Economics Bulletin

Volume 32, Issue 2

A note on predicting recessions in the euro area using real M1

Jens Boysen-Hogrefe
Kiel Institute for the World Economy

Abstract

Real M1 is a renowned leading indicator used to forecast real economic activity. This note provides evidence that real M1 is also a suitable recession indicator that gave a clear and early signal for the Great Recession as long as changes in money demand are controlled for.

I am grateful to the Editor, Eric Fisher, and to two anonymous referees for very helpful comments and suggestions. Further, I like to thank Paul Kramer for proof-reading the manuscript.
Citation: Jens Boysen-Hogrefe, (2012) "A note on predicting recessions in the euro area using real M1", *Economics Bulletin*, Vol. 32 No. 2 pp. 1291-1301.
Contact: Jens Boysen-Hogrefe - jens.hogrefe@ifw-kiel.de.
Submitted: October 13, 2011. **Published:** April 26, 2012.

1. Introduction

The Great Recession has demonstrated how important it is for monetary and fiscal policy to be able to predict recessions, and has thus revitalized the debate on what indicators to use in recession prediction models. Financial variables are well established indicators that are often applied in models to predict recessions, see e.g. Estrella and Mishkin (1998). Especially the yield spread is a frequently used predictor of recessions for US data (e.g. Chauvet and Potter, 2005) and for euro area data (e.g. Duarte et al., 2005). However, monetary aggregates are not often used in predicting recessions, although narrow monetary aggregates are well-established leading indicators for real activity as argued by several authors. E.g., Sauer and Scheide (1995) provide evidence that real M1 has is a leading indicator for real domestic demand in a study for the three biggest countries of the euro area, and Brand et al. (2003) discuss its predictive content for the output gap in the euro area. Further, Nelson (2002) discusses economic reasons for the predictive power of narrow money and supports this view by empirical evidence from the UK.

This note provides evidence that real M1 can be used reliably to predict recession in the euro area. To provide such evidence, I use four specifications of a probit model. The first specification is a simple benchmark that regresses the binary variable on lagged changes in real M1. The second specification controls for the opportunity costs of money, namely, short-term interest rates and the GDP deflator. Although there are good economic reasons for using this specification (see Nelson, 2002), it may run in trouble due to structural changes in the demand for M1 in the euro area. For example, regulatory changes and innovations in the banking sector (e.g. the evolution of direct banking) during the sample period made interest-bearing overnight deposits increasingly more available. To address this problem, I added a third and forth specification. The third specification allows for a structural break, and the forth for a linear trend that assumes an ongoing process of structural change.

I run an in-sample exercise for all the specifications for the period beginning in 1972 and running up to the Great Recession and an out-of-sample for a period surrounding the Great Recession, namely the period between 2007 and 2010. This is particularly important, since Drechsel and Scheufele (forthcoming) show evidence that real M1 had little power to predict German industrial production during the Great Recession and thus cast some doubt on the power of M1 to predict economic activity during the last four years.

The results of this note support the view that real M1 contains valuable information for predicting recessions also during the Great Recession. The forth specification is able to detect the beginning of the Great Recession very timely and precisely. Further, the second specification, which provides the best in-sample fit, fails to predict the Great Recession at all, which supports the view that structural changes have taken place that might have changed the relation between money demand and short-term interest rates as a measure of opportunity costs.

The note proceeds as follows. Section 2 describes the data used in this study. Section 3 discusses reasons for structural changes of demand for real M1 in the euro area. Section 4 presents the model specifications. Section 5 and 6 present the in-sample and out-of-sample results, and Section 7 concludes.

2. Data

The binary recession variable was taken from ECRI. Real M1 was constructed by dividing M1 by the GDP deflator. M1 was taken from the OECD database until 1979. Afterwards, it was taken from the ECB. The GDP deflator is taken from the Area Wide Model data set from the ECB until 1994. Afterwards it was taken from Eurostat. Further, an outlier was removed. M1 increased heavily in the second quarter of 2005 due to a technical change that was made by the Spanish central bank in calculating and reporting the Spanish contribution to M1 (ECB 2009). Some deposits were classified as overnight deposits afterwards and, thus, entered M1. Before they had been defined as deposits redeemable at notice and did not belong to M1. Therefore, I calculated quarterly growth rates, replaced the growth rate from the second quarter 2005 by the mean growth rate based on the six former years and recalculated the levels of M1. The whole sample ranges from 1972Q1 to 2010Q4. It is divided into an in-sample part ranging until 2006Q4 and an out-of-sample part ranging from 2007Q1 to 2010Q4.

3. Possible causes for structural instability in demand for real M1

Eyeball inspection indicates a rising trend in real M1 (Figure 1). A simple regression of the rate of change in real M1 on a linear trend provides a coefficient of determination of about 36 percent. A possible explanation for such a behavior might be the strong decrease in inflation and interest rates over the sample. While short-term interest rates reached 16 percent in the early 1980s it has been well below 6 percent from the late 1990s until now. However, several other aspects make it likely that the obvious changes in money demand have not been driven just by variations of the opportunity costs. The European monetary system experienced numerous changes after 1972. Finally, a joint currency was introduced in 1999. Furthermore, the structure of M1 with respect to the impact of the before-mentioned opportunity costs may have changed dramatically due to regulatory and technical changes. Such changes can have an impact on money demand as witnessed by Taylor (1986) who analyzed money demand in the US, when regulation for overnight deposits was changed in the early 1980s. It seems plausible that the case that Taylor made for the US is also valid for the member states of the euro area. Data of the German Bundesbank show evidence of a "boom" of overnight deposits relative to deposits redeemable a notice since the late 1990s, and data for the whole euro area staring in 1997 show also a rising trend (Figure 2). Since these years, direct banking increasingly

gained market shares. Direct banks were among the first to offer overnight deposits to private customers. The changeover to more overnight deposits changed the responsiveness of money demand to changes in short-term interest rates, since some amounts of money includes in M1 now bear short-term interest rates themself. Also, the technical change done by the Spanish Central Bank in 2005 has the impact that the amount of interest-bearing money increases in M1. Unfortunately, the changeover cannot be observed in the euro area for the whole sample due to data limitations. In sum, structural changes make it reasonable to be skeptical that a prediction model based on M1 and measures for opportunity costs like short-term interest rates can be stable over the whole sample.

4. Model specifications

In the following four specifications of a probit model are presented. All specifications are used to assess the issue whether real M1 is suitable to predict recessions.

The binary recession indicator follows a Probit model:

$$y_t = \begin{cases} 1 & \text{if } y_t^* < 0 \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

In the first specification, the corresponding latent model contains a constant, the first lag of year-on-year real money growth, and the forth lag:

$$y_t^* = \alpha + \beta_1 \Delta M1_{t-1} + \beta_2 \Delta M1_{t-4} + u_t, \qquad u_t \sim N(0,1). \tag{2}$$

The lags were selected via a general-to-specific selection scheme, where the Hannan-Quinn criterion was applied to select the best model. Model selection is based on the in-sample data. The first specification acts as a benchmark. It does not incorporate any notion of structural change or changing opportunity costs.

Additionally, I follow Nelson (2002) and include a measure of the opportunity costs of holding money, namely short-term interest rates (i_t) and the year-on-year rate of change in the GDP deflator (def_t). The corresponding second specification is denoted as follows:

$$y_t^* = \alpha + \beta_1 \Delta M1_{t-1} + \beta_2 \Delta M1_{t-4} + \delta_1 i_{t-1} + \delta_2 def_{t-1} + u_t, \qquad u_t \sim N(0,1). \tag{3}$$

The third specification contains a dummy to control for a possible structural break. I allow for an unknown structural break that is dated via the supremum of the likelihood statistic:

$$y_t^* = \alpha + \beta_1 \Delta M1_{t-1} + \beta_2 \Delta M1_{t-4} + \gamma d_t + u_t, \qquad u_t \sim N(0,1), \tag{4}$$

where d_t is defined as:

$$d_t = \begin{cases} 0, & \text{if } t \leq t^* \\ 1, & \text{otherwise.} \end{cases}$$

Several good reasons exist for a structural break in real M1. The European currency system changed several times before a single currency was finally introduced in 1999. The changeover or the process that led to it may have induced structural changes. Alternatively, the already mentioned change in the structural composition of M1, namely the increasing amount of interest bearing money, may have invoked a structural break.

The forth and final specification contains a linear trend that assumes that real money demand increases over time:

$$y_t^* = \alpha + \beta_1 \Delta M1_{t-1} + \beta_2 \Delta M1_{t-4} + \gamma t + u_t, \qquad u_t \sim N(0,1). \tag{5}$$

The linear trend is meant to be an approximation of all the processes of change that have taken place with respect to money demand in the euro area.

5. In-sample results

In-sample results are given in Figure (2). Corresponding model diagnostics are given in Table (1). The first specification signals only the two recessions in the 1970s. The second specification, which includes measures for opportunity costs, provides the best in-sample fit. All the recessions are fitted properly by the model. The third specification signals all the recessions but also signals falsely a recession in the mid-1990s whereat the break was times in 1992Q1. The forth specification includes a linear trend that can be rationalized by the assumption of a steady structural change in money demand. The Hannan-Quinn criterion provides evidence in favor of this specifications in contrast to the structural break specification. However, again a recession is falsely signaled in the mid-1990s.

6. Out-of-sample results

In addition, I check the four specifications of the probit model using an out-of-sample analysis. To do so, I estimate the specifications with data running up to 2006Q4 and project recession probabilities for the rest of the sample. Results are given in Figure (3). The baseline specification provides no signal for a recession. The second specification does not provide any signal for a recession, too. The third specification (break) provides a signal, with a probability of greater than 50 percent, for a recession starting in late 2008. The forth specification (trend) provides the clearest signal for a recession starting in early 2008. It fits the recession almost perfectly.

The out-of-sample result for the second and the forth specification underline the importance of the structural change in M1. While the second specification was the best in-sample specification, where all recession took place before the introduction of the single currency and the "boom" in overnight deposits the forth specification was the best specification afterwards.

7. Conclusion

Real M1 is an established leading indicator of economic activity. This note provides evidence that real M1 can also be used to predict recessions in the euro area. However, structural changes have to be taken into account. While a specification that considers short-term interest rates as opportunity costs is preferred in-sample according to the Hannan-Quinn criterion but fails to signal the Great Recession, a trend specification almost perfectly predicted the Great Recession out-of-sample. The trend provides a proxy for the ongoing change in the structure of the demand for M1. Possible reasons for structural changes in the demand for M1 are the introduction of a single currency in 1999 and the rising amount of interest-bearing money that is included in M1. A deeper investigation of the nature of structural changes that took place or are taking place is not within the scope of this note and is thus left for future research.

References

Brand, C., Reimers, H.-E., and W. Seitz (2003). Forecasting real GDP: What role for narrow money? ECB Working Paper No. 254.

Chauvet, M., and S. Potter (2005). Forecasting recessions using the yield curve. *Journal of Forecasting* 24(2), 77-103.

Drechsel, K., and R. Scheufele (forthcoming). The Performance of Short-term Forecasts of the German Economy before and during the 2008/2009 Recession. *International Journal of Forecasting*.

Duarte, A., I. A. Venetis, and I. Paya (2005). Predicting real growth and the probability of recession in the Euro area using the yield spread. *International Journal of Forecasting* 21, 261-277.

ECB (2009). Payments Statistics – Compilation of Notes. Via Internet: `http://www.ecb.europa.eu/stats/pdf/paymentstatistics_notes_discrepancies.pdf`

Estrella, A., and G. Hardouvelis (1991). The term structure as a predictor of real economic activity. *Journal of Finance* 46, 555-576.

Estrella, A. and F.S. Mishkin (1998). Predicting U.S. recessions: Financial variables as leading indicators. *Review of Economics and Statistics* 80(1), 45-61.

Nelson, E. (2002). Direct Effects of Base Money on Aggregate Demand: Theory and Evidence. *Journal of Monetary Economics* 49(4), 687-708.

Sauer, C., and J. Scheide (1995). Money, interest rate spreads, and economic activity. *Weltwirtschaftliches Archiv* 131, 708-722.

Taylor, H. (1986). Deposit Market Deregulation and the Recent Behaviour of M1. *Eastern Economic Journal* 12(3), 307-312.

A. Figures and Tables

Table 1: Model fit

Specification	LogLik	HQ
I	-29.06	67.70
II	-13.12	42.23
III	-20.75	54.29
IV	-19.89	52.56

Note: Models are estimated via maximum likelihood. LogLik: log likelihood. HQ: Hannan-Quinn criterion.

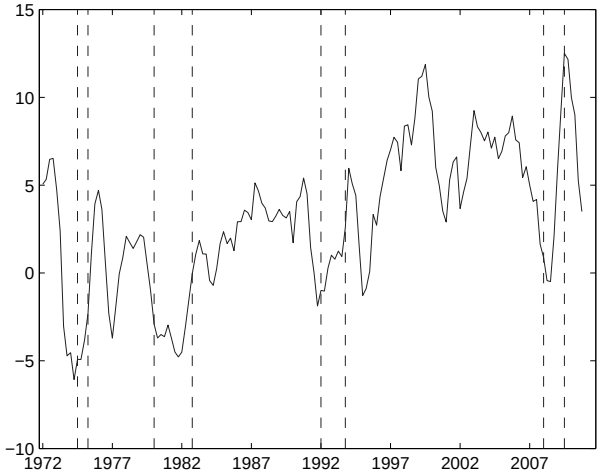

Figure 1: Year-on-year rate of change real M1. *Sources:* see text.

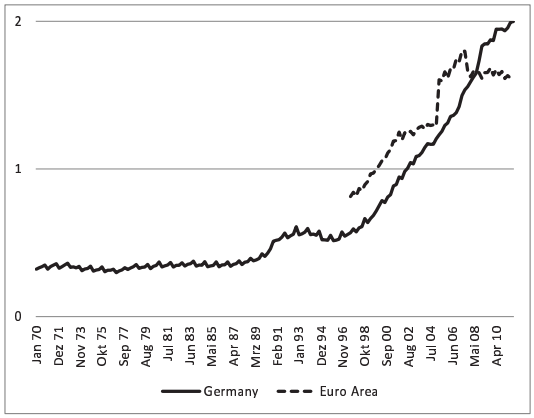

Figure 2: Relation between overnight deposits and deposits redeemable at notice in Germany and the euro area. *Sources:* Deutsche Bundesbank; European Central Bank; own calculations.

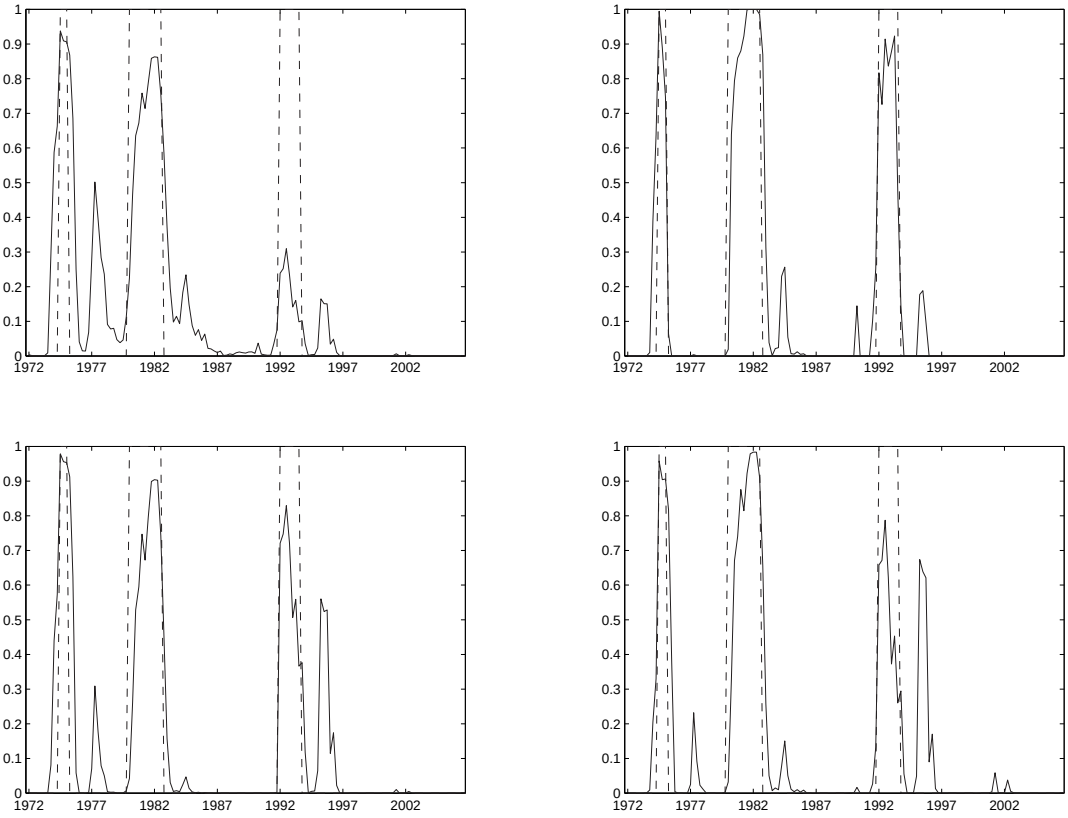

Figure 3: Recession probabilities – in-sample. Upper left: specification 1. Upper right: specification 2. Lower left: specification 3. Lower right: specification 4. Dashed lines: turning points according to ECRI.

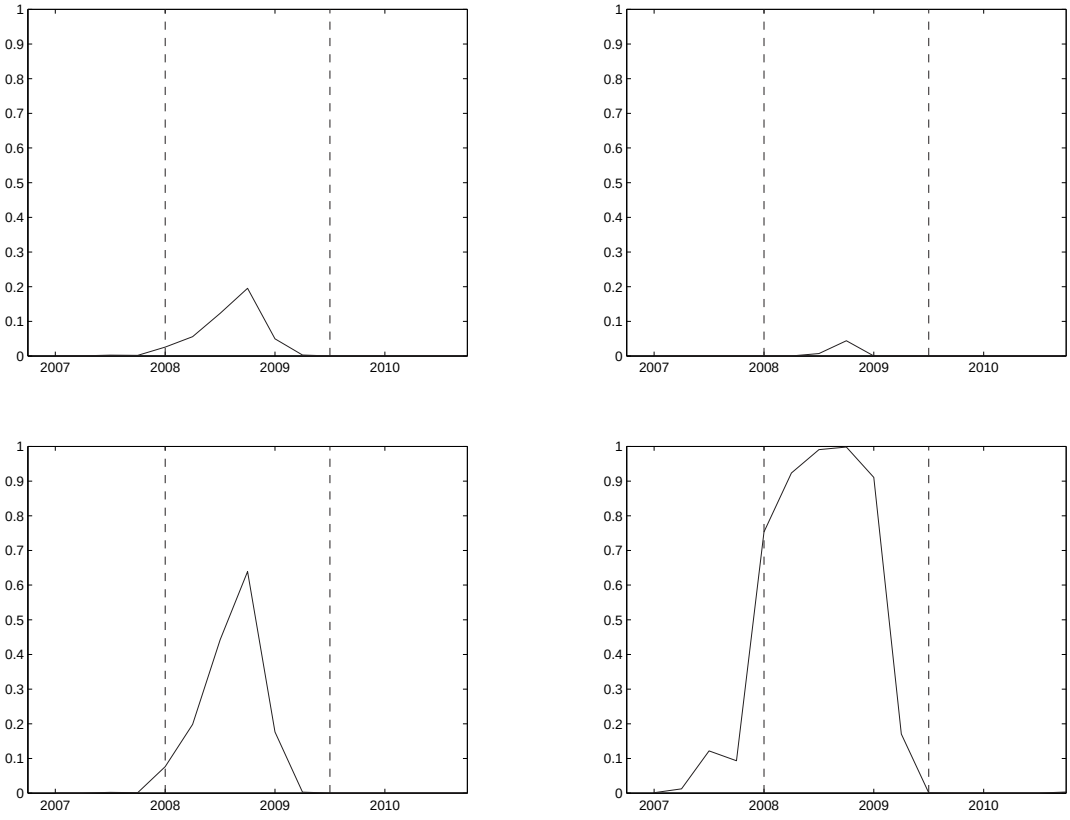

Figure 4: Recession probabilities – out-of-sample. Upper left: specification 1. Upper right: specification 2. Lower left: specification 3. Lower right: specification 4. Dashed lines: turning points according to ECRI.