–NOT FOR PUBLICATION–

On the Stability of Euro Area Money Demand and its Implications for Monetary Policy Supplementary Appendix*

October 20, 2017

The additional results here reported are intended to complement those provided in the paper and are not for publication. In particular, we present here

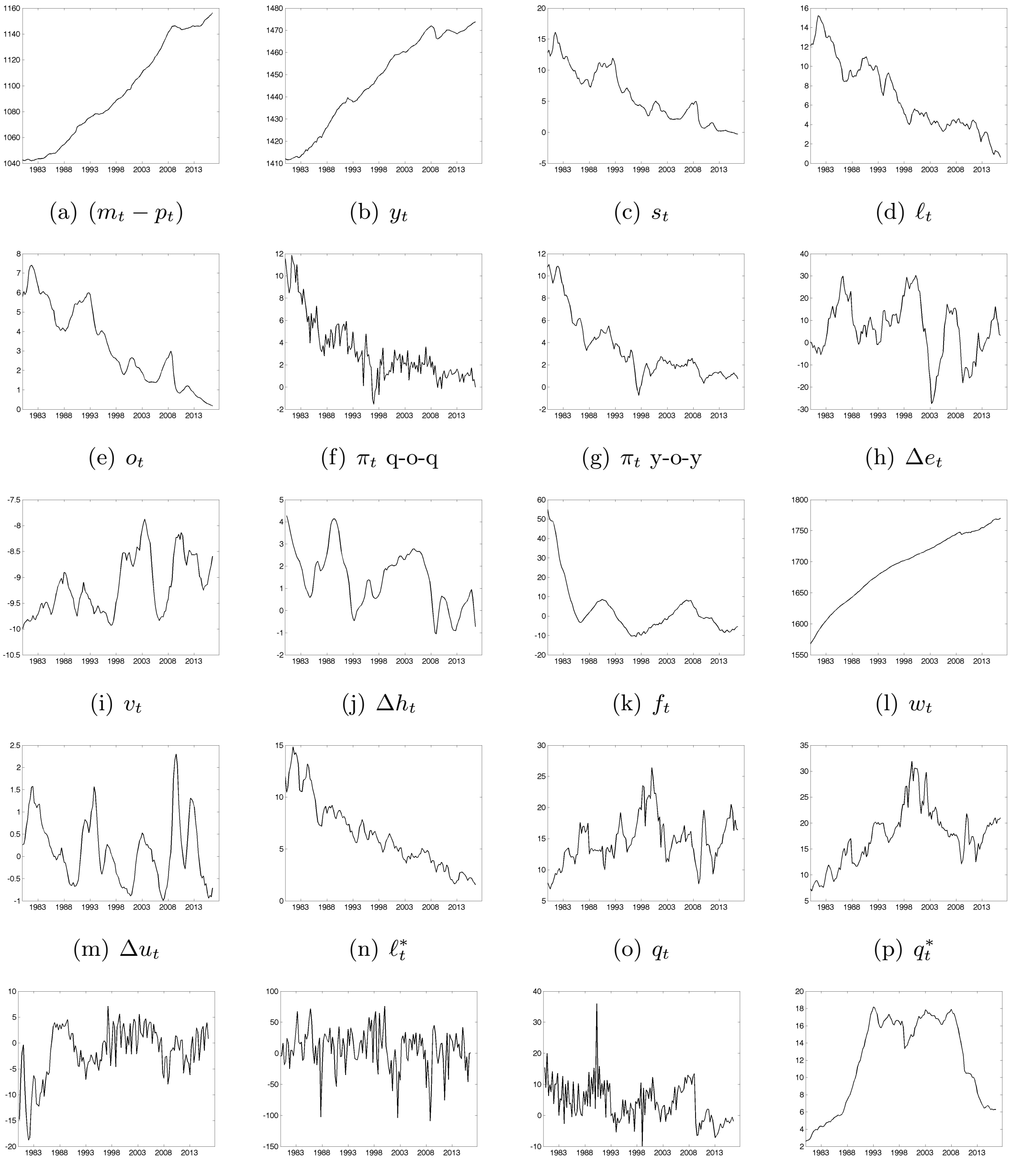
- the plot of the time series used in the empirical analysis and described in Section 3 and Appendix A of the paper;
- the additional robustness checks with respect to the results of the time–varying cointegration test by Bierens and Martins (2010);
- further additional evidence on the estimation of the time–invariant model in Section 5 of the paper.

Other additional results are available upon request from the authors.

The views here expressed are those of the authors and do not reflect those of the Banca d'Italia or the Eurosystem.

A Data plot

Figure 1: Series used in the analysis of Section 5 and 6.



(a) $(m_t - p_t)$ (b) y_t (c) s_t (d) ℓ_t

(e) o_t (f) π_t q-o-q (g) π_t y-o-y (h) Δe_t

(i) v_t (j) Δh_t (k) f_t (l) w_t

(m) Δu_t (n) ℓ_t^* (o) q_t (p) q_t^*

(q) Δf_t (r) Δe_t (s) cy_t (t) ncl_t

B Time–varying cointegration test

In this section we report the results for the time-varying cointegration test by Bierens and Martins (2010) for the following cases:

1. literature specifications when considering $p = 3$ lags in the VECM specification and using the periods 1980:Q1-2001:Q4, 1980:Q1-2007:Q4, 1980:Q1-2008:Q4, 1980:Q1-2009:Q4 as estimation samples;

2. literature specifications when considering $p = 2, 3$ lags in the VECM specification and using the periods originally specified in the literature;

3. our specification when considering $p = 3$ lags in the VECM specification and using the periods 1980:Q1-2007:Q4, 1980:Q1-2008:Q4, 1980:Q1-2009:Q4 as estimation samples;

4. other specifications we tested when considering $p = 2, 3$ lags in the VECM specification and using the periods 1980:Q1-2007:Q4, 1980:Q1-2008:Q4, 1980:Q1-2009:Q4 as estimation samples.

5. literature specifications we tested when considering $p = 2, 3$ lags in the VECM specification and using the period 1980:Q1-2014:Q2 as estimation sample, the one used for the time–invariant model in the paper.

The models considered are defined in the Table below. For a description of the variables see Section A above and Section 3 of the paper.

Table A-1: Euro area money demand. Specifications considered.

Ref.	Acronym	$\mathbf{X}_t$	r	Sample	k
Coenen and Vega (2001)	CV	ℓ_t, s_t, π_t	3	1980:Q1-1998:Q4	5
Calza *et al.* (2001)	CGL1	$(s_t - o_t), (\ell_t - o_t)$	1	1980:Q1-1999:Q4	4
Calza *et al.* (2001)	CGL2	$(s_t - o_t)$	1	1980:Q1-1999:Q4	3
Gerlach and Svensson (2003)	GS	$(\ell_t - s_t)$	2	1980:Q1-2001:Q4	3
Vlaar (2004)	V	$(\ell_t - s_t), \pi_t$	3	1980:Q1-2000:Q4	4
Carstensen (2006)	C	$(s_t - o_t), (\Delta e_t - o_t), v_t$	1	1980:Q1-2003:Q4	5
Beyer (2009)	B1	$o_t, s_t, \pi_t, \Delta h_t$	2	1980:Q1-2008:Q4	6
Beyer (2009)	B2	Δh_t	2	1980:Q1-2008:Q4	3
Beyer (2009)	B3	$\Delta h_t, \pi_t$	2	1980:Q1-2008:Q4	4
Dreger and Wolters (2010a)	DW1	π_t	1	1983:Q1-2004:Q4	3
Dreger and Wolters (2010b)	DW2	s_t, l_t, π_t, f_t	2	1983:Q1-2010:Q2	6
Dreger and Wolters (2010b)	DW3	f_t, π_t	1	1983:Q1-2010:Q2	4
Dreger and Wolters (2010b)	DW4	$f_t, \pi_t, (l_t - s_t)$	2	1983:Q1-2010:Q2	5
De Bondt (2010)	D1	$w_t, o_t, \Delta e_t, \Delta u_t$	1	1983:Q1-2007:Q2	6
De Bondt (2010)	D2	$w_t, o_t, \Delta e_t$	1	1983:Q1-2007:Q2	5
De Bondt (2010)	D3	$o_t, \Delta u_t$	2	1983:Q1-2007:Q2	4
De Santis *et al.* (2013)	DFR1	$\ell_t, \ell^*_t, q_t, q^*_t, o_t$	3	1980:Q1-2007:Q3	7
De Santis *et al.* (2013)	DFR2	$\ell_t, \ell^*_t, q_t, q^*_t$	3	1980:Q1-2007:Q3	6
De Santis *et al.* (2013)	DFR3	$(\ell_t - \ell^*_t), (q_t - q^*_t)$	3	1980:Q1-2007:Q3	4
Barigozzi and Conti	BC	$\Delta u_t, (q_t - q^*_t), (\ell_t - o_t), \pi_t$	3	1980:Q1-2008:Q4	6

The time-varying long run money demand equation considered is $(m_t - p_t) = \beta_0 + \beta^y_t y_t + \boldsymbol{\beta}^X_t \mathbf{X}_t$, where: $(m_t - p_t)$ = log-real balances, y_t = log-real income, ℓ_t = long-term interest rate, s_t = short-term interest rate, o_t = own rate, π_t = q-o-q inflation rate (in Beyer (2009) y-o-y inflation rate), Δe_t = q-o-q equity returns, v_t = log-volatility of equity returns, Δh_t = y-o-y housing wealth growth rate, f_t = log-real financial wealth, w_t = log-real wealth, Δu_t = y-o-y differences of unemployment rate, ℓ^*_t = US long-term interest rate, q_t = log-price to earnings ratio, q^*_t = US log-price to earnings ratio.

Table A-2: LIKELIHOOD-RATIO TEST, LR_T, FOR STABILITY. PART I. $(p = 3)$.

Ref. $\mathbf{X}_t$	1980:Q1-2001:Q4 $r=1$	$r=2$	$r=3$	1980:Q1-2007:Q4 $r=1$	$r=2$	$r=3$	1980:Q1-2008:Q4 $r=1$	$r=2$	$r=3$	1980:Q1-2009:Q4 $r=1$	$r=2$	$r=3$
CV	17.99	43.99	60.21	26.80	52.83	76.24	27.56	50.41	67.25	26.13	45.98	59.22
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CGL1	8.62	33.05	40.19	22.18	38.14	51.46	26.76	37.51	51.68	27.39	35.04	44.24
	(0.07)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CGL2	9.81	30.22	35.15	20.39	35.59	38.48	22.08	36.21	39.53	26.88	37.50	41.06
	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GS	2.95	10.02	15.03	24.96	33.16	34.48	22.25	30.86	33.98	17.38	25.32	27.99
	(0.40)	(0.12)	(0.09)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
V	10.89	34.96	42.79	15.06	37.06	48.03	16.36	29.62	38.60	18.23	29.25	36.11
	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Values for the Bierens and Martins (2010) likelihood ratio test LR_T which under the null hypothesis of time-invariant cointegration is distributed as $\chi^2_{(rmk)}$, with $m = 1$. Corresponding p-values in parenthesis. Results refer to a model with $p = 3$ lags. See Table A-1 for details.

Table A-3: LIKELIHOOD-RATIO TEST, LR_T, FOR STABILITY. PART II. ($p = 3$).

Ref. $\mathbf{X}_t$	1980:Q1-2007:Q4 $r=1$	$r=2$	$r=3$	1980:Q1-2008:Q4 $r=1$	$r=2$	$r=3$	1980:Q1-2009:Q4 $r=1$	$r=2$	$r=3$
C	33.88	60.81	77.26	21.13	50.38	66.18	29.53	49.48	65.19
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B1	28.17	45.27	64.68	33.36	39.92	60.93	27.85	42.77	65.87
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B2	25.54	30.99	31.73	29.81	34.20	38.25	26.91	30.16	32.82
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B3	25.12	37.50	56.09	15.15	35.56	53.30	19.08	28.42	37.77
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW1	16.48	39.44	47.84	20.53	37.84	46.33	21.95	30.22	37.21
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW2	36.57	66.90	98.31	27.86	69.18	101.62	36.75	80.17	111.33
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW3	28.01	43.15	53.71	31.42	48.78	65.40	28.49	53.39	67.73
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
DW4	21.73	47.48	62.97	20.86	51.07	67.31	19.44	51.84	69.08
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)

Values for the Bierens and Martins (2010) likelihood ratio test LR_T which under the null hypothesis of time-invariant cointegration is distributed as $\chi^2_{(rmk)}$, with $m = 1$. Corresponding p-values in parenthesis. Results refer to a model with $p = 3$ lags. See Table A-1 for details.

Table A-4: LIKELIHOOD-RATIO TEST, LR_T, FOR STABILITY. PART III. ($p = 3$).

	1980:Q1-2007:Q4			1980:Q1-2008:Q4			1980:Q1-2009:Q4		
Ref. $\mathbf{X}_t$	$r = 1$	$r = 2$	$r = 3$	$r = 1$	$r = 2$	$r = 3$	$r = 1$	$r = 2$	$r = 3$
D1	12.75	44.82	68.56	20.28	52.20	78.29	14.22	68.99	93.59
	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)
D2	12.13	38.88	69.79	18.68	39.50	66.24	37.35	60.14	88.78
	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D3	9.46	45.68	65.87	6.46	45.53	67.31	9.16	43.69	61.00
	(0.05)	(0.00)	(0.00)	(0.17)	(0.00)	(0.00)	(0.06)	(0.00)	(0.00)
DFR1	43.38	58.46	84.79	28.04	50.00	80.64	23.65	47.47	76.46
	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DFR2	8.83	32.24	52.45	12.94	38.16	62.62	10.66	31.85	53.41
	(0.18)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)
DFR3	10.96	33.80	54.68	7.19	36.31	54.68	6.37	27.31	48.43
	(0.03)	(0.00)	(0.00)	(0.13)	(0.00)	(0.00)	(0.17)	(0.00)	(0.00)
BC	15.40	24.66	46.80	12.89	17.95	35.84	13.73	20.23	35.35
	(0.02)	(0.02)	(0.00)	(0.04)	(0.12)	(0.01)	(0.03)	(0.06)	(0.01)

Values for the Bierens and Martins (2010) likelihood ratio test LR_T which under the null hypothesis of time-invariant cointegration is distributed as $\chi^2_{(rmk)}$, with $m = 1$. Corresponding p-values in parenthesis. Results refer to a model with $p = 3$ lags. See Table A-1 for details.

Table A-5: Likelihood-ratio test, LR_T. Original samples ($p = 2, 3$).

Ref. $\mathbf{X}_t$	Sample	$p=2$, $r=1$	$p=2$, $r=2$	$p=2$, $r=3$	$p=3$, $r=1$	$p=3$, $r=2$	$p=3$, $r=3$
CV	1980:Q1-1998:Q4	17.79	40.31	57.14	13.49	35.15	52.79
		(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
CGL1	1980:Q1-1999:Q4	14.03	36.75	45.39	3.75	32.07	39.94
		(0.01)	(0.00)	(0.00)	(0.44)	(0.00)	(0.00)
CGL2	1980:Q1-1999:Q4	20.98	35.64	38.10	14.99	34.36	38.66
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GS	1980:Q1-2001:Q1	2.18	14.42	17.02	2.95	10.02	15.03
		(0.54)	(0.03)	(0.05)	(0.40)	(0.12)	(0.09)
V	1980:Q1-2000:Q4	8.78	27.19	41.91	7.58	31.63	40.87
		(0.07)	(0.00)	(0.00)	(0.11)	(0.00)	(0.00)
C	1980:Q1-2003:Q4	16.80	49.88	72.17	24.27	60.24	79.89
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B1	1980:Q1-2008:Q4	25.26	49.77	64.51	33.36	39.92	60.93
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B2	1980:Q1-2008:Q4	21.47	27.90	31.13	29.81	34.20	38.25
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B3	1980:Q1-2008:Q4	20.57	33.49	49.27	15.15	35.56	53.30
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW1	1983:Q1-2010:Q2	25.06	33.18	37.20	23.88	32.39	36.72
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW2	1983:Q1-2010:Q2	77.32	118.94	149.37	77.76	125.51	161.36
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW3	1983:Q1-2010:Q2	33.18	54.10	63.24	39.70	57.89	63.75
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW4	1983:Q1-2010:Q2	27.75	58.90	77.04	33.84	63.20	79.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D1	1983:Q1-2007:Q2	12.26	32.77	63.65	15.27	42.71	71.88
		(0.20)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)
D2	1983:Q1-2007:Q2	12.23	44.45	77.18	11.28	40.66	69.35
		(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
D3	1983:Q1-2007:Q2	9.05	55.42	70.10	8.89	46.97	66.39
		(0.05)	(0.00)	(0.00)	(0.06)	(0.00)	(0.00)
DFR1	1980:Q1-2007:Q3	27.76	62.45	86.39	46.55	63.77	90.54
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DFR2	1980:Q1-2007:Q3	6.54	30.21	46.20	13.77	37.43	57.52
		(0.37)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)
DFR3	1980:Q1-2007:Q3	10.75	38.34	53.40	13.21	35.19	55.61
		(0.03)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)

Values for the Bierens and Martins (2010) likelihood ratio test LR_T which under the null hypothesis of time-invariant cointegration is distributed as $\chi^2_{(rmk)}$, with $m = 1$. Corresponding p-values in parenthesis. Results refer to a model with $p = 2, 3$ lags. See Table A-1 for details.

Table A-6: LIKELIHOOD-RATIO TEST, LR_T. 1980:Q1–2014:Q2 ($p = 2, 3$).

Ref. $\mathbf{X}_t$	$p=2$ $r=1$	$p=2$ $r=2$	$p=2$ $r=3$	$p=3$ $r=1$	$p=3$ $r=2$	$p=3$ $r=3$
C	40.97	50.12	58.53	41.94	54.11	65.28
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B1	34.41	70.60	85.10	37.75	76.54	98.82
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B2	16.91	29.68	34.82	25.00	36.00	41.26
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B3	15.48	31.08	45.88	12.26	30.57	45.59
	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
DW2	51.61	93.06	119.74	48.51	81.03	93.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW2	19.97	25.77	33.46	17.77	26.25	33.58
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW3	25.93	41.78	54.19	23.20	39.76	49.76
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DW4	36.53	48.43	63.70	28.21	40.53	53.62
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D1	20.17	61.50	88.94	35.98	83.95	115.37
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D2	35.92	63.25	93.65	41.14	72.49	105.61
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D3	3.50	46.20	51.34	3.05	44.81	50.58
	(0.48)	(0.00)	(0.00)	(0.55)	(0.00)	(0.00)
DFR1	25.15	44.39	67.04	29.01	47.83	71.81
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DFR2	13.25	35.96	55.94	14.77	35.30	52.83
	(0.04)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
DFR3	9.51	23.77	37.13	10.32	29.59	42.64
	(0.05)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)

Values for the Bierens and Martins (2010) likelihood ratio test LR_T which under the null hypothesis of time-invariant cointegration is distributed as $\chi^2_{(rmk)}$, with $m = 1$. Corresponding p-values in parenthesis. Results refer to a model with $p = 2, 3$ lags. See Table A-1 for details.

C Time–invariant VECM

In this section we report additional estimates of the model specified in Section 5 of the paper: We consider the following cases:

1. considering the period 1980:Q1-2009:Q4 as estimation sample, with no dummies, and with $p = 2$;
2. considering the period 1980:Q1-2010:Q4 as estimation sample, with no dummies, and with $p = 2$;
3. considering the period 1980:Q1-2008:Q4 as estimation sample, with dummies for M3, and with $p = 2$;
4. considering the period 1980:Q1-2008:Q4 as estimation sample, with no dummies, and with $p = 3$.

C.1 Sample 1980:Q1-2009:Q4, no dummies, $p = 2$

The likelihood ratio test for null-hypothesis of validity of the imposed restrictions is distributed as $\chi^2_{(4)}$ with a value 0.923 and p-value of 0.92.

Table B-1: Tests for determining the cointegration rank r.

$k-r$	r	Eig	Trace	$c_{95\%}$	p-val
6	0	0.448	181.700	95.514	0.000
5	1	0.381	111.584	69.611	0.000
4	2	0.221	55.050	47.707	0.008
3	3	0.121	25.603	29.804	0.145
2	4	0.080	10.368	15.408	0.258
1	5	0.004	0.489	3.841	0.484

Eig: largest eigenvalue; Trace: trace statistics; $c_{95\%}$: 95% critical value. Estimates are obtained when considering a time–invariant VECM.

Table B-2: Estimates of the long run structure - $\widehat{\boldsymbol{\beta}}'$.

	$(m_t - p_t)$	y_t	Δu_t	$(q_t - q_t^*)$	$(\ell_t - o_t)$	π_t
$\boldsymbol{\beta}_1$	1.000 [n.a.]	−1.897 [−48.360]	−12.990 [−15.932]	−2.052 [−12.660]	0.000 [n.a.]	0.000 [n.a.]
$\boldsymbol{\beta}_2$	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	0.000 [n.a.]	−0.135 [−4.025]	0.000 [n.a.]
$\boldsymbol{\beta}_3$	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	−0.517 [−10.537]

Estimated long run coefficients $\widehat{\boldsymbol{\beta}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

Table B-3: Estimates of the short run dynamics - $\widehat{\boldsymbol{\alpha}}$.

	$\boldsymbol{\alpha}_1$	$\boldsymbol{\alpha}_2$	$\boldsymbol{\alpha}_3$
$\Delta(m_t - p_t)$	−0.004 [−0.260]	−0.430 [−2.652]	−0.297 [−3.735]
Δy_t	−0.051 [−4.138]	−0.506 [−3.861]	0.074 [1.151]
$\Delta\Delta u_t$	0.014 [4.943]	−0.026 [−0.871]	−0.005 [−0.366]
$\Delta(q_t - q_t^*)$	0.202 [5.610]	2.192 [5.661]	0.472 [2.485]
$\Delta(\ell_t - o_t)$	0.006 [0.703]	0.131 [1.525]	−0.084 [−1.998]
$\Delta\pi_t$	0.058 [2.348]	0.452 [1.703]	0.394 [3.028]

Estimated short–run coefficients $\widehat{\boldsymbol{\alpha}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

C.2 Sample 1980:Q1-2010:Q4, no dummies, $p = 2$

The likelihood ratio test for null-hypothesis of validity of the imposed restrictions is distributed as $\chi^2_{(4)}$ with a value 1.358 and p-value of 0.85.

Table B-4: Tests for determining the cointegration rank r.

$k-r$	r	Eig	Trace	$c_{95\%}$	p-val
6	0	0.470	182.170	95.514	0.000
5	1	0.319	104.691	69.611	0.000
4	2	0.212	57.808	47.707	0.004
3	3	0.122	28.777	29.804	0.066
2	4	0.092	12.932	15.408	0.118
1	5	0.009	1.152	3.841	0.283

Eig: largest eigenvalue; Trace: trace statistics; $c_{95\%}$: 95% critical value. Estimates are obtained when considering a time–invariant VECM.

Table B-5: Estimates of the long run structure - $\widehat{\boldsymbol{\beta}}'$.

	$(m_t - p_t)$	y_t	Δu_t	$(q_t - q_t^*)$	$(\ell_t - o_t)$	π_t
$\boldsymbol{\beta}_1$	1.000 [n.a.]	−2.000 [−45.276]	−15.324 [−15.688]	−2.344 [−11.564]	0.000 [n.a.]	0.000 [n.a.]
$\boldsymbol{\beta}_2$	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	0.000 [n.a.]	−0.127 [−3.744]	0.000 [n.a.]
$\boldsymbol{\beta}_3$	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	−0.517 [−10.720]

Estimated long run coefficients $\widehat{\boldsymbol{\beta}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

Table B-6: ESTIMATES OF THE SHORT RUN DYNAMICS - $\widehat{\boldsymbol{\alpha}}$.

	$\boldsymbol{\alpha}_1$	$\boldsymbol{\alpha}_2$	$\boldsymbol{\alpha}_3$
$\Delta(m_t - p_t)$	-0.008 [-0.568]	-0.510 [-2.999]	-0.315 [-3.929]
Δy_t	-0.040 [-3.785]	-0.488 [-3.709]	0.100 [1.618]
$\Delta\Delta u_t$	0.012 [4.976]	-0.019 [-0.621]	-0.011 [-0.742]
$\Delta(q_t - q_t^*)$	0.164 [5.094]	2.070 [5.180]	0.392 [2.084]
$\Delta(\ell_t - o_t)$	0.005 [0.749]	0.120 [1.379]	-0.081 [-1.979]
$\Delta\pi_t$	0.031 [1.364]	0.387 [1.360]	0.368 [2.750]

Estimated short–run coefficients $\widehat{\boldsymbol{\alpha}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

C.3 Sample 1980:Q1-2008:Q4, dummies for M3, $p = 2$

The likelihood ratio test for null-hypothesis of validity of the imposed restrictions is distributed as $\chi^2_{(4)}$ with a value of 4.093 and p-value of 0.39.

Table B-7: TESTS FOR DETERMINING THE COINTEGRATION RANK r.

$k-r$	r	Eig	Trace	$c_{95\%}$	p-val
6	0	0.418	174.141	95.514	0.000
5	1	0.405	112.466	69.611	0.000
4	2	0.235	53.337	47.707	0.013
3	3	0.124	22.825	29.804	0.263
2	4	0.063	7.791	15.408	0.495
1	5	0.003	0.363	3.841	0.547

Eig: largest eigenvalue; Trace: trace statistics; $c_{95\%}$: 95% critical value. Estimates are obtained when considering a time–invariant VECM.

Table B-8: ESTIMATES OF THE LONG RUN STRUCTURE - $\widehat{\boldsymbol{\beta}}'$.

	$(m_t - p_t)$	y_t	Δu_t	$(q_t - q_t^*)$	$(\ell_t - o_t)$	π_t
$\boldsymbol{\beta}_1$	1.000 [n.a.]	−1.880 [−39.299]	−11.491 [−13.073]	−2.044 [−11.284]	0.000 [n.a.]	0.000 [n.a.]
$\boldsymbol{\beta}_2$	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	0.000 [n.a.]	−0.117 [−3.394]	0.000 [n.a.]
$\boldsymbol{\beta}_3$	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	−0.597 [−11.143]

Estimated long run coefficients $\widehat{\boldsymbol{\beta}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

Table B-9: ESTIMATES OF THE SHORT RUN DYNAMICS - $\widehat{\boldsymbol{\alpha}}$.

	$\boldsymbol{\alpha}_1$	$\boldsymbol{\alpha}_2$	$\boldsymbol{\alpha}_3$
$\Delta(m_t - p_t)$	-0.002 [-0.183]	-0.338 [-2.418]	-0.183 [-2.631]
Δy_t	-0.045 [-3.945]	-0.445 [-3.776]	0.061 [1.037]
$\Delta\Delta u_t$	0.012 [4.636]	-0.045 [-1.667]	-0.006 [-0.445]
$\Delta(q_t - q_t^*)$	0.219 [6.046]	2.219 [5.955]	0.508 [2.739]
$\Delta(\ell_t - o_t)$	0.005 [0.645]	0.135 [1.695]	-0.083 [-2.099]
$\Delta\pi_t$	0.055 [2.275]	0.302 [1.212]	0.442 [3.560]

Estimated short–run coefficients $\widehat{\boldsymbol{\alpha}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

C.4 Sample 1980:Q1-2008:Q4, no dummies, $p = 3$

The likelihood ratio test for null-hypothesis of validity of the imposed restrictions is distributed as $\chi^2_{(4)}$ with a value 3.356 and p-value of 0.50.

Table B-10: TESTS FOR DETERMINING THE COINTEGRATION RANK r.

$k-r$	r	Eig	Trace	$c_{95\%}$	p-val
6	0	0.449	167.936	95.514	0.000
5	1	0.347	100.541	69.611	0.000
4	2	0.228	52.455	47.707	0.016
3	3	0.139	23.248	29.804	0.242
2	4	0.054	6.272	15.408	0.667
1	5	0.000	0.017	3.841	0.897

Eig: largest eigenvalue; Trace: trace statistics; $c_{95\%}$: 95% critical value. Estimates are obtained when considering a time–invariant VECM.

Table B-11: ESTIMATES OF THE LONG RUN STRUCTURE - $\widehat{\boldsymbol{\beta}}'$.

	$(m_t - p_t)$	y_t	Δu_t	$(q_t - q_t^*)$	$(\ell_t - o_t)$	π_t
$\boldsymbol{\beta}_1$	1.000 [n.a.]	−1.913 [−42.016]	−16.939 [−18.256]	−1.931 [−11.554]	0.000 [n.a.]	0.000 [n.a.]
$\boldsymbol{\beta}_2$	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	0.000 [n.a.]	−0.120 [−4.929]	0.000 [n.a.]
$\boldsymbol{\beta}_3$	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	0.000 [n.a.]	1.000 [n.a.]	−0.557 [−11.002]

Estimated long run coefficients $\widehat{\boldsymbol{\beta}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

Table B-12: ESTIMATES OF THE SHORT RUN DYNAMICS - $\widehat{\boldsymbol{\alpha}}$.

	$\boldsymbol{\alpha}_1$	$\boldsymbol{\alpha}_2$	$\boldsymbol{\alpha}_3$
$\Delta(m_t - p_t)$	-0.006 [-0.274]	-0.476 [-1.619]	-0.349 [-3.870]
Δy_t	-0.055 [-3.452]	-0.818 [-3.578]	0.055 [0.779]
$\Delta\Delta u_t$	0.011 [2.948]	-0.051 [-0.986]	-0.011 [-0.700]
$\Delta(q_t - q_t^*)$	0.246 [5.028]	3.692 [5.231]	0.531 [2.450]
$\Delta(\ell_t - o_t)$	0.017 [1.521]	0.291 [1.853]	-0.057 [-1.186]
$\Delta\pi_t$	0.089 [2.780]	0.801 [1.744]	0.432 [3.066]

Estimated short–run coefficients $\widehat{\boldsymbol{\alpha}}$ in the identified model, t-statistics in parenthesis. Estimates are obtained when considering a time–invariant VECM.

C.5 Other estimators of cointegrating vectors

- FM–OLS (Phillips and Hansen, 1990)

$$\begin{array}{lclclclcl} (m_t - p_t) & = & \widehat{\beta}'_{12} y_t & + & \widehat{\beta}'_{13}\Delta u_t & + & \widehat{\beta}'_{14}(q_t - q_t^*) & & \\ (m_t - p_t) & = & 2.001\ y_t & + & 5.674\ \Delta u_t & + & 2.340\ q_t & - & 2.340 q_t^*. \quad (1980{:}Q1\text{-}2014{:}Q2) \\ & & [49.481] & & [6.373] & & [10.006] & & [-10.006] \end{array} \quad . \tag{1}$$

- SW–DOLS (Stock and Watson, 1993)

$$\begin{array}{lclclclcl} (m_t - p_t) & = & \widehat{\beta}'_{12} y_t & + & \widehat{\beta}'_{13}\Delta u_t & + & \widehat{\beta}'_{14}(q_t - q_t^*) & & \\ (m_t - p_t) & = & 2.017\ y_t & + & 5.355\ \Delta u_t & + & 2.524\ q_t & - & 2.524 q_t^*. \quad (1980{:}Q1\text{-}2014{:}Q2) \\ & & [25.213] & & [1.87] & & [7.340] & & [7.340] \end{array} \quad . \tag{2}$$

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