Monetary Targeting in the EMU: Lessons from the United States

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I. Introduction

Europe's central bankers face a tight time schedule preparing for Economic and Monetary Union (EMU). Up to now, little progress has been made on the formulation of a European monetary strategy in the third stage of EMU.[1] The issue centers on the selection of monetary indicators the future European Central Bank (ECB) should take into account when it decides on changes in the level of the short-term interest rate.

The German Bundesbank would prefer the ECB to adopt its own strategy, which consists of setting monetary targets.[2] An alternative to monetary targeting is inflation targeting, a policy which is currently being implemented in several European countries, including the United Kingdom. Inflation targeting differs from monetary targeting in that the monetary strategy is not dominated by a single monetary indicator – the money supply – but incorporates information on a multitude of monetary and economic variables. The difference between monetary targeting and inflation targeting is often played down, as nothing more than a different weight attached to the money supply indicator.[3] Yet the two strategies differ much in the way monetary policy is communicated to and assessed by financial markets and the public. The ECB will have to weigh the risk of announcing monetary targets in the face of increased money demand uncertainty against the risk of deviating from a strategy which many people think, rightly or wrongly, has served the Bundesbank very well.

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1 See *Eijffinger* (1996) for an overview of the issues concerning future European monetary policy.

2 Arguments supporting the Bundesbank's view can be found in *Issing* (1994).

3 See for example *Haldane* (1996).

The European Monetary Institute (EMI), the forerunner of the ECB, has to prepare decisions on monetary policy, which eventually will be taken by the ECB at the start of stage three. The EMI has not taken and presumably will not take a position on monetary strategy.

Most economists would agree that the choice of monetary strategy ultimately is an empirical matter. The amount of faith a central bank is willing to put into monetary targets crucially depends on the stability of the demand for money. The recent history of monetary targeting illustrates this point. In the early 1980s, many central banks experimented with a policy aimed at controlling monetary aggregates. However, most policymakers' preference for monetary targeting has been short-lived, especially in the Anglo-Saxon countries. After 1982, faced with a continuing unpredictability of the velocity of money, the United States, the United Kingdom, Canada and Australia abandonned monetary targeting and 'returned to pragmatism'.[4] At this moment, the Bundesbank is one of the few central banks which still takes monetary targeting seriously, in spite of severe difficulties in estimating money demand after German reunification in 1990. The *Bundesbank* (1994) attributes the viability of monetary targeting in Germany to the continuity of the institutional environment and the stability of financial relationships, which contrast markedly to the changes in the Anglo-Saxon financial systems caused by financial deregulation and innovation.

In the run-up to EMU, many economists have started to estimate European money demand functions, based on artificially constructed European monetary aggregates.[5] The consensus which has emerged from these studies is that the demand for money in the area of the European Union is extremely stable, certainly compared to money demand in individual European countries. The stylized fact of the exceptional stability of European monetary aggregates itself has never been in much doubt.[6] Nevertheless, a lively debate has developed concerning the interpretation and relevance of this finding. Evidently, authors of empirical papers on

[4] See *Goodhart* (1989), p. 305 - 308.

[5] The path-breaking paper is *Kremers* and *Lane* (1990). See also *Bekx* and *Tullio* (1989), *Artis* (1992), *Artis, Bladen-Hovell* and *Zhang* (1993), *Monticelli* and *Strauss-Kahn* (1992), *Monticelli* (1993), *Fase* and *Winder* (1994), *Falk* and *Funke* (1995) and *Wesche* (1996). *Van Riet* (1992, 1993) provides a survey and assessment of European money demand research. A related literature focuses on currency substitution. See e.g. *Angeloni, Cottarelli* and *Levi* (1992), *Lane* and *Poloz* (1992) and *Mizen* and *Pentecost* (1994).

[6] Though see *Arnold* (1992) and *Barr* (1992) for technical comments on the *Kremers* and *Lane* (1990) paper.

European money demand studies are willing to attach some weight to their pre-EMU findings in preparing for a European monetary strategy in stage three. In contrast, some economists have dismissed these empirical results beforehand because of the *Lucas* (1976) critique.[7] According to this view, the regime-shift caused by EMU will unsettle previous monetary relationships, as is argued by De Grauwe in *Alders, Koedijk, Kool, Winder* (1996):

> 'De Grauwe argued that at least initially, in the first few years of operation of the European Central Bank, it should not use monetary targeting. Experience shows that there is a problem with monetary targeting when there are a lot of financial innovations and institutional changes, because the money supply may become an unclear concept and, therefore, dangerous to use as a targeting device. When an Economic and Monetary Union will be established, the European Central Bank will be confronted with huge and unknown institutional changes and great uncertainties concerning the money stock. Thus, it would be a great mistake to start with monetary targeting by the European Central Bank initially. It would be advisable in such case to pursue inflation targeting, the more since several instruments, including – but not exclusively – the money stock, are available. Afterwards, it depends on how the dust settles in EMU.' (p. 139)

The present paper contributes in the following way to this debate. A comparison of regional monetary fluctuations inside an existing monetary union with national monetary fluctuations in Europe may tell us whether present estimates of European money demand functions give a realistic idea of monetary developments within EMU once the dust raised by the introduction of the single currency has settled. This crucially depends on the extent to which the correlations between national money demand shocks change with the transition to EMU. In a previous paper, the hypothesis has been put forward that for example the centralisation of monetary policy after EMU may synchronize money demand shocks which before EMU operated relatively independently of one another.[8] It follows from elementary statistics that in such a case pre-EMU money-demand functions will overestimate post-EMU money demand stability. In the present paper this hypothesis is tested using data on regional demand deposits in the United States.

The organisation of this paper is as follows. Section II summarizes previous evidence on the stability of an aggregate European money demand function compared with the stability of national money demand func-

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7 See *Giovannini* (1991), *Arnold* (1994, 1996), De Grauwe in *Alders K., Koedijk K., Kool C.* and *Winder C.* (1996). See also *Rother* (1996) for a theoretical analysis of the effect of the EMU regime-shift on money demand.

8 See *Arnold* (1994).

tions. In section III, I compare correlations between regional money demand functions in the United States with correlations between national money demand functions in Europe. Conclusions are drawn in section IV.

II. The Stability of European Money Demand

In many empirical studies, a money demand function is called unstable when it fails to pass a number of stability tests. Most of these tests have been designed to investigate whether a behavioural relationship has broken down over time because of parameter instability. In this paper, I will interpret money demand instability differently: it will refer not to structural change in the money demand function but to high money demand volatility, measured by e.g. the standard error of residuals. The reason for this deviation from common econometric practice is that monetary targeting usually is being implemented by setting *annual* targets for money supply growth. In that case, high money demand volatility will reduce the likelihood that money supply growth will fall within the central bank's annual target range. Of course, the importance of higher-frequency money demand volatility would diminish relative to structural change when monetary policy would be geared towards medium-term money targets.

Instead of providing a complete survey of the empirical literature on European money demand, I have selected two studies which contain both estimates of an aggregate European money demand function and estimates of national money demand functions in Europe. Each of these studies allows for a proper comparison between national and aggregate money demand stability, without any undue influence from wide differences in statistical methodology, sample period or data availability. Table 1 lists some key results. The *Artis, Bladen-Hovell* and *Zhang* (1993) study uses quarterly data covering the EMS-period up to the second quarter of 1990. European aggregates are calculated including Germany, France, Italy, the Netherlands, Denmark and Belgium using fixed-base exchange rates to convert data into a common currency.[9] The standard errors listed in the final column of table 1 are taken from a cointegrated relationship between the levels of real M1, real income, the long-term interest rate and an exchange rate variable. It can be

[9] See *Arnold* (1992), *Bayoumi* and *Kenen* (1992), *Kremers* and *Lane* (1992) and *Wesche* (1996) for discussions on conversion methods.

seen that the standard error for the European aggregate is almost 50 % lower than the standard errors for France, Italy and Germany. Despite differences in data and methodology, a similar result can be found in *Cassard, Lane* and *Masson* (1994). They use a broader monetary aggregate (M3) and convert national data using Purchasing Power Parity (PPP) exchange rates. Also, their standard errors are taken from error-correction equations, instead of from cointegrated relationships. Yet the conclusion is exactly the same: on average, the standard error for the European aggregate is nearly 50 % below the average of national standard errors.

The statistical explanation for the finding that in these two studies the standard error of the aggregate money demand function is much lower than the standard error of national money demand functions, is a lack of correlation between the residuals from national money demand functions.[10] Basically, a diversification effect accounts for the superior performance of the aggregate. However, the statistical explanation is not wholly satisfactory. From an economic point of view, we would like to know whether the lack of correlation between European money demand functions is also characteristic of money demand behaviour inside a monetary union.

Table 1

National versus European money demand instability: previous results

study	*period*	*M*	*countries*	*s.e.*
Artis, Bladen-Hovell and Zhang (1993) (tables 2 and 3)	1979Q2-1990Q2	M1	France	0.0296
			Italy	0.0244
			Germany	0.0274
			Average	0.0272
			Aggregate	0.0142
Cassard, Lane and Masson (1994) (p. 12,13 and 15)	1979Q1-1992Q2	M3	France	0.0083
			Germany	0.0068
			Average	0.0075
			Aggregate	0.0039

Notes: *Period* gives the period used in the selected studies to estimate money demand functions; *M* is the monetary aggregate chosen and *s.e.* is the standard error of the estimated money demand function; Average and Aggregate denote respectively the (weighted) average standard error of national money demand functions and the standard error of the demand for the European monetary aggregate.

10 See e.g. the residual correlation matrices in *Den Butter* and *Van Dijken* (1995) and *Arnold* (1996).

A final look at table 1 tells us that the standard error of the European aggregate is at least 40 % smaller than the standard error of the corresponding German money demand equation. Can it really be true that money demand in the EMU will outperform German money demand – generally perceived to be one the most stable money demand functions in the world – by such a large margin?

III. Lessons from the U.S. experience

If aggregation indeed leads to the large reduction in money demand instability suggested by the studies surveyed in the previous section, we would expect regional money demand fluctuations inside existing monetary unions to be much more volatile than union-wide fluctuations in money demand. In statistical terms, we would expect the diversification effect – or more specifically its assumption of independence between variables – to remain valid within a monetary union.

In the present section, I test this hypothesis by comparing regional monetary developments in the United States with national monetary developments in Europe. As regional data on U.S. currency holdings are not available, the comparison has to be confined to deposits. Regional data on demand deposits and disposable income have been compiled by Andrew Atkeson and Rachel van Elkan and were previously used by *Ireland* (1991) and *Mulligan* and *Sala-i-Martin* (1992). Figure 1 shows the annual growth rates of nominal demand deposits in 9 regions of the United States during the period from 1929 to 1988. For the purpose of comparison, figure 2 shows growth rates in demand deposits for 7 European countries during the period from 1954 to 1992. The difference between the two figures is striking: deposit growth rates appear to be strongly related between regions of the United States, but not at all between European countries. This visual impression is confirmed by correlation coefficients: figure 3 shows frequency distributions of the 36 correlation coefficients between the 9 U.S. regions and the 21 correlation coefficients between the 7 European countries. Without exception, the U.S. correlation coefficients are higher than 0.60, whereas the European correlation coefficients are between –0.20 and 0.80 and average 0.20. Moreover, all U.S. correlation coefficients are significantly different from zero at a 5 % level, compared to just 6 out of 21 European correlation coefficients.

Estimating full money demand equations may shed some light on whether or not the strong correlation between regional growth rates in

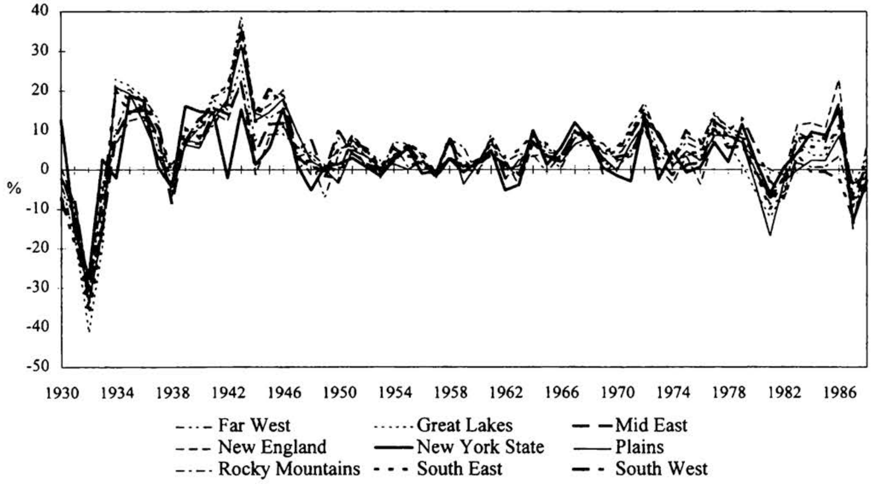

Figure 1: Deposit growth in 9 regions of the United States: 1930 - 1988

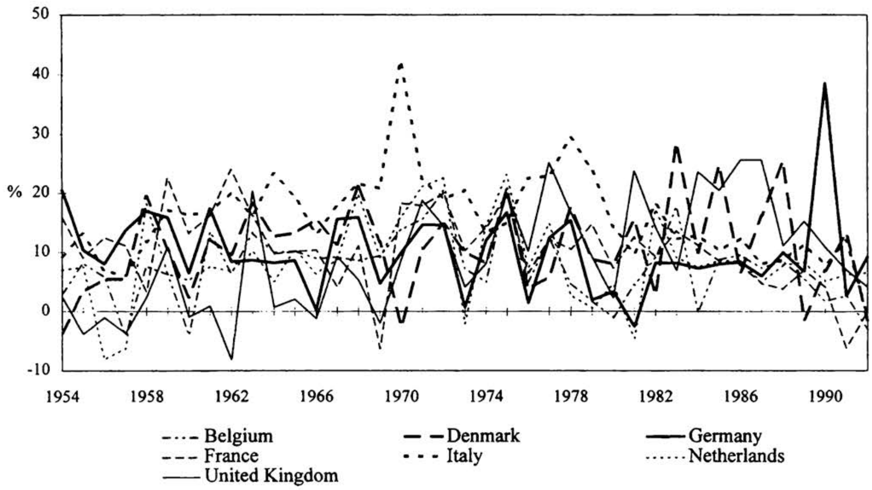

Figure 2: Deposit growth in 7 nations of the European Union: 1954 - 1992

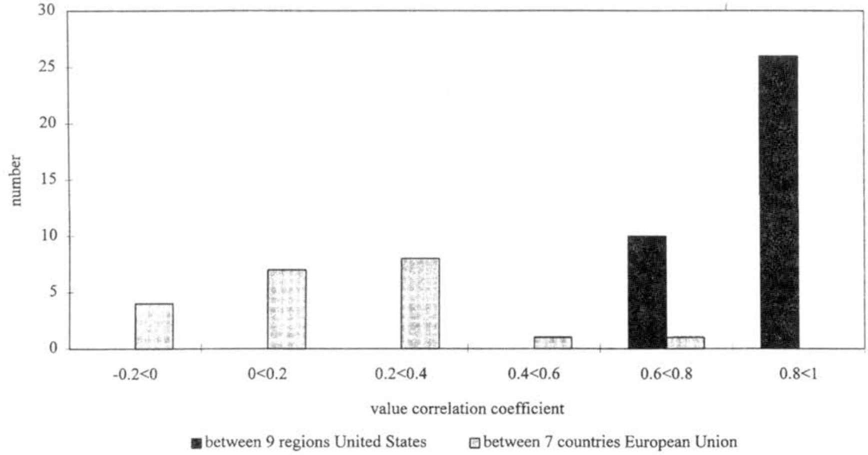

Figure 3: Frequency distributions of correlation coefficients

U.S. demand deposits is caused by common movements in explanatory variables like prices, real income and interest rates. For that purpose, this paper adopts the two-stage cointegration methodology.[11] A cointegration relationship may exist between time series which are integrated of order one. Therefore, the order of integration of the U.S. data has been checked using augmented Dickey-Fuller tests.[12] The hypothesis of non-stationarity cannot be reject for the levels of real demand deposits, real income and the short-term interest rate, but can be rejected for the first differences of these variables. We may therefore proceed on the assumption that the time series are integrated of order one and apply the two-stage cointegration methodology. The following first-stage cointegration regression represents the long-run relationship between real demand deposits, real income and the interest rate in regions of the United States:

$$lrdep_i = b_1 + b_2 lrinc_i + b_3 is \tag{1}$$

In this log-linear specification, $lrdep_i$ is the log of real demand deposits in region i, $lrinc_i$ is the log of real disposable income in region i and

11 See *Engle* and *Granger* (1987).

12 In order to economize on the number of tables, the results are not reported here.

is is the short-term interest rate. The short-run dynamics are captured in the second-stage regression:

$$dlrdep_i = c_1 + c_2 ec_i(-1) + c_3 dis + c_4 dlrinc_i \quad (2)$$

In equation (2), $dlrdep_i$, dis and $dlrinc_i$ are the first differences of respectively $lrdep_i$, is and $lrinc_i$. The error-correction term, $ec_i(-1)$, is equal to the residual from equation (1). Tables 2 and 3 contain the estimation results using annual regional U.S. data from 1929 to 1988.

The results from the first-stage regression, reported in table 2, show all income elasticities and interest (semi-)elasticities to have the right sign and to be significantly different from zero at a 5 % level. Also, the (semi-)-elasticities do not differ widely across regions, except for the income elasticity of 0.32 in New York State. This deviation can be attributed to New York's special position as the financial center of the United States. The explanatory power of the regressions, measured by the adjusted R-squared, in general is fairly high. The presence of a cointegrated relationship may be tested using the Engle-Granger test statistic in the final column of table 2. Few of the Engle-Granger test statistics reach acceptable significance levels. However, failure of cointegration tests may well be caused by small sample size or low power of unit root tests; indeed, it often occurs that cointegration tests reject the hypothesis of no integra-

Table 2

First-stage regression: $lrdep = b_1 + b_2\, lrinc + b_3\, is$, annual data 1929 - 1988

	b_1	t_{b1}	b_2	t_{b2}	b_3	t_{b3}	$adjR^2$	$E\text{-}G$
United States	5.49	3.99	0.69	10.20	-0.072	6.04	0.66	-3.95***
New England	6.23	4.97	0.59	8.37	-0.068	6.84	0.54	-2.60*
Far West	0.35	0.37	0.92	17.96	-0.078	6.58	0.88	-2.15
Great Lakes	1.80	1.13	0.85	10.10	-0.096	7.26	0.63	-2.22
Mid East	4.83	3.34	0.68	8.72	-0.073	6.40	0.56	-2.24
New York State	12.45	7.20	0.32	3.38	-0.071	6.59	0.46	-2.80*
Plains	2.17	1.24	0.83	8.54	-0.087	5.68	0.55	-1.65
Rocky Mountains	1.72	1.32	0.83	10.50	-0.071	4.33	0.72	-1.77
South East	-0.39	0.32	0.95	14.54	-0.073	4.97	0.84	-1.69
South West	1.27	1.03	0.88	12.42	-0.065	3.95	0.81	-1.26

Notes: *lrdep* is (log) real demand deposits; *lrinc* is (log) real disposable income; *is* is the short-term interest rate; *t* denotes the *t*-statistic; $adjR^2$ is the adjusted coefficient of determination; *E-G* shows the Engle-Granger test on cointegration using 1 lag; * Significant at a 10 % level; *** Significant at a 1 % level.

Table 3

Second-stage regression: $dlrdep = c_1 + c_2\, ec\,(-1) + c_3\, dis + c_4\, dlrinc$, annual data 1929 - 1988

Panel A	c_1	t_{c1}	c_2	t_{c2}	c_3	t_{c3}	c_4	t_{c4}	$adjR^2$
United States	-0.014	1.66	-0.09	2.08	-0.015	2.76	0.84	6.71	0.49
New England	-0.008	1.09	-0.23	6.64	-0.017	3.11	0.69	7.14	0.93
Far West	0.000	0.03	-0.22	6.70	-0.015	2.30	0.67	9.40	0.98
Great Lakes	-0.011	1.54	-0.17	7.10	-0.017	3.48	0.77	13.27	0.97
Mid East	-0.010	1.45	-0.19	7.62	-0.013	2.66	0.72	10.01	0.96
New York State	-0.011	1.19	-0.24	5.58	-0.015	2.19	0.63	4.28	0.90
Plains	-0.001	0.14	-0.17	5.86	-0.011	1.57	0.38	5.74	0.96
Rocky Mountains	0.002	0.25	-0.16	5.39	-0.007	0.92	0.43	5.95	0.97
South East	0.005	0.50	-0.18	6.42	-0.009	1.35	0.55	8.49	0.98
South West	0.003	0.34	-0.10	3.68	-0.005	0.73	0.46	4.27	0.98

Panel B	*DW*	*LB(2)*	*LB(4)*	*Arch(1)*	*Arch(2)*	*Norm*			*s.e.*
United States	1.43	0.161	0.431	0.126	0.246	0.498			0.056
New England	1.59	0.303	0.606	0.024	0.079	0.000			0.060
Far West	1.36	0.007	0.013	0.460	0.450	0.000			0.071
Great Lakes	1.04	0.001	0.000	0.212	0.171	0.208			0.060
Mid East	1.22	0.014	0.023	0.069	0.183	0.010			0.055
New York State	1.61	0.631	0.816	0.046	0.073	0.510			0.074
Plains	0.95	0.000	0.000	0.147	0.265	0.155			0.077
Rocky Mountains	0.95	0.000	0.000	0.077	0.137	0.001			0.083
South East	0.92	0.000	0.000	0.248	0.243	0.010			0.075
South West	0.92	0.000	0.000	0.041	0.005	0.003			0.077

Panel C	*NE*	*FW*	*GL*	*ME*	*NY*	*PL*	*RM*	*SE*	*SW*
New England	1.00	0.75	0.74	0.89	0.75	0.65	0.62	0.72	0.61
Far West		1.00	0.74	0.84	0.61	0.77	0.89	0.85	0.85
Great Lakes			1.00	0.84	0.64	0.90	0.84	0.89	0.85
Mid East				1.00	0.75	0.76	0.78	0.85	0.76
New York State					1.00	0.53	0.52	0.58	0.52
Plains						1.00	0.92	0.93	0.89
Rocky Mountains							1.00	0.93	0.94
South East								1.00	0.90
South West									1.00

Notes: *dlrdep* is the change in (log) real demand deposits; *ec* (the error-correction term) is the residual from the first-stage regression; *dlrinc* is the change in (log) real disposable income; *dis* is the change in the short-term interest rate; t denotes the t-statistic; $adjR^2$ is the adjusted coefficient of determination; *DW* is the Durbin-Watson statistic; *LB(j)* is the Ljung-Box test on j-th order residual autocorrelation; *Arch(j)* is the Lagrange Multiplier test for j-th order autoregressive conditional heteroscedasticity; *Norm* is the Jarque-Bera test on normality of the residuals; *s.e.* is the standard error of the regression; for *LB(j)*, *Arch(j)* and *Norm* probability values are shown. Panel C shows the matrix of residual correlation coefficients.

tion while error-correction models indicate that cointegration is present.[13] This is illustrated by the results from the second-stage regressions in panel A of table 3: all error-correction terms have the right (negative) sign and are significantly different from zero at a 5 % level. Panel C shows that the residual correlations between the regional money demand functions are very high, despite the high explanatory power of the regressions.[14] Clearly the correlations between regional deposit growth rates cannot be fully accounted for by a common influence of income and the interest rate on real deposits. Notice also the standard errors of the residuals, shown in the final column of panel B: the standard error for the United States is lower than most, but not all, of the regional standard errors. However, the difference is much smaller – on average 18 % – than the difference implied by the studies surveyed in the previous section. However, the diagnostic statistics, reported in panel B of table 3, caution against drawing any hasty conclusions. The Ljung-Box and Jarque-Bera statistics point to severe autocorrelation in and extreme non-normality of the residuals. This is not surprising, given that the sample period includes the shrinkage of financial intermediation at the start of the great depression, the Second World War and a large part of the 1980s, a period in which financial deregulation and innovation increased money demand instability. Equations (1) and (2) therefore have been reestimated over the relatively tranquil subperiod from 1946 to 1975.

Tables 4 and 5 contain the new estimation results. Compared to the previous results, the explanatory power and the significance of the interest rate coefficient have dropped sharply. The income elasticities have also decreased but in most cases are still significantly different from zero. Compared to table 2, the Engle-Granger test statistics are significant more often. As in table 3, all error-correction terms in table 5 are significantly different from zero at a 5 % level, with the exception of the error-correction term for the United States, which is significant at a 10 % level. None of the diagnostic statistics in Panel B of table 5 indicates any misbehaviour of the residuals. The interesting findings are again the standard errors in the final column of panel B combined with the correlation coefficients in panel C. The high correlation between the residuals from the regional money demand functions is reflected in the small reduction of the U.S. standard error (9 % on average) compared to

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13 See *Kremers, Ericsson* and *Dolado* (1992).

14 All correlation coefficients in panel C of table 3 are significant at a 5 % level. The 5 % critical value for the correlation coefficient is 0.258.

Table 4

First-stage regression: $lrdep = b_1 + b_2\, lrinc + b_3\, is$, annual data 1946 - 1975

	b_1	t_{b1}	b_2	t_{b2}	b_3	t_{b3}	$adjR^2$	$E\text{-}G$
United States	15.53	10.04	0.20	2.72	-0.006	0.56	0.47	-3.15**
New England	12.08	7.43	0.27	2.91	-0.022	1.99	0.23	-1.88
Far West	10.15	9.46	0.39	6.76	-0.009	0.96	0.86	-3.68**
Great Lakes	14.24	9.71	0.20	2.65	-0.013	1.49	0.25	-2.50
Mid East	13.92	8.79	0.20	2.33	-0.011	1.02	0.26	-2.41
New York State	20.37	7.51	-0.11	0.76	-0.013	0.84	0.25	-2.55
Plains	15.13	7.91	0.12	1.17	-0.010	0.87	-0.02	-3.06**
Rocky Mountains	11.17	7.48	0.28	3.14	-0.008	0.59	0.55	-2.26
South East	7.38	4.88	0.55	6.73	-0.008	0.62	0.89	-3.12**
South West	9.56	11.64	0.42	9.19	-0.011	1.49	0.93	-3.58**

Notes: *lrdep* is (log) real demand deposits; *lrinc* is (log) real disposable income; *is* is the short-term interest rate; *t* denotes the *t*-statistic; $adjR^2$ is the adjusted coefficient of determination; *E-G* shows the Engle-Granger test on cointegration using 1 lag; ** Significant at a 5 % level.

regional standard errors.[15] The U.S. evidence suggests that the diversification effect does not work inside a monetary union. National regulation of the financial system and of demand deposits in particular may explain part of the highly positive residual correlation. For example, the strong increase in U.S. deposit growth in the early 1980s is often attributed to a change in deposit regulation by the U.S. government, which enabled the nation-wide introduction of interest-bearing deposits.[16] This regulatory change has increased the popularity of deposits vis-a-vis other financial instruments and may provide an explanation for the decrease in M1-velocity in the beginning of the 1980s.

Because the present results are based on demand deposits and the studies surveyed in the previous section use either narrow (M1) or broad (M3) monetary aggregates, there may be a lack of comparability between the U.S. and European findings. I address this problem by reestimating equations (1) and (2) using European data on demand deposits.[17] Data availability did force two deviations from the U.S. dataset: instead of real disposable income and the short-term interest rate, I use respectively real GDP and the long-term interest rate. The annual dataset

15 Also, all correlation coefficients in panel C of table 5 are significant at a 5 % level. The 5 % critical value for the correlation coefficient now is 0.360.

16 Socalled Negotiable Orders of Withdrawal. See *Thornton* and *Stone* (1992).

17 The source of all European data is International Financial Statistics.

Table 5

Second-stage regression: $dlrdep = c_1 + c_2\, ec\,(-1) + c_3\, dis + c_4\, dlrinc$, annual data 1946 - 1975

Panel A	c_1	t_{c1}	c_2	t_{c2}	c_3	t_{c3}	c_4	t_{c4}	$adjR^2$
United States	-0.023	2.81	-0.29	1.88	-0.008	1.48	0.75	4.04	0.58
New England	-0.022	3.40	-0.25	3.28	-0.012	2.47	0.74	7.04	0.59
Far West	-0.012	1.67	-0.46	4.72	-0.010	2.04	0.55	4.48	0.95
Great Lakes	-0.020	3.34	-0.27	3.64	-0.010	2.23	0.72	9.07	0.67
Mid East	-0.025	3.78	-0.23	3.27	-0.007	1.38	0.81	8.15	0.70
New York State	-0.030	3.42	-0.25	3.71	-0.002	0.37	0.66	4.45	0.69
Plains	-0.013	1.83	-0.26	3.59	-0.005	1.07	0.39	4.79	0.53
Rocky Mountains	-0.014	1.74	-0.31	4.72	-0.012	2.15	0.54	5.20	0.85
South East	-0.011	1.56	-0.33	5.81	-0.006	1.19	0.62	6.87	0.97
South West	-0.011	1.82	-0.47	4.59	-0.011	2.85	0.61	6.62	0.96

Panel B	*DW*	*LB(2)*	*LB(4)*	*Arch(1)*	*Arch(2)*	*Norm*			*s.e.*
United States	1.98	0.189	0.459	0.443	0.327	0.413			0.032
New England	1.55	0.419	0.679	0.832	0.771	0.951			0.035
Far West	1.70	0.682	0.899	0.382	0.646	0.763			0.034
Great Lakes	1.96	0.430	0.150	0.318	0.283	0.397			0.032
Mid East	1.64	0.628	0.647	0.768	0.388	0.588			0.035
New York State	2.20	0.827	0.756	0.880	0.391	0.825			0.048
Plains	2.26	0.113	0.212	0.243	0.415	0.553			0.039
Rocky Mountains	1.75	0.579	0.466	0.363	0.342	0.863			0.040
South East	1.74	0.975	0.421	0.332	0.221	0.841			0.035
South West	1.88	0.430	0.399	0.767	0.980	0.757			0.028

Panel C	*NE*	*FW*	*GL*	*ME*	*NY*	*PL*	*RM*	*SE*	*SW*
New England	1.00	0.43	0.82	0.90	0.78	0.59	0.42	0.65	0.46
Far West		1.00	0.43	0.53	0.49	0.49	0.71	0.72	0.77
Great Lakes			1.00	0.91	0.86	0.68	0.60	0.65	0.60
Mid East				1.00	0.79	0.56	0.53	0.66	0.63
New York State					1.00	0.69	0.55	0.63	0.52
Plains						1.00	0.76	0.83	0.56
Rocky Mountains							1.00	0.78	0.80
South East								1.00	0.63
South West									1.00

Notes: *dlrdep* is the change in (log) real demand deposits; *ec* (the error-correction term) is the residual from the first-stage regression; *dlrinc* is the change in (log) real disposable income; *dis* is the change in the short-term interest rate; *t* denotes the *t*-statistic; $adjR^2$ is the adjusted coefficient of determination; *DW* is the Durbin-Watson statistic; *LB(j)* is the Ljung-Box test on j-th order residual autocorrelation; *Arch(j)* is the Lagrange Multiplier test for j-th order autoregressive conditional heteroscedasticity; *Norm* is the Jarque-Bera test on normality of the residuals; *s.e.* is the standard error of the regression; for *LB(j)*, *Arch(j)* and *Norm* probability values are shown. Panel C shows the matrix of residual correlation coefficients.

spans the period from 1953 to 1992 and covers the countries Belgium, Denmark, Germany, France, Italy, The Netherlands and the United Kingdom.[18] A check on the univariate time series properties revealed that, with the exception of French real deposits, French GDP and the German interest rate, all time-series are integrated of order one.

The estimation results are in table 6 and 7. At the European level, there is clear evidence of cointegration of real deposits, real GDP and the long-term interest rate, both from the Engle-Granger test statistic in table 6 and from the significance of the error-correction term in table 7. However, the results for individual European countries are quite diverse. In both tables, the income elasticities and, in particular, the (semi-)-interest rate elasticities differ a lot across countries. Compared to the United States, aggregation bias therefore seems to be a much bigger problem in Europe.[19] Using a 10 % significance level, there is no evidence of a cointegrated relationship for Belgium, France and Italy. The diagnostics statistics, reported in panel B of table 7, do not reveal any indications of residual autocorrelation, heteroscedasticity or non-normality. The standard errors repeat the pattern established in the previous sec-

Table 6

First-stage regression: *lrdep* = $b_1 + b_2$ *lrgdp* + b_3 *il*, annual data 1953 - 1992

	b_1	t_{b1}	b_2	t_{b2}	b_3	t_{b3}	$adjR^2$	E-G
European Aggregate	-2.13	18.35	1.27	63.84	-0.020	5.47	1.00	-3.34**
Belgium	-3.02	11.42	1.12	31.10	-0.019	3.23	0.98	-1.29
Denmark	-4.78	16.34	1.53	29.10	-0.041	8.14	0.97	-3.31**
Germany	-4.19	24.08	1.30	50.88	-0.028	2.71	0.99	-1.85
France	-2.48	6.61	1.09	21.02	-0.014	1.74	0.96	-0.70
Italy	-4.96	12.19	1.61	21.68	0.000	0.00	0.96	-0.72
Netherlands	-2.44	9.34	1.16	19.88	-0.058	4.48	0.96	-2.96**
United Kingdom	3.92	5.94	1.31	10.49	-0.085	7.38	0.74	-2.28

Notes: *lrdep* is (log) real demand deposits; *lrgdp* is (log) real gross domestic product; *il* is the long-term interest rate; *t* denotes the *t*-statistic; $adjR^2$ is the adjusted coefficient of determination; *E-G* shows the Engle-Granger test on cointegration using 1 lag; ** Significant at a 5 % level; the German regression includes a dummy variable to account for the effect of reunification in 1990.

18 I followed *Bayoumi* and *Kenen* (1992) in calculating growth rates for the European aggregates as weighted growth rates of individual country series. The weights are dollar GDP's converted at 1990 PPP exchange rates. Series for levels were created by setting a base-period value equal to 100.

19 See also *Fase* and *Winder* (1993) and *Wesche* (1996).

Table 7

Second-stage regression: *dlrdep* = *c1* + c_2 *ec* (−1) + c_3 *dil* + c_4 *dlrgdp*, annual data 1953 - 1992

Panel A	c_1	t_{c1}	c_2	t_{c2}	c_3	t_{c3}	c_4	t_{c4}	$adjR^2$
European Aggregate	0.010	1.03	-0.47	3.34	-0.022	4.00	0.95	4.70	0.55
Belgium	0.012	1.19	-0.20	1.51	-0.027	4.13	0.63	2.63	0.99
Denmark	0.032	2.82	-0.33	3.34	-0.033	5.61	0.39	1.54	0.99
Germany	0.024	2.11	-0.21	1.75	-0.040	5.61	0.71	3.63	0.99
France	-0.003	0.18	-0.13	1.57	-0.010	1.40	1.11	3.55	0.99
Italy	-0.009	0.55	-0.03	0.59	-0.009	1.52	1.68	6.47	1.00
Netherlands	0.024	1.96	-0.24	2.83	-0.048	5.15	0.43	1.81	0.99
United Kingdom	0.008	0.50	-0.21	2.98	-0.044	4.19	0.61	1.33	0.95
Panel B	*DW*	*LB(2)*	*LB(4)*	*Arch(1)*	*Arch(2)*	*Norm*			*s.e.*
European Aggregate	1.88	0.996	0.489	0.491	0.491	0.483			0.030
Belgium	1.80	0.631	0.787	0.260	0.477	0.604			0.046
Denmark	1.79	0.735	0.257	0.341	0.433	0.814			0.056
Germany	1.93	0.748	0.459	0.570	0.802	0.994			0.045
France	1.93	0.757	0.956	0.988	0.627	0.045			0.058
Italy	1.35	0.091	0.076	0.216	0.456	0.427			0.060
Netherlands	1.99	0.984	0.977	0.010	0.007	0.721			0.052
United Kingdom	1.73	0.501	0.065	0.448	0.720	0.877			0.073
Panel C	*BE*	*DE*	*GE*	*FR*	*IT*	*NL*	*UK*		
Belgium	1.00	0.22	0.14	0.34	0.57	0.25	-0.11		
Denmark		1.00	0.23	-0.20	0.16	0.24	0.16		
Germany			1.00	0.30	0.18	0.33	0.22		
France				1.00	0.20	0.01	-0.04		
Italy					1.00	0.21	-0.24		
Netherlands						1.00	0.22		
United Kingdom							1.00		

Notes: *dlrdep* is the change in (log) real demand deposits; *ec* (the error-correction term) is the residual from the first-stage regression; *dlrgdp* is the change in (log) real gross domestic product; *dil* is the change in the long-term interest rate; *t* denotes the *t*-statistic; $adjR^2$ is the adjusted coefficient of determination; *DW* is the Durbin-Watson statistic; *LB(j)* is the Ljung-Box test on j-th order residual autocorrelation; *Arch(j)* is the Lagrange Multiplier test for j-th order autoregressive conditional heteroscedasticity; *Norm* is the Jarque-Bera test on normality of the residuals; *s.e.* is the standard error of the regression; for *LB(j), Arch(j)* and *Norm* probability values are shown. Panel C shows the matrix of residual correlation coefficients; the German regression includes a dummy variable to account for the effect of reunification in 1990.

tion: the standard error for the European aggregate is much lower than the standard error for the individual European countries. In fact, the aggregate standard error is almost 50 % lower than the weighted average of national standard errors; this is in the same order of magnitude as the results from the *Artis, Bladen-Hovell* and *Zhang* (1993) and *Cassard, Lane* and *Masson* (1994) studies. The correlation coefficients in panel C of table 7 again are much lower than their U.S. counterparts. Just 3 out of 21 European correlation coefficients are significantly different from zero.[20]

Table 8 summarizes the main results from this paper. Findings from money demand studies using artificially constructed monetary aggregates suggest that after EMU, European money demand volatility may be reduced by at least 48 % compared to the present European average and at least 33 % compared to the most stable national money demand function in Europe. In contrast, regional evidence from the United States suggests that union-wide money demand volatility is at the most 18 % lower than the average of regional money demand volatilities and may be as much as 14 % higher than the volatility in the most stable region. The exceptional stability of the demand for a European monetary aggregate seems to be caused by mixing national idiosyncrasies in the financial system and in monetary management. This induces a statistical effect which will disappear once EMU will lead to harmonisation and centralisation of monetary policy and once institutional changes will synchronize the impact of monetary decisions throughout the entire area of the EMU, as in the United States. Econometric studies based on historical data do not take this effect into account. They therefore overestimate

Table 8

Summary of main results

standard errors:	*average*	*minimum*	*aggregate*	*% deviation from average*	*% deviation from minimum*
Existing monetary unions					
United States 1929-1988	0.0686	0.055	0.056	-18%	+1.8%
United States 1946-1975	0.0353	0.028	0.032	- 9%	+14%
Constructed European aggregates					
present study, Europe 1953-1992	0.0575	0.0450	0.030	-48%	-33%
Artis, Bladen-Hovell and Zhang	0.0272	0.0244	0.0142	-48%	-42%
Cassard, Lane and Masson	0.0075	0.0068	0.0039	-48%	-43%

Notes: *average* is the GDP-weighted average of the standard errors of either regional (for the U.S.) or national (for Europe) money demand functions; *minimum* is minimum of the standard errors of either regional (for the U.S.) or national (for Europe) money demand functions; *aggregate* is the standard error of either the national money demand function of the United States or a European money demand function based on constructed European monetary aggregates; % *deviation from average* equals 100 % * *(aggregate – average)/ average;* % *deviation from minimum* equals 100 % * *(aggregate – minimum)/minimum.*

20 The 5 % critical value for the correlation coefficient is 0.312.

money demand stability in a future monetary union by more than 30 %.[21] Economists have made the ECB glad too soon: money demand in the EMU won't be much more stable than what we are used to now. Monetary targeting is neither an easy option nor the obvious policy choice.

As an additional caveat, it should be mentioned that this paper does not take into account the uncertainty regarding the behaviour of money demand in the initial phase of EMU, when the new currency is being introduced and institutional changes are being implemented. This uncertainty adds further downward bias to stability estimates from European money demand studies.

IV. Conclusions

The economic arguments in favour of monetary targeting are based on the presumed stability of European money demand and the effect of monetary targets on the credibility of central banks. Evidence from the United States shows monetary aggregates to move together inside a monetary union. In contrast, the stability of constructed European monetary aggregates is caused by a lack of comovement between monetary aggregates in the European countries. This suggests that the stability of European money demand may not be extrapolated to stage three of EMU.

Proponents of monetary targeting, well aware of the uncertainty regarding money demand behaviour, have pointed to other potential advantages. For example, *Issing* (1994) argues that the use of monetary targeting by the ECB will increase its credibility in financial markets; by adopting the Bundesbank's 'toolkit', the ECB would automatically inherit the Bundesbank's anti-inflation reputation:

> 'In the early days, however, the ESCB will not be able to point to its own success record on stability or to offer proof of its tenacity even in difficult situations. It will therefore be essential for it to take over as much credibility from its predecessors as possible. To try and inherit the good record of the Bundesbank, which also owes its past stability successes to the medium-term orientation of its policy of monetary targeting, a procedure which it has now been pursuing for almost 20 years, would seem to be the obvious thing to do.' (p. 140)

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[21] Based on the −48 % deviation from the European average and the −18 % deviation from the U.S. average, the overestimation of money demand stability is 1 - (1 - 048)/(1 - 0.18) = 37 %.

However, the Bundesbank's track record in hitting monetary targets, reported in *Von Hagen* (1995), is very poor. Of the seventeen years for which a target range has been specified, the money supply overshot the target eight times, undershot it twice and hit it just seven times. Following German unification in 1990, the Bundesbank has hit its targets just once, in 1994. After unification the Bundesbank had difficulty estimating the demand for money. Uncertainty regarding economic growth in the East-German provinces, combined with the effect of the inverted yield curve on the growth of savings deposits, hampered monetary targeting. German reunification illustrates the problems of monetary targeting right after the formation of a monetary union. In spite of its poor performance in hitting monetary targets, the Bundesbank's reputation has not suffered. All in all, it seems more likely that the Bundesbank gives credence to monetary targeting than that twenty years of monetary targeting have improved the Bundesbank's anti-inflation reputation. This probably has much to do with the fact that the Bundesbank's reputation derives to a large extent from the inflation aversion of the German people. The ECB is a new institution without reputation. Monetary targeting at the start of EMU is therefore not without risks: missing targets can delay the build-up of a reputation by the ECB; investors in financial markets may react to target overshooting by increasing the risk premium on bonds denominated in Euros. The bottom line is that the Bundesbank can afford to regularly miss its monetary targets, the ECB not (yet).

What remains are two important political arguments in favour of monetary targeting. First of all, German politicians will argue that the public acceptance of EMU in Germany requires the ECB to resemble the Bundesbank as close as possible. This argument seems plausible as far as the price stability objective and the autonomy of the ECB are concerned. However, the 'black art' of monetary strategy seems to be too remote from the day-to-day concerns of the German people to influence public acceptance. The second political argument in favour of monetary targeting is that it will help the ECB to deal with political pressures for interest rate reductions. According to this view, one of the disadvantages of using several monetary indicators is that it will allow politicians to use whichever indicator they prefer. Bakker has expressed this argument in *Alders, Koedijk, Kool, Winder* (1996), as follows:

> 'Second, a move to inflation targeting implies looking at a variety of indicators, as already indicated by De Grauwe and Thygesen. This will make decision making in the council of the European Central Bank extremely difficult, and prone to political interference because everybody can refer to the indicator that best suits his needs.' (p. 139).

This argument assumes that the directors of the ECB will have insufficient backbone to resist political pressures and form an independent opinion on monetary conditions. If that assessment is correct, it may not be such a good idea to entrust monetary policy to such an institution.

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Summary

Monetary Targeting in the EMU: Lessons from the United States

The economic arguments in favour of monetary targeting at the start of the stage three of EMU are based on the presumed stability of European money demand and the effect of monetary targets on the credibility of central banks. Regional data from the United States show monetary aggregates to move closely together inside a monetary union. In contrast, the stability of constructed European monetary aggregates is caused by a lack of comovement between monetary aggregates in European countries. This comparison suggests that presently available European money demand studies may overestimate money demand stability

in the future EMU by more than 30 %. The paper therefore cautions against extrapolating empirical findings on European money demand stability to stage three. Given the uncertainties surrounding European money demand, the case for implementing monetary targeting right at the start of EMU rests solely on the presumed credibility effect of announcing targets for money supply growth.

Zusammenfassung

Geldmengensteuerung in der EWU: Lehren aus den Vereinigten Staaten

Die wirtschaftlichen Argumente zugunsten einer Geldmengensteuerung zu Beginn der dritten Stufe der EWU basieren auf der Annahme einer stabilen europäischen Geldnachfrage und auf den Auswirkungen von Geldmengenzielen auf die Glaubwürdigkeit der Zentralbanken. Regionale Daten aus den Vereinigten Staaten zeigen, daß in einer Währungsunion sich die Geldmengenaggregate eng aufeinander zu bewegen. Dagegen wird die Stabilität der konstruierten europäischen Geldmengenaggregate aufgrund des Fehlens gleichgerichteter Bewegungen der monetären Aggregate der europäischen Länder bewirkt. Dieser Vergleich deutet darauf hin, daß die derzeit vorhandenen Untersuchungen über die europäische Geldnachfrage die Stabilität derselben in der künftigen EWU um mehr als 30 % zu hoch ansetzen. Dieser Beitrag warnt daher vor einer Hochrechnung empirischer Erkenntnisse über die europäische Geldnachfragestabilität auf Stufe drei. In Anbetracht der die europäische Geldnachfrage umgebenden Ungewißheiten begründet sich das Argument für die Geldmengensteuerung gleich zu Beginn der EWU ausschließlich auf dem angenommenen Glaubwürdigkeitseffekt der Ankündigung von Zielen für das Geldmengenwachstum.

Résumé

Objectifs monétaires de l'UEM: leçons des Etats Unis

Les arguments économiques en faveur des objectifs monétaires au début de la troisième phase de l'UEM sont basés sur la stabilité présumée de la demande monétaire européenne et sur l'impact des objectifs monétaires sur la crédibilité des banques centrales. Des données régionales provenant des Etats Unis montrent que les aggrégats monétaires sont fort liés entre eux au sein de l'Union monétaire. En contraste, la stabilité des aggrégats monétaires européens est causée par un manque de mouvements parallèles entre les aggrégats monétaires des pays européens. La comparaison suggère que les études de demande monétaire européenne disponibles actuellement surestiment la stabilité de la demande monétaire du futur UEM de plus de 30 %. L'article met en garde contre l'extrapolation de résultats empiriques sur la stabilité de la demande monétaire européenne pour la troisième phase. Vu les incertitudes conernant la demande monétaire européenne, l'application d'objectifs monétaires juste au début de l'UEM repose seulement sur l'effet de crédibilité présumé des objectifs annoncés de la croissance de l'offre monétaire.