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Spillovers of the ECB's non-standard monetary policy into CESEE economies

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Outline of the presentation

1. Motivation.
2. Preview of the main takeaways of the analysis.
3. ECB's asset purchase programmes (APPs): stylised facts.
4. Spillovers into Central, Eastern and South-Eastern European (CESEE) economies:
   - ✓ in the short-run: event study analysis (and its shortcomings);
   - ✓ in the longer-run:
     - impact on euro area liquidity conditions;
     - the *portfolio rebalancing* channel;
     - the *banking liquidity* channel.
4. Counterfactual analysis.
5. Robustness tests.
6. Policy implications for CESEE economies.

Motivation

Since the onset of the 2008-2009 global financial crisis, the ECB has implemented a series of non-standard monetary measures to address a range of unusual risks (i.e. to overcome impairments in the functioning of the certain financial asset markets, to dispel the fears of a euro-area break-up and 'redenomination' risk and, more recently, to tackle the serious consequences of a prolonged period of excessively low inflation/deflation).

Among these non-standard measures, outright purchases of financial assets on primary and secondary markets have increasingly gained importance in the balance sheet of the Eurosystem.

Nevertheless, differently from the Fed's QE programmes, the available empirical evidence about the international spillover of such non-standard policies is relatively scant so far.

We aim to fill this gap by looking at 11 CESEE economies which, on the background of the strong financial (i.e. banking) linkages with the euro area, represent a sort of *ideal* sample for our research objective.

Our attention will be mainly devoted to the international *financial* spillovers stemming from the implementation of outright asset purchases, of which it will be given both a *short-* and a *long-run* perspective.

Preview of the main takeaways of the analysis

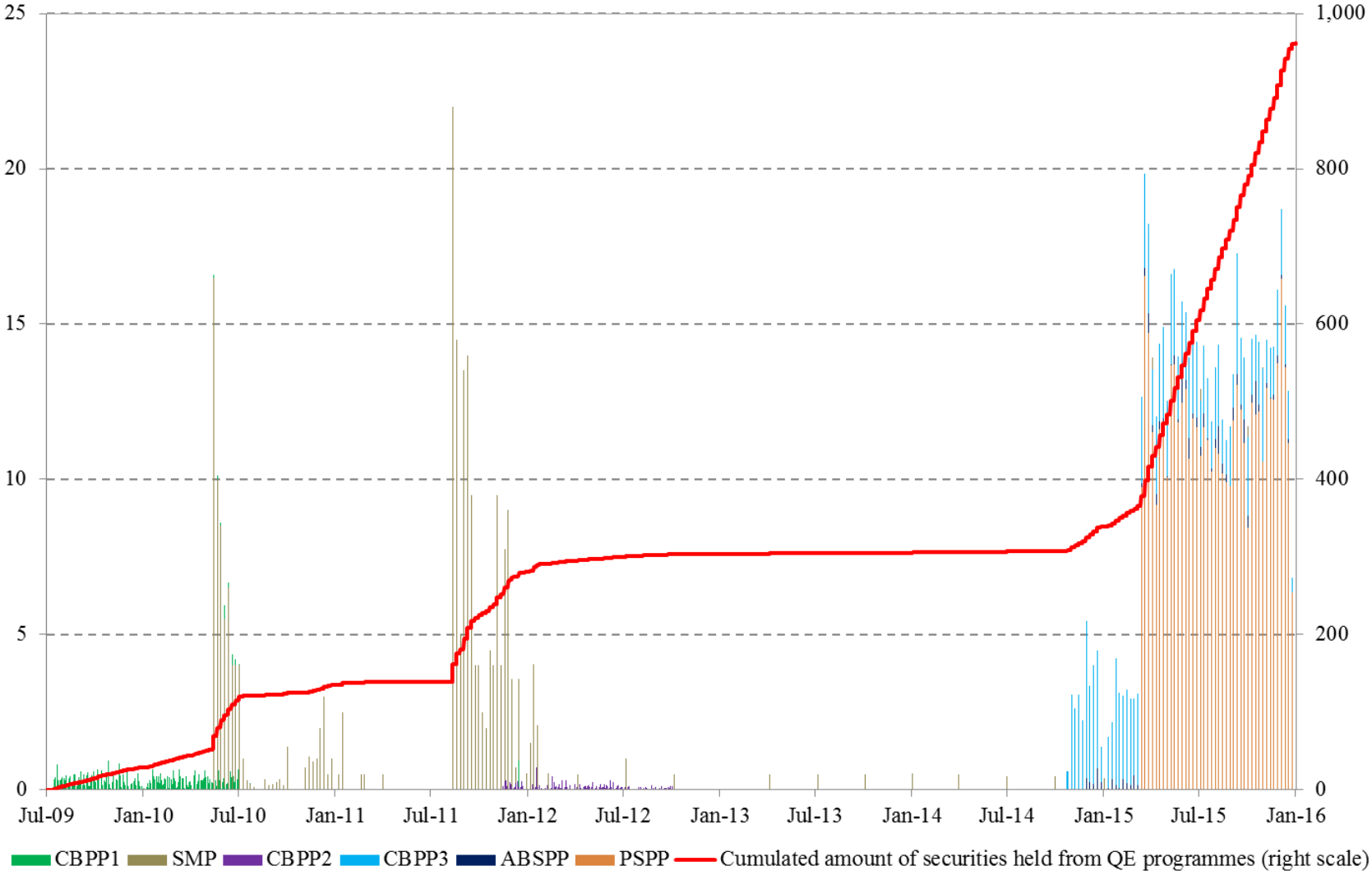
1. In the short-run, the event-study analysis confirms that the *announcements* of such measures influenced, in the expected direction, the movement of certain financial variables.

2. In the longer-run, the results of the empirical strategy point to the existence of both a *portfolio rebalancing* and a *banking liquidity* channel of transmission: ECB's APPs tended to positively affect cross-border portfolio and banking flows into CESEE economies in an indirect way, i.e. by means of their impact on certain euro-area liquidity indicators.

3. A counterfactual analysis shows that, especially in more recent quarters when it was gradually extended and enlarged, the programmes of outright asset purchases supported both types of capital inflows which, being absent such measures, would have turned to be weaker than they actually were.

4. The empirical evidence may imply relevant macro-financial policy implications for CESEE economies going forward.

ECB's APPs: stylised facts



Source: ECB; Bloomberg.
Note: end-of-the-week data, in billion euros.

Short-run spillovers: event study analysis

Around the dates of the *announcements* of ECB's APPs (17 events recorded from January 2009 to December 2015), we study the response of:

a. nominal spot FX (expected +);
b. long-term interest rates (expected -);
c. stock market indices (expected +);
d. portfolio inflows (EPFR, not BoP), directed to both the stock and the bond sector (expected +)

In the econometric exercise, we use a 1-day window in case of financial variables and a 1-week window for portfolio inflows.

Formally, we run the following FE panel regression (as in Falagiarda *et al.*, 2015):

$$y_{i,t}^{(j)} = \alpha_i + \beta_1 APP_{EA,t} + \beta_2 F_t + \epsilon_{i,t}$$

where the controlling variables F_t are:

a. contemporaneous surprises related to the release of macroeconomic indicators in the euro area and the US (proxied by the Citigroup Economic Surprise indices);
b. contemporaneous (log) changes in global volatility indicators (the JPMorgan currency volatility index for FX; the MOVE index for long-term interest rates; the VIX index for stock market returns and portfolio inflows) to account for movements related to common shocks.

Event study analysis: results

		Nominal spot FX	10 year yields	Equity returns	Portfolio flows		
					All	Stock	Bond
ECB indicator dummy		**0.054**	**-0.014**	**0.411**	**1.853**	**0.438**	**1.520**
		(0.036)*	**(0.009)***	**(0.147)****	**(0.831)****	**(0.224)***	**(0.671)****
Surprise index (Citi)							
	US	0.000	**0.000**	**0.002**	0.007	**0.014**	**-0.004**
		(0.000)	**(0.000)***	**(0.000)*****	(0.006)	**(0.007)***	**(0.002)****
	Euro area	**0.000**	0.000	**0.000**	0.022	**0.015**	0.010
		(0.000)**	(0.000)	**(0.000)*****	(0.015)	**(0.008)***	(0.009)
Volatility measures							
	JPMorgan	**-2.602**					
		(1.402)*					
	MOVE		**0.087**				
			(0.036)**				
	VIX			**-2.587**	**-0.069**	**-0.023**	**-0.052**
				(0.785)***	**(0.028)****	**(0.009)****	**(0.022)****
Constant		**-0.006**	**-0.002**	**0.009**	**0.770**	**-1.132**	**1.692**
		(0.001)***	**(0.000)*****	**(0.002)*****	**(0.119)*****	**(0.055)*****	**(0.072)*****
	Observations	18,250	10,950	17,886	3,000	2,398	2,978
	R-squared (adj.)	0.03	0.00	0.02	0.00	0.02	0.00

Note: the sample of 11 EMEs includes Albania, Bosnia, Bulgaria, Croatia, Czech Republic, Hungary, FYR of Macedonia, Montenegro, Poland, Romania and Serbia. Robust standard errors are provided in parenthesis, ***p<0.01, **p<0.05, *p<0.1. Nominal spot FX is the (one-day) percentage change in country i's currency bilateral exchange rate vis-à-vis the euro; 10 year yields is the (one-day) change in country i's ten-year government bond yield; Equity return is the (one-day) change in country i's major stock market index; Capital flows are weekly amount of portfolio inflows into country i's bond and equity sectors; the Surprise index (Citi) measures the contemporaneous surprises related to the release of macroeconomic indicators in the US and the Euro area; JPMorgan is a volatility index for EMEs FX changes; MOVE is a volatility index for long-term bond yields; VIX is the Chicago Board Option Volatility Index, a popular measure of the implied volatility of S&P 500 index options.

Overall, results are consistent with our *a priori* and other pieces of extant research (Fratzscher *et al.*, 2014; Falagiarda *et al.*, 2015; Georgiadis and Gräb, 2015).

Event study analysis: shortcomings

Event study techniques can only provide a limited representation of the spillover effects from non-standard monetary measures, since they cannot capture longer-lasting (and, for this reason, more relevant from a policy perspective) financial (or real) effects.

It is therefore important to combine this approach with other methodologies which, controlling for a wider set of macroeconomic and financial variables, take into account longer time spans.

Long-run spillovers: overall strategy

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Our assumption

The ECB's APPs have had an impact on euro area liquidity conditions which, on their turn, have translated into a support for larger cross-border capital flows (Bruno and Shin, 2012, 2013, 2014, 2015; Rey, 2013, 2015) directed to CESEE economies.

Against this background, we use a two-step procedure.

First, we isolate the share/fraction of the changes in euro-area liquidity conditions which is directly attributable to the unfolding of the ECB's APPs (Ahmed and Zlate, 2014; Korniyenko and Loukoianova, 2015).

Second, we plug this share/fraction into a panel model aimed to examine whether, and to what extent, the implementation of the ECB's APPs affected the (quarterly) cross-border flows of portfolio and banking capital towards our sample of 11 CESEE economies in the period 2009Q1-2015Q4, therefore revealing the existence of both a *portfolio rebalancing* and a *banking liquidity* channel at play.

The ECB's APPs and euro area liquidity conditions

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As regards the measures of euro area liquidity conditions we used a standard array of both *price* and *quantity* indicators, extensively used in the empirical literature on global liquidity.

Among the former:

a) the average level of 10-year yields on euro area AAA rated government bonds (Korniyenko and Loukoianova, 2015);

b) the slope of the yield curve (Cerutti *et al.*, 2014);

c) the average spread between Italian and Spanish long-term yields and the German Bund (our innovation; included to capture redenomination risk and supposed being relevant for banking flows only).

Among the latter:

a) the yearly changes in the M2 aggregate (IMF, 2010);

b) the yearly changes in the stock of credit to the private sector (Cerutti *et al.*, 2014).

All the variables are regressed on (one-quarter ahead) actual gross asset purchases.

The ECB's APPs and euro area liquidity conditions (cont.)

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As a first step, we perform OLS regressions over the period 2009Q1-2015Q4 of each indicator upon the one-quarter ahead actual gross asset purchases.

	Nominal credit (percentage)	M2 aggregate (percentage)	Long-term yields (in percent)	Slope of the yield curve (in basis points)	Average spread (in basis points)
Asset purchases	**0.018**	**0.028**	**-0.114**	**-8.818**	**-6.133**
	(0.006)* **	**(0.005)*** **	**(0.012)*** **	**(0.813)*** **	**(1.295)*** **
Costant	-0.270	2.547	2.745	248.433	234.580
	(0.229)	(0.143)***	(0.081)***	(6.478)***	(12.965)***
Observations	61	61	217	217	217
R-squared (adj.)	0.06	0.28	0.32	0.30	0.06

Note: robust standard errors are provided in parenthesis, ***p<0.01, **p<0.05, *p<0.1. Nominal credit is the yearly change in credit to the private sector; M2 aggregate is the yearly change in M2; Long-term yields is the average level of 10-year yields on euro area AAA rated government bonds; Slope of the yield curve is defined as the differential between 10-year and 3-month yields of euro area government bonds; Average spread is the average spread between Italian and Spanish 10-year yields and the corresponding German Bund.

As a second step, we use the estimation results to calculate the relative fitted values, which are intended to measure the actual impact of ECBs' APPs on euro area liquidity conditions.

Such fitted values are then plugged as relevant independent variables in a specification for both the *portfolio rebalancing* and the *banking liquidity* channel of transmission.

Long-run spillovers: the *portfolio rebalancing* channel

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We start from a simple representation (Ahmed and Zlate, 2014):

$$PORT_{i,t} = \alpha_i + \beta_1 G_{i,t-1} + \beta_2 G_{EA,t-1} + \beta_3 R_{i,t-1} + \beta_4 R_{EA,t-1} + \beta_5 VIX_t + \beta_6 t + \epsilon_{i,t}$$

where:

- $PORT_{i,t}$: portfolio investment flows to country of destination i at time t from the EU based mutual funds (compiled by EPFR), as a percentage of domestic nominal GDP;
- $G_{i,t-1}$: annual real GDP growth in country i (expected +);
- $G_{EA,t-1}$: annual real GDP growth in the euro area (expected +/-);
- $R_{i,t-1}$: interest rate conditions in country i (expected +);
- $R_{EA,t-1}$: interest rate conditions in the euro area (expected -);
- VIX_t : the Chicago board option volatility index (expected -);
- t : a time trend.

We then augment the basic empirical model with: 1) the actual measures of euro area liquidity conditions; alternatively, 2) the relative share/fraction ascribed to the actual implementation of the APPs (i.e., the fitted values seen before); and, finally, 3) a simple dummy variable (to investigate the behaviour of such flows during the quarters when the different rounds of APPs were first announced or subsequently extended).

Long-run spillovers: the *portfolio rebalancing* channel (cont.)

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CATEGORY	NAME OF VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	Constant	**0.482**	**0.258**	**1.613**	**0.524**	**0.676**	**0.676**
		(0.135)***	**(0.144)***	**(0.616)*****	**(0.199)*****	**(0.252)*****	**(0.252)*****
Growth							
	Domestic real GDP growth	**0.018**	**0.017**	**0.020**	**0.019**	0.000	0.000
		(0.009)*	**(0.010)***	**(0.009)****	**(0.011)***	(0.022)	(0.020)
	Euro area real GDP growth	0.033	**0.054**	**0.035**	0.033	0.036	0.036
		(0.019)	**(0.027)****	**(0.021)***	(0.022)	(0.033)	(0.030)
Short-term rates							
	Domestic interbank rate	**0.052**	**0.053**	**0.051**	**0.052**	0.042	0.042
		(0.027)*	**(0.029)***	**(0.028)***	**(0.028)***	(0.044)	(0.042)
	Euro area interbank rate	**-0.201**	**-0.307**	**-0.206**	**-0.202**	**-0.282**	**-0.282**
		(0.071)**	**(0.095)*****	**(0.062)*****	**(0.062)*****	**(0.109)*****	**(0.102)*****
VIX		**-0.095**	-0.012	-0.058	**-0.106**	**-0.096**	**-0.096**
		(0.065)***	(0.029)	(0.048)	**(0.044)*****	**(0.030)*****	**(0.028)*****
Time trend		**-0.012**	**-0.018**	**-0.045**	**-0.014**	**-0.017**	**-0.017**
		(0.005)*	**(0.006)*****	**(0.016)*****	**(0.005)*****	**(0.007)*****	**(0.007)*****
Euro area liquidity indicators							
Non-price:	Growth of Euro area M2		**0.045**				
			(0.019)***				
Price:	Long-term bond yields			**-0.261**			
				(0.094)***			
Asset purchases							
	Announcements				**0.061**		
					(0.020)***		
Asset purchases' impact on:							
	Growth of Euro area M2					**0.034**	
						(0.016)**	
	Long-term bond yields						**-0.052**
							(0.022)**
	Observations	201	201	201	201	168	168
	R-squared (adj.)	0.27	0.27	0.24	0.25	0.08	0.08

Note: the sample of 11 EMEs includes Albania, Bosnia, Bulgaria, Croatia, Czech Republic, Hungary, FYR of Macedonia, Montenegro, Poland, Romania and Serbia. Bootstrapped (1,000 replications) standard errors are provided in parenthesis, ***p<0.01, **p<0.05, *p<0.1.

ECB's APPs tended to affect portfolio flows into CESEE countries both directly (based on their announcement effect) and indirectly (through their influence on our chosen set of indicators of euro area liquidity conditions).

Long-run spillovers: the *banking liquidity* channel

We start from a simple specification (Garcia-Herrero and Martinez-Peria, 2005; McGuire and Tarashev, 2008; Buch *et al*., 2009; Herrmann and Mihaljek, 2010):

$$BANK_{i,t} = \alpha_i + \beta_1 G_{i,t-1} + \beta_2 R_{i,t-1} + \beta_3 NEER_{i,t-1} + \beta_4 M2_{i,t-1} + \beta_5 VIX_t + \beta_6 t + \epsilon_{i,t}$$

where:

- $BANK_{i,t}$: exchange rate-adjusted changes in the external position of BIS reporting banks vis-à-vis country *i (*banks and non-banks sectors*)*, as a percentage of domestic nominal GDP;
- $G_{i,t-1}$: annual real GDP growth in country *i* (expected +);
- $R_{i,t-1}$: interest rate conditions in country *i* (expected +);
- $NEER_{i,t-1}$: annual nominal effective exchange rate changes in country *i* (expected +);
- $M2_{i,t-1}$: annual M2 growth in country *i* (expected +);
- VIX_t : the Chicago board option volatility index (expected -);
- t : a time trend.

We again augment the basic empirical model with both the actual measures of euro area liquidity conditions, their corresponding 'instruments' and the simple dummy variable.

Long-run spillovers: the *banking liquidity* channel (cont.)

CATEGORY	NAME OF VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Constant	**7.841**	**6.514**	**15.879**	**10.078**	4.502	**10.588**	**10.588**	**10.588**
		(3.887)*	**(3.407)***	**(5.906)****	**(4.009)****	(4.387)	**(3.608)****	**(3.608)****	**(3.608)****
Domestic									
	Domestic real GDP growth	**0.583**	**0.389**	**0.579**	**0.554**	**0.577**	0.170	0.170	0.170
		(0.153)***	**(0.183)***	**(0.143)*****	**(0.130)*****	**(0.154)*****	(0.130)	(0.130)	(0.130)
	Domestic interbank rate	0.309	-0.037	0.355	0.478	0.260	-0.206	-0.206	-0.206
		(0.415)	(0.457)	(0.391)	(0.369)	(0.421)	(0.330)	(0.330)	(0.330)
	Exchange rate	**0.209**	**0.168**	**0.251**	**0.156**	**0.229**	**0.158**	**0.158**	**0.158**
		(0.071)***	**(0.088)***	**(0.074)*****	**(0.076)***	**(0.071)****	**(0.087)***	**(0.087)***	**(0.087)***
	M2 growth	**0.170**	0.045	**0.155**	**0.141**	**0.177**	-0.063	-0.063	-0.063
		(0.057)***	(0.033)	**(0.053)*****	**(0.051)****	**(0.058)****	(0.039)	(0.039)	(0.039)
Global									
	VIX	**-2.089**	**-2.339**	-1.545	**-2.888**	-1.018	**-2.632**	**-2.632**	**-2.632**
		(1.016)*	**(0.887)****	(1.123)	**(0.841)*****	(1.278)	**(0.834)****	**(0.834)****	**(0.834)****
Time trend		**-0.256**	**-0.208**	**-0.479**	-0.130	**-0.261**	**-0.182**	**-0.182**	**-0.182**
		(0.133)*	**(0.107)***	**(0.214)***	(0.107)	**(0.132)***	**(0.054)*****	**(0.054)*****	**(0.054)*****
Euro area liquidity indicators									
Non-price:	Growth of Euro area M2		**0.875**						
			(0.371)**						
Price:	Long-term bond yields			**-2.012**					
				(0.840)**					
	Average spread				**-0.015**				
					(0.005)**				
Asset purchases									
	Announcements					0.011			
						(0.318)			
Asset purchases' impact on:									
	Growth of Euro area M2						**1.294**		
							(0.261)***		
	Long-term bond yields							**-1.975**	
								(0.399)***	
	Average spread								**-0.020**
									(0.004)***
	Observations	237	237	237	237	237	180	180	180
	R-squared (adj.)	0.55	0.64	0.56	0.62	0.55	0.15	0.15	0.15

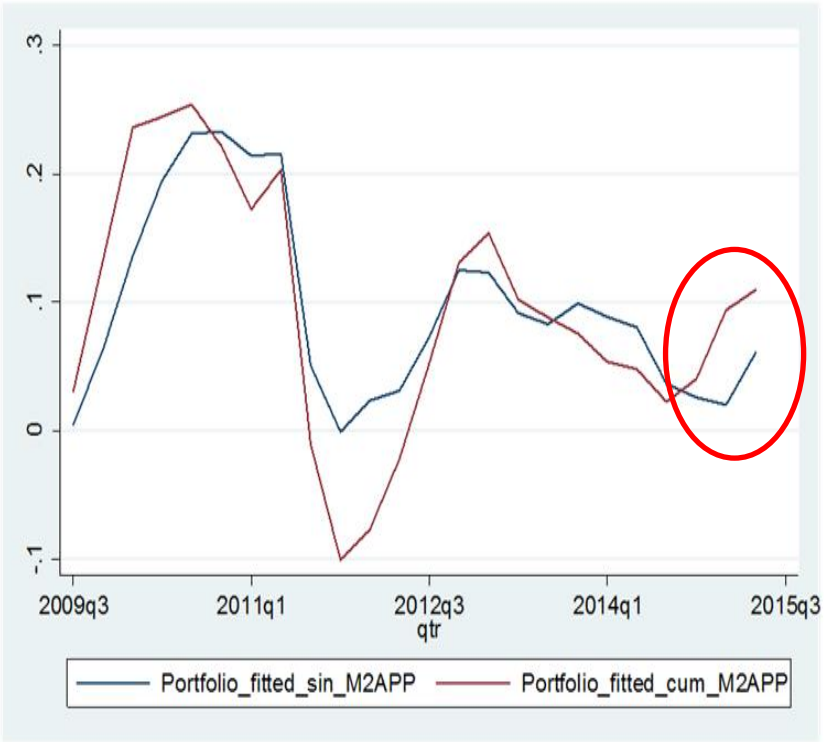
Note: the sample of 11 EMEs includes Albania, Bosnia, Bulgaria, Croatia, Czech Republic, Hungary, FYR of Macedonia, Montenegro, Poland, Romania and Serbia. Bootstrapped (1,000 replications) standard errors are provided in parenthesis, ***p<0.01, **p<0.05, *p<0.1.

ECB's APPs tended to affect cross border banking flows into CESEE countries indirectly (through their influence on our chosen set of indicators of euro area liquidity conditions).

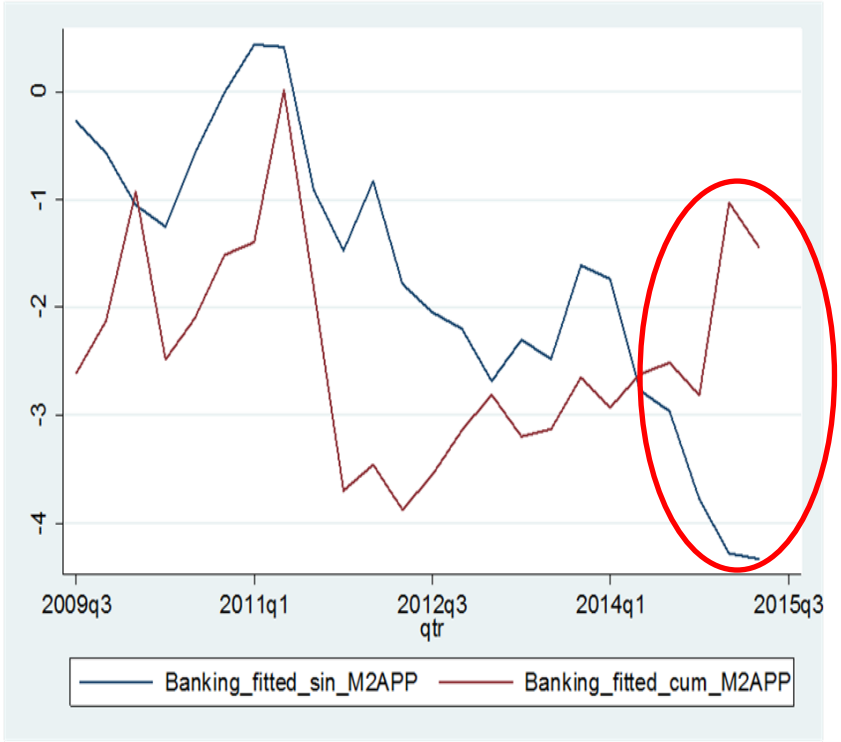
Counterfactual analysis

We compare the fitted values from the full model with the model predictions under the counterfactual that keeps that particular explanatory variable of interest at a certain value, rather than allowing it to evolve as it actually did.

Portfolio inflows



Cross-border banking inflows



Note: The fitted values and counterfactuals are based on the model with country fixed effects. The counterfactuals are the fitted values obtained under the assumption that the ECB APP variable was kept equal to zero over the whole estimation period.

The impact of ECB's APPs on the dynamics of the M2 aggregate turned out as an economically important determinant of cross-border capital flows, helping to sustain them especially in the more recent years, when the programme was gradually extended and enlarged.

Robustness tests

1. Event study analysis:

   we used longer time spans (two-days and one-week) instead of the one-day window case reported in the main table.

2. ECB's APPs impact on euro-area financial and liquidity conditions:

   we used longer time spans (quarterly) instead of the weekly (for financial vbls.) and monthly (for monetary aggregates).

3. *Portfolio rebalancing* channel:

   - we used the credit to the private sector instead of M2 and the slope of the yield curve instead of long-term rates;
   - we re-estimated the whole models separating between stock and bond flows.

4. *Banking liquidity* channel:

   we used the credit to the private sector instead of M2 and the slope of the yield curve instead of the long-term rates.

Results turned out being broadly consistent with those reported in the main tables and confirm the role played by ECB's APPs.

Policy implications

Our empirical evidence could be thought of pointing to a half-full glass for CESEE economies.

So far, a number of CESEE economies have adapted their policy settings to the spillover effects arising from ECB's APPs mainly by slashing domestic reference interest rates to historical lows.

Nevertheless, as long as price developments in the euro area don't warrant a *tapering* of non-standard stimulus, new vulnerabilities may potentially build up. The same Fed's QE experience clearly suggests that the desirability of cross-border effects of UMPs may change over time, as the cyclical position of receiving (emerging) economies gradually reinforces and the growth prospects with respect to advanced economies diverge.

Going forward, to safeguard domestic macro-financial stability policymakers in CESEE economies should stand ready to adapt their portfolio of instruments, e.g.: by making the exchange rate fully flexible; by easing further reference rates; by implementing sterilised interventions in FX markets; by conducting countercyclical fiscal measures; by adopting new well-suited macroprudential tools; by introducing capital flows management measures (as a very last resort).

Of course, the appropriate policy response will inevitably involve trade-offs and need careful evaluation depending on the underlying source of risks to the financial system as well as country-specific circumstances.

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Thank you

Supporting slides_I: a taxonomy of the ECB's APPs

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Covered Bond Purchase Programme (CBPP*X*)

Purchases on primary and secondary markets.

1. CBPP1 (July 2009–June 2010), with a predefined amount of €60 billion;
2. CBPP2 (July 2009–June 2010), with a predefined amount of €40 billion but only €16.4 billion actually purchased;
3. CBPP3 (October 2014–ongoing), with a not predefined amount (€198 billion as of November 2016).

Securities Markets Programme (SMP)

Purchases on secondary markets "to ensure depth and liquidity in those market segments that are dysfunctional" (May 2010–September 2012).

- Sterilized interventions;
- Amount not pre-defined; currently €102 billion.

Outright Monetary Transactions (OMT)

Purchases on primary and secondary markets

- Conditionality/ 1-3 years/ no predefined amount
- Never activated

Asset Backed Securities Purchase Programme (ABSPP)

Purchases on primary and secondary market (November 2014–ongoing), €21 billion purchased as of November 2016.

Public Sector Purchase Programme (PSPP)

Purchases on secondary markets/detailed rules (March 2015–ongoing), predefined amount (€80 billion monthly until March 2017); €1,135 billion as of October 2016.

Corporate Sector Purchase Programme (CSPP)

Purchases on primary and secondary market (June 2016–ongoing), €40 billion as of November 2016.

Supporting slides_II: transmission channels of UMPs

The literature has focused on three main transmission channels (not mutually exclusive):

1. **Portfolio rebalancing channel.** Modification in size and composition of the balance sheet of both the central bank and the private sector. Necessary condition imperfect substitutability among different assets.

2. **Banking liquidity channel.** Easing financial conditions and supporting bank lending to the private sector by improving the availability of more easily traded funds.

3. **The signalling/confidence channel.** Through its unconventional measures, the central bank conveys information to the public about its intentions regarding the future evolution of monetary policy, which influences long-term yields.