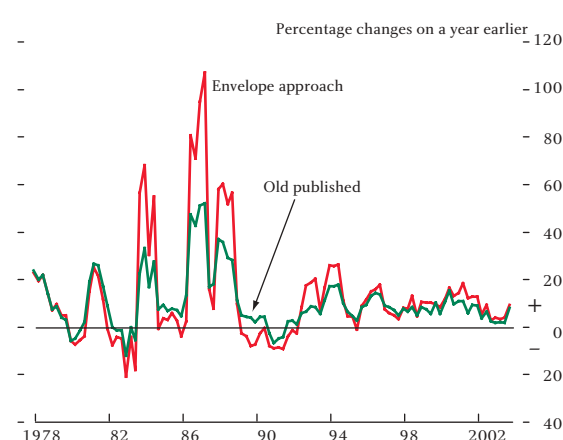
Chart 3
OFC Divisia: effect of envelope approach

Chart 4
Aggregate Divisia: effect of envelope approach

new type of account with a high rate to attract new customers, but continue to pay a lower rate to existing account holders. In that case using the quoted rate would give too little weight to these deposits in measuring Divisia money. Also, quoted rates are susceptible to changes in the way that the sample rates are reported by banks.[1]

Since 1999 the Bank has published a measure of effective interest rates. That measure calculates the average interest paid on all deposit balances, by measuring the value of interest paid and dividing this by the outstanding level of balances. These effective rates data more closely reflect the benefit of holding different types of money asset, and so are better suited for the purpose of measuring the user cost used within the calculation of Divisia money.[2] Although effective rates measure the average, rather than the marginal, rates on balances, they are both practically and theoretically more appealing than quoted rates, so we have decided to use them where possible.

This change leads to a small break in the Divisia indices between 1998 Q4 and 1999 Q2. The Bank recognises that introducing a break into any series is unhelpful for econometric work that typically relies on a long run of data. However, the break is the result of using improved methods and in any case its impact on the Divisia series is small. Furthermore, we will continue to publish the component parts of the old Divisia data,[3] so it will be possible for users to reconstruct the old version of Divisia money should they wish.

There are no effective rates data for corporate building society deposits. However, the value of these deposits is small, and the rate on them can be fairly closely proxied by the effective corporate bank rate. Under an envelope approach, corporate Divisia is almost exactly the same with quoted and effective rates.

Charts 5 and 6 show the impact of the change to effective rates for the calculation of aggregate and household Divisia. As we can see, the differences are not large, with mean absolute differences in growth rates since 1999 of 0.7 percentage points and 0.5 percentage points respectively. The impacts of the changes to PNFC and OFC Divisia are not shown, as they are very small.

Chart 5
Aggregate Divisia: effect of effective rates
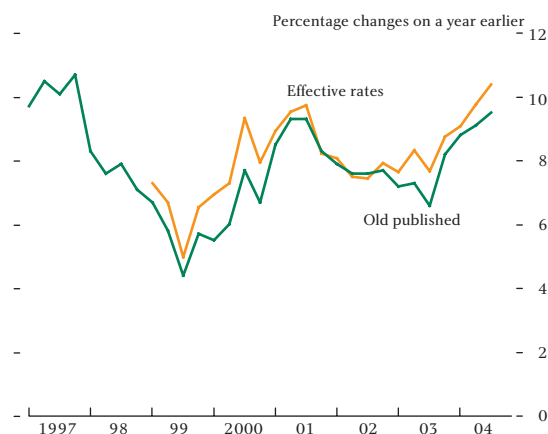
Chart 6
Household Divisia: effect of effective rates
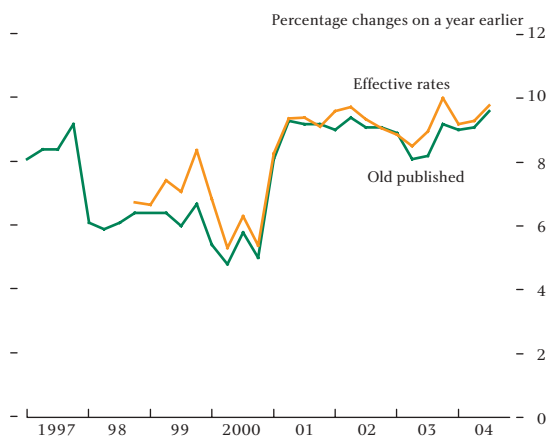
Level of aggregation

A third problem is the question of the level of aggregation. When we weight different components of Divisia, we have already performed a degree of simple aggregation to reach those components. For example the household bank time deposit component is itself an aggregate of all UK bank accounts held by households that do not allow free instant access to the money, whatever the required notice period. In deciding at which level to use Divisia weights, we must take into account the similarity of different components, the accuracy of measurement, and data availability. Optimally, we should group balances only when they are held on identical terms. But this would lead us to treat every bank product and every type of account as separate components, as each has very slightly different properties and non-price features — for instance down

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(1) For instance, there is a break in November 2004 in the quoted rates series due to the impact of new regulations concerning the rates that banks can advertise. This reinforces the benefit of the switch to using effective rates.
(2) The Bank's new measure of Divisia money, for example, is more closely correlated to consumption expenditure than the old measure or M4.
(3) Except for data on LG bills, which could in practice be proxied by Treasury bills in future if required.

to the availability of bank branches. These individual data may be hard to find accurately. So in practice we compromise on perfect similarity in return for ease of compiling the data.

In this review of the Bank's measure, we have made no major changes to the level of aggregation used.[1] We have included TESSA and ISA accounts as separate components of M4, instead of including them within bank and building society deposits as in the past. And we have separated out household building society instant access accounts from accounts requiring a period of notice, which reflects our treatment of banks. These changes do not make a significant impact on the Divisia series.
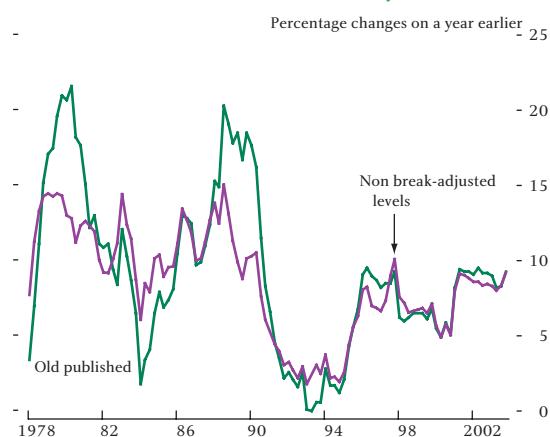
Break-adjustment

Monetary statistics are adjusted for breaks in the data. These breaks largely occur when a building society demutualises and changes classification to become a bank. Were we to leave the data unadjusted, this would lead us to report large flows into banks, and out of building societies, simply because of an institutional change. To avoid this distortion, the data are 'break-adjusted'.

When making break-adjustments, we adjust the back data so that all previous deposits with that institution are reallocated to the new classification. So if, for example, a building society demutualises to become a bank in 1992, then all data up to 1992 are reallocated into the bank series. Break-adjusting Divisia series presents additional problems because of the importance of allocating the right interest rate to past deposits. When a building society becomes a bank, *past* deposits at that building society were still remunerated at *past* building society interest rates, and must be measured as such. So we need to use non break-adjusted levels data, but break-adjusted flows, to weight each component asset correctly.

Charts 7 and 8 show the old measure of Divisia, and Divisia calculated with only this change: using break-adjusted flows (as before) and non break-adjusted levels. This makes a bigger difference than any of the changes we have discussed above. Nonetheless, as with all of these methods, the changes to the recent past are fairly small.

Chart 7
Household Divisia: non break-adjusted levels

Chart 8
Aggregate Divisia: non break-adjusted levels
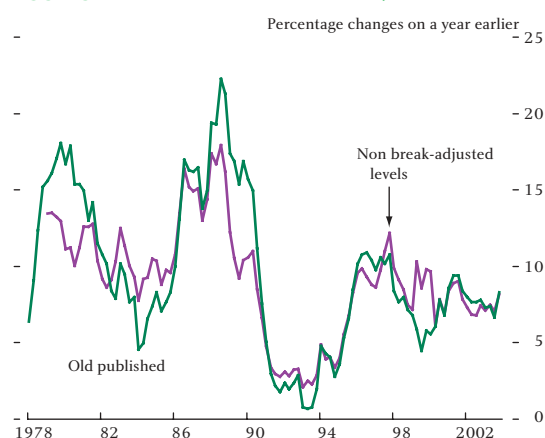
Monthly Divisia and aggregate Divisia excluding OFCs

Until January, the Bank published its Divisia money series on a quarterly basis. However, we now have the constituent data to publish a monthly series from 1999.

We have also added a further sectoral series for aggregate Divisia excluding OFCs (which is equivalent to household and PNFC Divisia). Chart 3 shows that OFC Divisia data have a high variance, and that volatility may be telling us little about their near-term spending plans.

Conclusion

Divisia money weights the component assets of broad money according to an estimate of the transactions services they provide. The availability of some new data sources has given the Bank the opportunity to revisit the computation of its measure of Divisia money. In doing so, five improvements have been made. First, an envelope approach has been introduced to determine the benchmark rate. Second, new effective interest rate

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(1) See the appendix for more details.

data have been incorporated. Third, the level of
aggregation has been changed slightly. Fourth, non
break-adjusted levels are now used as the denominator in
the Divisia calculation, and finally, a series for aggregate
Divisia excluding OFCs, and a set of monthly series, have
been introduced.

Charts 9 to 13 show the old and new series, combining
all of our changes, for the aggregate and each of the four
sectoral measures. Although the back data contain some
substantial revisions, the changes to the most recent

data are fairly small. The new series reflect a better
method and improved data inputs, so should therefore
be closer to the true underlying measure of liquidity
that we are trying to measure: an estimate of the
growth rate of money balances held for the transactions
services they provide. The new index, its growth
rates, the component asset levels and flows, and the
interest rates used are now available along with the
components of the old series, in *Monetary and Financial
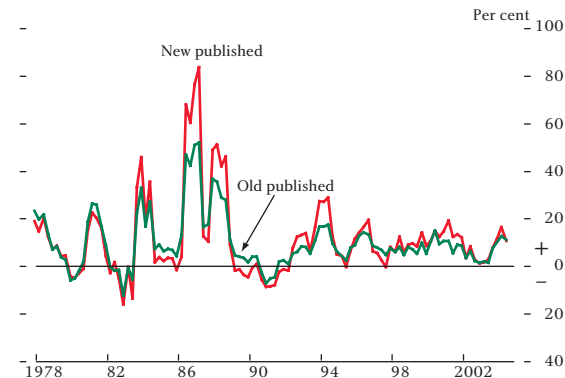Statistics*, and on the Bank's Statistical Interactive
Database.

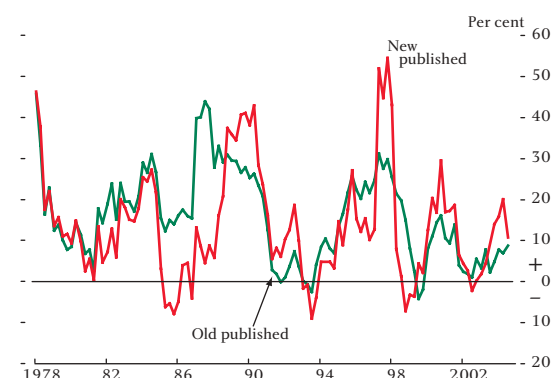**Chart 9**
Annual growth in aggregate Divisia

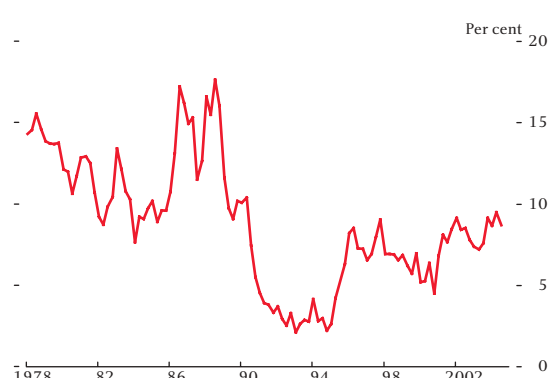

Chart 10
Annual growth in household Divisia

Chart 11
Annual growth in PNFC Divisia

Chart 12
Annual growth in OFC Divisia

Chart 13
Annual growth in aggregate minus OFC Divisia

Appendix
Calculation of Divisia money

Divisia money is calculated as a weighted average of the growth rate of N different component money holdings. The components are weighted according to their usefulness for making transactions, which is proxied by the user cost of holding these components. The user cost is measured by the difference between the benchmark rate, which is the post-tax interest rate paid on balances with no transactions value, and the post-tax interest rate paid on component balances. Divisia is therefore calculated as follows:

$$\frac{\Delta D_t}{D_{t-1}} = \sum_{i=1}^{N} \frac{1}{2}\left(W_{i,t} + W_{i,t-1}\right)\frac{\Delta M_{i,t}}{M_{i,t-1}} \qquad \textbf{(1)}$$

where M_i is the level of the ith money holding, and W_i is the weight on the ith component:

$$W_{i,t} = \frac{M_{i,t}\left(r_{B,t} - r_{i,t}\right)}{\sum_{j=1}^{N} M_{j,t}\left(r_{B,t} - r_{j,t}\right)} \qquad \textbf{(2)}$$

where r_B is the rate on the benchmark asset and r_j is the rate on the jth asset. Under the envelope approach:

$$r_{B,t} = \max(r_{1,t}, r_{2,t} ... r_{N,t}) \qquad \textbf{(3)}$$

We take ΔM_i to be the average of the change over the past two periods. We allow r_B to vary between households and companies because households cannot access the benchmark rates available to companies and *vice versa*. Below we tabulate the old and new methods of calculating each variable. The changes improve measurement of M_i, r_B, and r_i. The Divisia series includes the following components of money holdings:

> Household, PNFC and OFC bank time deposits[a][b]
> Household, PNFC and OFC bank sight deposits
> Household building society instant access deposits[a]
> Household building society notice deposits[b]
> PNFC and OFC building society deposits
> Household, PNFC and OFC bank non-interest bearing deposits
> Household, PNFC and OFC notes and coin
> Household TESSA and ISA deposits

(a) Excluding household ISA deposits.
(b) Excluding household TESSA deposits.

Variable	Old method	New method
M_i	Break-adjusted	Non break-adjusted
ΔM_i	Break-adjusted	Break-adjusted (no change)
r_B	Quoted rates, arbitrary adjustment	Effective rates since 1999, envelope approach
r_i	Quoted rates	Effective rates since 1999

References

Anderson, R, Jones, B and Nesmith, T (1997), 'Building new monetary services indices: concepts, data and methods', *Federal Reserve Bank of St. Louis Review* (January/February), pages 53–82.

Astley, M and Haldane, A (1995), 'Money as an indicator', *Bank of England Working Paper no. 35*.

Barnett, W A (1980), 'Economic monetary aggregates', *Journal of Econometrics*, pages 11–48.

Barnett, W A, Offenbacher, E K and Spindt, P A (1984), 'The new Divisia aggregates', *Journal of Political Economy*, December, pages 1,049–85.

Binner, J and Elger, T (2002), 'The UK personal sector demand for risky money', *Lund University Department of Economics Working Paper 2002–9*.

Fisher, P, Hudson, S and Pradhan, M (1993a), 'Divisia indices for money', *Bank of England Working Paper no. 9*.

Fisher, P, Hudson, S and Pradhan, M (1993b), 'Divisia measures of money', *Bank of England Quarterly Bulletin*, May, pages 240–55.

Gaab, W (1996), 'On the demand for Divisia and simple-sum M3 in Germany', in Mullineux, A (ed), *Financial innovation, banking and monetary aggregates*, Edward Elgar, Cheltenham, pages 160–86.

Gaiotti, E (1996), 'Measuring money with a Divisia index: an application in the UK, 1977–93', in Mullineux, A (ed), *Financial innovation, banking and monetary aggregates*, Edward Elgar, Cheltenham, pages 39–65.

Hulten, C R (1973), 'Divisia index numbers', *Econometrica*, Vol. 41, pages 1,017–25.

Janssen, N (1996), 'The demand for Divisia money', *Bank of England Quarterly Bulletin*, November, pages 405–09.

Reimers, H (2002), 'Analysing Divisia aggregates for the euro area', *Economic Research Centre of the Deutsche Bundesbank Discussion Paper 13/2002*.

Stracca, L (2001), 'Does liquidity matter? Properties of a synthetic Divisia monetary aggregate in the euro area', *ECB Working Paper no. 79*.