Does money matter in the euro area?
Evidence from a new Divisia index

Zsolt Darvas

Bruegel, Hungarian Academy of Sciences and Corvinus University of Budapest

2nd International Conference of the Society for Economic Measurement (SEM)
22-24 July 2015, OECD, Paris, France
• Money has virtually disappeared from standard monetary models:
  • Empirical failures: estimated money demand functions found to be unstable; money proved to be less effective in predicting economic outcomes;
  • Policy shifts: central banks focus on interest rates;
  • Theory: development of theories suggesting that money is redundant.

• Measurement problem?

• Standard (simple sum) monetary aggregates were used, but:
  • E.g. cash and bank debt securities quite different, yet simple sum money aggregation assumes they are perfect substitutes
  • Each component provides a monetary service (usefulness in transaction) and an investment service (return)
Divisia monetary aggregates:

- Correct aggregation: using either aggregation theory or index number theory;
- Barnett (1980): use the discrete-time Törnquist-Theil approximation of the Divisia index;
- Divisia money aggregates weight the components according to their "moneyness", i.e. according to their usefulness in making transactions;
- For the US, it is found that money demand for divisia is stable; divisia works better than simple sum aggregates in VARs; divisia helps to predict inflation and nominal GDP (some recent works: Hendrickson (2013, Macr.Dyn.), Keating, Kelly and Valcarcel (2014, EL), Belongia and Ireland (2015, JBES));
- Euro area: no official divisia index available; academic works are outdated, not available publicly and have some drawbacks.

Goals of this paper: (1) calculate divisia aggregates for the euro area, (2) study the impacts of shocks to money, user cost and interest rate on output, prices and monetary variables in the euro area, using SVAR models.
1. Construction of the new euro-area Divisia dataset
2. Structural vector autoregression (SVAR) estimates
3. Summary
Calculating Divisia monetary aggregates

- Weight components of broad monetary aggregates according to their usefulness in transactions
- Weights are inversely related to returns
- We largely follow the Bank of England methodology:

\[ w_i = \frac{(r_B - r_{B,t})M_i}{\sum_{j=1}^{N} (r_B - r_{j,t})M_j} \]

where \( D \) is the level of divisia money,
\( M_i \) is the level of the \( i \)-th money holding,
\( w_i \) is the weight on the \( i \)-th component,
\( r_B \) is the rate on the benchmark asset,
\( r_j \) is the rate on the \( j \)-th asset.
Earlier estimates for the euro area used country-specific data and then aggregated them to the euro-area level


- El-Shagi and Kelly (2013) calculated Divisia-money indicators for six euro-area countries

- Problem 1: not all country-specific data is published by the ECB
- Problem 2: sum of country-values does not equal euro-area consolidated total

➤ We use euro-area aggregates and interest rates
We use euro-area aggregates and interest rates. However:

- euro-area aggregates published by the ECB have changing country composition (level shift when a new member joins),
- outstanding money stock data subject to reclassification changes.

We create four versions of Divisia (and corresponding simple-sum):

1. Changing composition euro-area based on outstanding stock data;
2. First twelve euro-area members based outstanding stock data;
3. Changing composition euro-area based on transactions data;
4. First twelve euro-area members based on transactions data.
Calculating euro-area Divisia monetary aggregates, \textit{cont.}

- \textbf{Rate on the benchmark asset} \( (r_B) \): should be the return on an asset that does not provide money service, only investment income
  - Typical assumption is to add a spread (eg. 100bps or 200bps) on the return of an observed asset
  - BoE: same approach till 2005; since then envelope approach: the highest yield is considered benchmark: \( r_{B,t} = \max(r_{1,t}, r_{2,t} \ldots r_{N,t}) \)
  - We use envelope approach but also include yields on bank debt with longer maturities
**Components of M3**

- Source ECB; Available from **August 1997**

**Interest rates on the components of M3:**

- Currency in circulation: zero return
- Deposit rates and repo: ECB, available from **January 2003**
- Money market funds: ECB, available from January 1995
- Bank debt up to 2 years: BofA Merrill Lynch 1-3 Year Euro Financial Index; available from January 1996
- Some country-specific interest rates from Jan **January 2001**

**Additional interest rates considered for the benchmark rate**

- Bank debt with maturities 3-5 years, 5-7 years, 5-10 years and over 10 years; source: BofA Merrill Lynch Year Euro Bond Indices

**Our Divisia sample period:** **January 2001** – **May 2015**; download:

12-month growth rates of M2 and M3

First twelve euro-area members based on transactions data

- Pre-crisis there was money-growth acceleration according to simple sum, but not according to Divisia
- 2013-15: Divisia-growth is faster
Sample is relatively short: quarterly data 2001Q1-2014Q4

5 variables:
- GDP (log-level),
- GDP deflator (log-level),
- Monetary aggregate (log-level): either Divisia or simple-sum,
- User cost of money (%)
- German 10-year government bond yield (%).

Identification:
- Generalised impulse response function derived by Pesaran and Shin (1998)
Impulse responses to money shocks

Weaker results with Simple-sum money

Note: Solid line: estimated impulse–response function; dashed lines: 95 percent confidence band. The horizontal axis indicates the number of quarters after the shock.
Impulse responses to money shocks

Liquidity effect not significant with Simple-sum money

Note: Solid line: estimated impulse–response function; dashed lines: 95 percent confidence band. The horizontal axis indicates the number of quarters after the shock.
Impulse responses to user cost shocks

Impact shorter-lived in Simple-sum model

Note: Solid line: estimated impulse–response function; dashed lines: 95 percent confidence band. The horizontal axis indicates the number of quarters after the shock.
Impulse responses to interest rate shocks

User cost UP & Money DOWN only in Divisia model

Note: Solid line: estimated impulse–response function; dashed lines: 95 percent confidence band.
The horizontal axis indicates the number of quarters after the shock.
Impulse responses to interest rate shocks

**Interest shock works better in Divisia model**

**Note:** Solid line: estimated impulse–response function; dashed lines: 95 percent confidence band. The horizontal axis indicates the number of quarters after the shock.
No Divisia monetary aggregates are published for the euro area
We create and make available a dataset on euro-area Divisia aggregates

Structural vector autoregression (SVAR) results:
- Significant output and prices responses to Divisia-money shocks;
- After a short-term liquidity effect, Divisia-money shocks increase interest rates (suggesting that the European Central Bank reacted to developments in monetary aggregates);
- Divisia-money declines after a user cost shock (consistently with a money-demand function);
- An interest rate shock increases user cost and decreases Divisia-money, (suggesting that the ECB can influence monetary developments);
- Interest rate shock has correct output&price response only in Divisia model
- Most of these results are not significant when we use simple-sum measures of money.
Thank you for your attention

zsolt.darvas@bruegel.org
ECB’s definitions of euro area monetary aggregates

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Currency in circulation</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. Overnight deposits</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3. Deposits with an agreed maturity up to 2 years</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4. Deposits redeemable at a period of notice up to 3 months</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5. Repurchase agreements</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6. Money market fund (MMF) shares/units</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>7. Debt securities up to 2 years</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

* Liabilities of the money-issuing sector and central government liabilities with a monetary character held by the money-holding sector.