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Structural Changes and the Role of Monetary Aggregates in the UK

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Contribution of paper

- We essentially ask if money has a more important role to play in the behavioural equations of the new Keynesian monetary policy model

- The policy model normally consists of:
  - An IS curve
  - A Philips curve
  - A policy rule

No role for money in the behavioural equations

- Currently money does not have any role in the behavioural equations
- The literature provides arguments, both, for excluding and including money in the equations
- The main argument for excluding money is that its behaviour is reflected in interest rate changes, as the central bank adjusts the money supply to achieve a desired interest rate

No role for money in the behavioural equations

- In support of that argument Rudebusch and Svensson (2002), using a semi-structural model show that monetary aggregates do not significantly affect the US output

- Ireland (2004) makes similar findings

An argument for including money in the behavioural equations

- There are arguments suggesting that interest rate changes do not fully capture the changes in monetary aggregates
- Therefore important effects of monetary aggregates on macro-variables are being ignored.
- Meltzer (1999) argues that monetary policy affects the prices of a range of assets – the interest rate is the price of one of many assets
- If money demand functions are defined as in Friedman (1956) that is yields beyond what is observed in securities market – such as returns on physical assets, then monetary aggregates will serve as a proxy for a wide spectrum of yields
- Nelson (2003) also argues that monetary aggregates are easier to measure than a wide range of yields

So, the question is, why do studies such as Rudebusch and Svensson (2002) do not find a significant role for money in the semi-structural equations

- Our belief is the results are influenced by definition of variables, the time period employed, specification of model

- These arguments are supported by some findings in the literature:
  - Nelson (2002) re-estimates the Rudebusch and Svensson (2002) semi-structural model over a slightly longer period and uses money base instead of M2 and finds monetary aggregates significantly affect output
  - Castelnuvo (2012) and Hafer et a;. (2007) find that the significance of monetary aggregates improves when M2 is used instead of narrower mesures
  - Canova and Menz (2011) and Castelnuovo (2012) find that the impact of monetary aggregates on output and inflation is time varying but the majority of models appear to be time invariant

Our contribution – a bit more specific

- We will investigate the role of money in a semi-structural setting – similar to Rudebusch and Svensson
- Given the arguments earlier, we will also investigate the impact of the definition of money and nonlinearities on influencing the significance of money in the semi-structural equation

Definition of money

- The overwhelming majority of studies employ official Simple Sum aggregates- all component assets are equally weighted
- We will investigate the contribution of Divisia aggregates – weighted aggregates – assets with higher liquidity receive higher weights

Nonlinearities

- As discussed earlier, the impact of money on output and inflation could be time varying
- Time variation (nonlinearities) are potentially introduced by significant exogenous shocks
- We use nonparametric structural break tests to identify breaks in the underlying series of our model
    - In particular, the ‘nominating and awarding’ procedure of Karoglou

Model Specification and Data

- Consistent with studies such as Rudebusch and Svensson (2002), our model is specified as follows:

$$y_{gt} = \beta_0 + \beta_1 y_{gt-1} + \beta_2 y_{gt-2} + \beta_3 r_{t-1} + \beta_4 m_{t-1} + \varepsilon_{2t}$$

Data

- Data employed is for the UK for the period 1977Q1 to 2013Q4
- Data obtained from Datastream and Bank of England website

Structural break tests results

Nominating break dates stage

Panel A: The results of the 'Nominating breakdates' stage

	IT	ASC_1	ASC_2^{BT}	ASC_2^{QS}	ASC_2^{VH}	KL_{BT}	KL_{QS}	KL_{VH}	LMT	Adopted
Simple Sum	2008Q3**	2008Q3**	2008Q3*	2008Q3**	-	-	2008Q3**	-	2008Q3**	2008Q3**
	2010Q2*	0	-	-	-	-	-	-	-	-
DIVISIA	1986Q2*	-	-	-	-	-	-	-	-	-
	1989Q4*	-	-	-	-	-	-	-	-	-
GDP	1980Q3**	1980Q3*	-	1980Q3*	-	-	1980Q3*	-	1980Q3*	1980Q3**
	2008Q2**	2008Q2*	-	2008Q2*	-	-	2008Q2*	-	2008Q2*	2008Q2**
CPI	1981Q4**	1981Q4**	-	1981Q4**	-	-	1981Q4**	-	1981Q4**	1981Q4**
	1991Q3**	1991Q3**	-	1991Q3**	-	-	1991Q3**	-	1991Q3**	1991Q3**
	2007Q3*	-	-	-	-	-	-	-	-	-
TBR	1993Q1**	1993Q1**	1993Q1**	1993Q1**	1993Q1**	1993Q1**	1993Q1**	1993Q1**	1993Q1**	1993Q1**
	2008Q4**	-	-	-	-	-	-	-	-	-
	2009Q2**	-	-	-	-	-	-	-	-	-
	2010Q2*	-	-	-	-	-	-	-	-	-

Awarding stage

Segments	t-test	Satterthwaite-Welch t-test	F-test	Siegel-Tukey	Bartlett	Levene	Brown-Forsythe
CPI 1 & 2	6.76**	5.27**	5.50**	2.24*	19.00**	7.15**	4.84*
CPI 2 & 3	9.49**	7.84**	2.82**	2.35*	15.59**	9.92**	9.53**
Output 1 & 2	8.98**	6.81**	2.05	4.49**	3.53	1.99	1.3
Output 2 & 3	5.62**	4.38**	2.13*	1.68	5.85*	5.35*	4.82*
Simple Sum 1 & 2	5.32**	3.48**	3.49**	4.70**	17.54**	12.24**	7.09**
TBR 1 & 2	-0.17	-0.15	8.32**	6.21**	73.39**	53.69**	52.77**

Structural breaks

(i) A break in 2008Q3 in the Simple Sum monetary aggregate, which seems to correspond to the recent financial crisis which affected the UK and many other countries.

(ii) Two breaks in GDP; the one in 1980Q3 corresponds to the recession occurring around that time in the UK; the other in 2008Q3 corresponds to the recent financial crisis.

(iii) Two breaks in CPI; the one in 1981Q4 corresponds to the recession at the time; the break in 1991Q3 appears to correspond to the UK exiting the exchange rate mechanism (ERM).

(iv) A break in 1993Q1 in TBR which also seems to correspond to the exit of the UK from ERM.

- The breaks create four segments: the first segment does not have enough observations- therefore discarded
- We therefore estimate our models for the other three segments and also for the entire sample for comparative purposes

IS curve estimations: 1977Q1 to 2013Q4

Panel A1: Whole sample, HP filter

	Standard IS Curve	IS curve with monetary aggregates	
		Simple Sum	Divisia
β_0	0.001 (0.57)	-0.001 (-0.52)	-0.001 (-1.38)
y_{gt-1}	0.859 (10.13)	0.819 (9.58)	0.707 (8.37)
y_{gt-2}	0.001 (0.017)	0.020 (0.24)	0.129 (1.56)
r_{t-1}	-0.014 (-0.54)	-0.053 (-1.74)	-0.072 (-2.74)
m_{t-1}	-	0.045 (2.24)	0.103 (4.89)
R^2	0.73	0.74	0.77
DW	1.99	2.00	1.93

IS curve estimation: 1982Q1 to 1991Q3

Panel B1: 1982Q1 to 1991Q3, HP filter

	Standard IS Curve	IS curve with monetary aggregates	
		Simple Sum	Divisia
β_0	0.002 (0.29)	-0.009 (-1.48)	0.002 (0.39)
y_{gt-1}	0.943 (5.51)	0.634 (3.74)	0.681 (3.99)
y_{gt-2}	-0.033 (-0.20)	0.219 (1.36)	0.237 (1.39)
r_{t-1}	-0.028(-0.25)	-0.114 (-1.15)	-0.139 (-1.33)
m_{t-1}	-	0.185 (3.67)	0.114 (3.29)
R^2	0.83	0.88	0.87
DW	2.01	2.14	1.90

IS curve estimation: 1993Q2 to 2008Q2

Panel C1: 1993Q2 to 2008Q2, HP filter

	Standard IS Curve	IS curve with monetary aggregates	
		Simple Sum	Divisia
β_0	0.008 (2.58)	0.005 (1.16)	0.008 (2.25)
y_{gt-1}	0.690 (5.24)	0.680 (5.12)	0.689 (5.18)
y_{gt-2}	0.215 (1.52)	0.185 (1.25)	0.220 (1.53)
r_{t-1}	-0.191 (-2.31)	-0.167 (-1.88)	-0.192 (-2.31)
m_{t-1}	-	0.029 (0.75)	-0.009 (-0.23)
R^2	0.77	0.77	0.77
DW	1.88	1.87	1.89

IS curve estimation: 1993Q2 to 2008Q2

Panel C2: 1993Q2 to 2008Q2, QD filter

	Standard IS Curve	IS curve with monetary aggregates	
		Simple Sum	Divisia
β_0	0.007 (2.07)	0.007 (1.53)	0.003 (0.85)
y_{gt-1}	0.693 (4.72)	0.692 (4.67)	0.584 (4.16)
y_{gt-2}	0.268 (1.83)	0.264 (1.77)	0.313 (2.28)
r_{t-1}	-0.155 (-1.55)	-0.156 (-1.55)	-0.263 (-2.66)
m_{t-1}	-	0.009 (0.20)	0.152 (3.18)
R^2	0.98	0.98	0.98
DW	1.68	1.67	1.74

IS curve estimation: 2008Q4 to 2013Q4

Panel D1: 2008Q4 to 2013Q4, HP filter

	Standard IS Curve	IS curve with monetary aggregates	
		Simple Sum	Divisia
β_0	-0.007 (-1.33)	-0.007 (-1.01)	-0.015 (-4.03)
y_{gt-1}	0.830 (2.89)	0.828 (2.75)	0.351 (1.66)
y_{gt-2}	-0.209 (-0.98)	-0.206 (-0.89)	0.208 (1.27)
r_{t-1}	-0.222 (-1.27)	-0.231 (-0.86)	-0.473 (-3.80)
m_{t-1}	-	0.002 (0.05)	0.244 (4.92)
R^2	0.60	0.60	0.84
DW	1.84	1.84	2.15

Concluding remarks

- Some evidence of nonlinearities
- Nonlinearities (exogenous shocks) appear to affect official Simple Sum aggregates more than Divisia aggregates
- Why do Divisia aggregates have a stronger relationship with output?
  - Divisia aggregates represent transactions orientated assets and hence have display a stronger relationship with economic activity
  - These results suggest that if firms and consumers were not hoarding money, the recovery from the financial crisis could have been faster
- Monetary policy models potentially ignoring the effects of monetary aggregates, not captured by interest rates, on macro-variables.