MONETARY POLICY AND CYCLICAL SYSTEMIC RISK - FRIENDS OR FOES?

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Abstract

We explore the procyclicality of monetary policy decisions towards the financial cycle in the 1995–2015 period on a sample of seven central banks. Using the real interest rate gap and the credit-to-GDP gap, we provide evidence that monetary policy procyclicality is a material issue occurring in more than 50% of observations in expansionary phase of financial cycle. It indicates that the central bank faces conflicting objectives of price and financial stability (as proxied by cyclical systemic risk). Nevertheless, taking into consideration all financial cycle phases, complementariness between price and financial stability is more frequent than cases with conflicting objectives in the UK, Euro Area and the US. The occurrence of potential procyclical behaviour of monetary policy (especially in the financial cycle expansion phases) underlines the need for proactive macroprudential policy.

Keywords: financial stability, macroprudential policy, monetary policy, financial cycle
JEL Classification: E52, E58, E61, G18

1. Introduction

Since the onset of the Global Financial Crisis (GFC), maintaining financial stability has been the key concern of policymakers. The scale of negative effects caused and the resulting losses in the real economy underline the need to pre-emptively safeguard financial stability. The Jackson Hole paradigm is no longer valid, and both price stability and financial stability are currently the two indispensable pillars of economic stability. However, this situation raises the question of the evolving role of monetary policy (the *leaning vs*. *cleaning* debate) as well as the interactions between price and financial stability. There is no question of whether or not both policies interact, rather what is the potential trade-off between achieving both goals at the same time.

For example, although an excessively loose monetary policy (*i.e*. the low-level interest rates) is conducive to price stability, it may fuel the procyclical cumulative build-

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up of financial imbalances at the same time (Borio *et al.,* 2016). This study aims to assess the extent to which monetary policy stance (as proxied by the real interest rate gap) was countercyclical or procyclical towards the financial cycle (as proxied using credit/GDP gap) on the sample of seven central banks from both post-communist economies (Poland, Hungary and the Czech Republic) and four from advanced countries (the UK, Sweden, the US and Euro Area) over the period of 1995−2015.

The contributions of this research are twofold. First, we assess the co-movement between the monetary policy stance and the phases of the financial cycle in seven countries. This is in contrast to previous studies focussing on the effect of monetary policy on the business cycle only, and we prove that the procyclicality of monetary policy towards financial cycle is material. Second, we empirically investigate the extent of potential conflicts between achieving inflation target and stabilizing the financial cycle on the basis of the theoretical framework provided by Beau *et al.* (2012) and find that these conflicts are not negligible, especially in the expansive phase of financial cycle. To the best of our knowledge, this investigation has been done only to a limited extent in the literature.

This paper is organised as follows. In the second section, we review the relevant literature on financial cycles and monetary policy effect on cyclical systemic risk. In the third part, we discuss the methodology applied and outline the data sources used. The fourth part contains stylised facts about monetary policies and financial cycles in the analysed countries. The fifth section presents the empirical results of monetary policy procyclicality and the final section concludes.

2. Literature Review on Monetary Policy and Financial Cycle

Procyclicality, as a cyclical dimension of systemic risk, might be regarded as self-reinforcing cyclical fluctuations in risk and leverage and their distribution within the financial system (Smaga, 2014). It strengthens interconnectedness within the financial sector and may negatively affect economic growth (Olszak and Pipień, 2016). Procyclicality is especially pronounced in the banking sector, and it is mainly due to both exogenous and endogenous factors (Athanasoglou *et al*., 2014).

Financial cycles are considerably distinct from business cycles. Financial cycles are longer, deeper, with much greater amplitude than business cycles, but with lower frequency (Hiebert *et al.,* 2014). Financial cycles are a medium to long-term phenomenon as opposed to a short-term business cycle. The length and amplitude of financial cycles also depend on the given financial regime, monetary regime and real-economy regime. Both the duration and amplitude of the financial cycle have increased since the mid-1980s, with an average duration of around 16 years (Borio, 2014a).

Although distinct, business and financial cycles are closely interlinked. Kollintzas *et al*. (2011) prove that a positive correlation exists between procyclical monetary aggregates and GDP. Further, Claessens *et al*. (2011) show using a sample of 44 countries in the period of 1960–2010 that recessions associated with financial disruptions, notably house and equity price busts, tend to be longer and deeper than other recessions because financial

cycle peaks are closely associated with financial crises (Borio, 2014a; Stremmel, 2015). At the same time, recoveries following asset price busts tend to be weaker, but recoveries associated with rapid growth in credit and house prices are usually stronger.

However, both business and financial cycles are more pronounced in emerging markets (EMEs) than in advanced countries. In a panel of 71 countries from 1970 to 2012, Calderon and Fuentes (2014) arrive at the conclusion that recessions in the EMEs are deeper, steeper and costlier than those in industrial countries, and that this condition is associated with a higher incidence of crises in the EMEs. Recoveries in the EMEs are stronger but slower and more volatile than those in industrial countries. During crisis-related downturns, real credit and asset prices tend to be more volatile in the EMEs than regular recessions. Moreover, peaks in a financial cycle tend to precede peaks in a business cycle during crises in the EMEs. Financial cycles are increasingly being determined by the global financial cycle (Bauer *et al*., 2016), thereby reducing the effect of conventional monetary policy on the "national" financial cycle.

Table 1 | Monetary Policy Instruments and Financial Stability – Review of Impact Channels

Impact Channel	Source	Monetary Policy Instrument	Effect on Financial Stability/ Financial Cycle
Balance sheet	Illing, 2007	Liquidity injection programmes	Increase in leverage and excessive asset price movements
	Shin, 2008	Liquidity injection programmes in case of poorly capitalised institutions	Credit expansion and increase in total assets of financial institutions, thus leading to asset price growth and additional balance sheet expansion
	Persson, 2009	Interest rate cut	Increase in over-indebtedness of households and nonfinancial corporations
Risky behaviour	Ioannidou *et al*., 2008, Jiménez *et al*., 2008	Interest rate cut	Higher share of loans provided to borrowers with worse creditworthiness
	Nicolo *et al*., 2010	Interest rate cut	Search for yield behaviour
	Landier *et al*., 2011	Interest rate increase	Higher exposure to the risk of real estate price changes
Asset prices and exchange rate	Taylor, 2007	Interest rate cut	Higher level of asset prices (in 2001–2005 in the US)
	Merrouche and Nier, 2010	Interest rate cut	Strengthening financial imbalances in other countries–higher exchange rate volatility
	IMF, 2013	Interest rate increase	Increase in the share of foreign currency loans

Source: Authors

Irrespective of their primary goal, monetary policy instruments affect financial stability and the financial cycle (see Table 1). The strength and direction of monetary policy decisions affecting systemic risk depend on the source of systemic risk (IMF, 2013). If the balance sheet structure of monetary financial institutions is the source of systemic risk, then the central bank's policy involving liquidity programmes increases their leverage (*e.g*. through risk assessment models; see *e.g*. Illing, 2007).

Reduction in interest rates, as a main monetary policy instrument, can be a "double-edged sword." In the short term, it decreases credit risk but encourages clients to take more debt and increase their level of the over-indebtedness in the medium term (Jiménez *et al*., 2008). Several studies have shown that the reduction of interest rates may induce banks to provide loans to riskier borrowers with worse creditworthiness. The high level of risk-taking behaviour is observed in small banks and cooperative banks (*e.g.* Ioannidou *et al.*, 2008, Jiménez *et al.*, 2008). Further, interest rates that turn negative exacerbate the search for yield behaviour. Ultra-low or negative interest rates encourage investors to search more profitable and risky investment opportunities (Nicolo *et al.*, 2010).

Monetary policy affects systemic risk through asset prices, currency and capital flows channels. Taylor (2007) shows a significant correlation between monetary policy decisions and asset prices in the period of 2001–2005. Expansionary monetary policies induce capital flows, which may increase financial imbalances (Merrouche and Nier, 2010). In a negative interest rate environment, capital flows between countries may force central banks to cut interest rates to stop the currency exchange appreciation. However, if the source of systemic risk is foreign currency loans, restrictive monetary policies will amplify the accumulated risk and exposure to foreign exchange volatility (IMF, 2013). Moreover, Agur and Demertzis (2012) identify the substitution effect related to restrictive monetary policies. When the interest rate increases, balance sheet items levered by the banking sector become more expensive. Therefore, banks strive to lever less, thus lowering risk taking.

Thus, the following question remains: Should monetary policy, which aims to stabilise price, consider the financial cycle? Delis and Karavias (2015) show that the "optimal" monetary policy targeting stabilisation of the business cycle simultaneously forces the level of banks' credit risk out of equilibrium. The optimal policy dampens the strength of financial amplification by responding to the drivers of uncertainty shocks in stress periods, even if doing so is at the expense of creating a mild degree of fluctuations in inflation (Fendoglu, 2014). However, Baxa *et al*. (2013) find that the degree of financial stress effect on the changes in interest rate setting is nil when the levels of stress are moderate.

A financial cycle is usually measured best with the credit-to-GDP gap. The most promising leading indicators of financial crises are gaps of the ratio of (private sector) credit-to-GDP and asset prices, especially property prices (Borio and Drehmann, 2009), as combining them appears to capture the link among the financial cycle, business cycle and crises. Borio *et al*. (2012) and Giese *et al.* (2014) show that financial cycle is effectively identified by the co-movement of cycles in credit and property prices aside from the credit-to-GDP gap. The ESRB (2014) finds that the credit-to-GDP gap is the best single leading indicator for systemic banking crises associated with excessive credit growth for both

the EU as a whole and for the majority of EU countries, including for CESEE countries (Geršl and Seidler, 2015).

The literature on financial cycles and on the interactions between various phases of real and financial cycles is relatively new and blossomed after the GFC. Many empirical studies have been conducted on the monetary policy effect on the business cycle (see *e.g.* Kaminsky *et al*. (2005), McGettigan *et al.* (2013). However, to our knowledge, the potential effect of monetary policy on a financial cycle has been explored only to a limited extent to date. Therefore, we attempt to address this gap.

3. Methodology and Data

To assess the cyclical behaviour of monetary policies, we analyse three post-communist countries (Hungary, the Czech Republic and Poland) and four advanced countries/regions (the United Kingdom, Sweden, the US and euro area). We use OECD data[1] and data from central bank websites for the quarterly inflation rates. As a proxy for monetary policy decisions we analyse the official interest rates assuming the level of quarterly interest is given as an average of daily rates. We assess the quarterly monetary policy stance in each country/region over the period of 1995−2015 based on the real interest rate gap calculated using Kalman filter (Holston *et al*., 2016)[2]. Therefore the real interest rate gap is a difference between actual real interest rate and the natural real rate, which better determines intertemporal substitution of agents and can be used as a proxy for the monetary policy stance. Comparing to the dynamic general equilibrium models, Kalman filter focuses on higher frequency components, what should be considered as an advantage in a natural rate calculation (Giammarioli and Valla, 2004).

We use quarterly country-level data on the credit-to-GDP ratio[3] from the fourth quarter of 1995 to the fourth quarter of 2015 obtained from the Bank for International Settlement database[4] (data series for euro area starts from the first quarter of 1999) for Hungary, the Czech Republic, Poland, euro area, Sweden and the US.

As previously mentioned, the long-term credit-to-GDP ratio performs well in assessing the build-up of the financial cycle (financial imbalances). Different methods are used to calculate financial cycle trends (*e.g*. Christiano−Fitzgerald filter, Kalman filter and Baxter−King filter; see Mohr (2005)). For the purpose of our research, the long-term trend of credit-to-GDP ratio is calculated using Christiano−Fitzgerald filter with a band of 32 to 120 quarters (Drehmann *et al*., 2012). This band range used in the filter is motivated by the observation that financial cycles are about four times longer than business cycles and that systemic crises tend to occur once every 20−25 years (BSCB, 2010). We choose the CF filter because it allows to unambiguously define the phases of the financial cycle in the whole sample.

1 https://data.oecd.org/price/inflation-cpi.htm (accessed 20 May 2017)

2 For key inputs we use HP filter with $\lambda = 1600$.

3 The ratio includes credits to the private non-financial sector.

4 http://www.bis.org/statistics/totcredit.htm (accessed 20 May 2017)

Subsequently, we analyse the monetary policy stance. For the purpose of the study, expansive monetary policy is defined as the period (number of quarters) when real interest rate gap is negative. Restrictive monetary policy is defined as the opposite.

To check behaviour of monetary policy towards financial cycle, we calculate the share of quarters in the whole sample when each monetary policy stance (expansive and restrictive) is associated with each financial cycle phases (expansion, slowdown, depression and recovery).

$$MPA_{s,f} = \frac{m_{s,f}}{n} \tag{1}$$

MPA (monetary policy approach towards financial phase) equals the share of observation with monetary policy stance *s* in financial cycle phase *f* and *n* is a total number of observations (quarters in the sample). We assess the behaviour of monetary policies towards cyclical systemic risk according to a dynamic approach (changes in the credit-to-GDP gap level). We follow the research approach of Malovaná and Frait (2016) who used the credit-to-GDP to analyse causality between monetary and macroprudential polices in a time-varying coefficient panel VAR model. A similar approach was also taken by Claessens *et al*. (2011), who developed the measure of cycle synchronisation based on the gap change.

Table 2 | Monetary Policy and Financial Cycle Gap: A Dynamic Approach

Monetary Policy/Gap	Positive Financial Cycle Gap Level in Quarte *i*		Negative Financial Cycle Gap Level in Quarter *i*	
	Δgap > 0 (expansive phase)	**Δgap < 0 (slowdown phase)**	**Δgap < 0 (depression phase)**	**Δgap > 0 (recovery phase)**
Expansive in quarter *i*	Procyclical (*build-up of cyclical imbalances*)	Neutral	Counterclical (*reduction of cyclical imbalances*)	Neutral
Restrictive in quarter *i*	Counterclical (*reduction of cyclical imbalances*)	Neutral	Procyclical (*build-up of cyclical imbalances*)	Neutral

Source: Authors

We also assume that we cannot assess the behaviour of monetary policy towards financial imbalances when credit-to-GDP gaps (positive and negative) are closing (in slowdown and recovery phases, see Table 2). When a positive financial cycle gap increases on a quarterly basis (Δ positive gap > 0), the expansive monetary policy is building up financial imbalances (is procyclical towards financial cycle). This approach is similar to the situation in which the interest rate decreases and the asset price bubble builds up (Bordo and Lane, 2012). Similar procyclicality appears when restrictive monetary policy is associated with depression in financial cycle (negative and expanding financial cycle gap). In this situation, an increase in the interest rate leads to further fall in credit flow, which is already below the trend. Beau *at al.* (2012) described this situation as one in which financial deflation occurs when inflation reaches values above the target.

We consider restrictive monetary policies to reduce cyclical financial imbalances (be countercyclical) when a financial cycle gap is positive and increases on a quarterly basis. A similar case involves an expansive monetary policy and depression phase. When a financial cycle gaps closes (slowdown and recovery), the monetary policy behaviour towards cyclical imbalances is defined as neutral. The cases of the monetary policy behaviour towards cyclical systemic risk are defined based on Table 2.

The key indicator for monetary policy is the price level. Therefore, we compare deviation of inflation rate from inflation target with financial cycle phases. We calculate it in two cases - using the actual value of inflation rate and expected values of inflation. Expected values of inflation (4 quarters ahead) were obtained using OLS regression with trend extrapolation methodology:

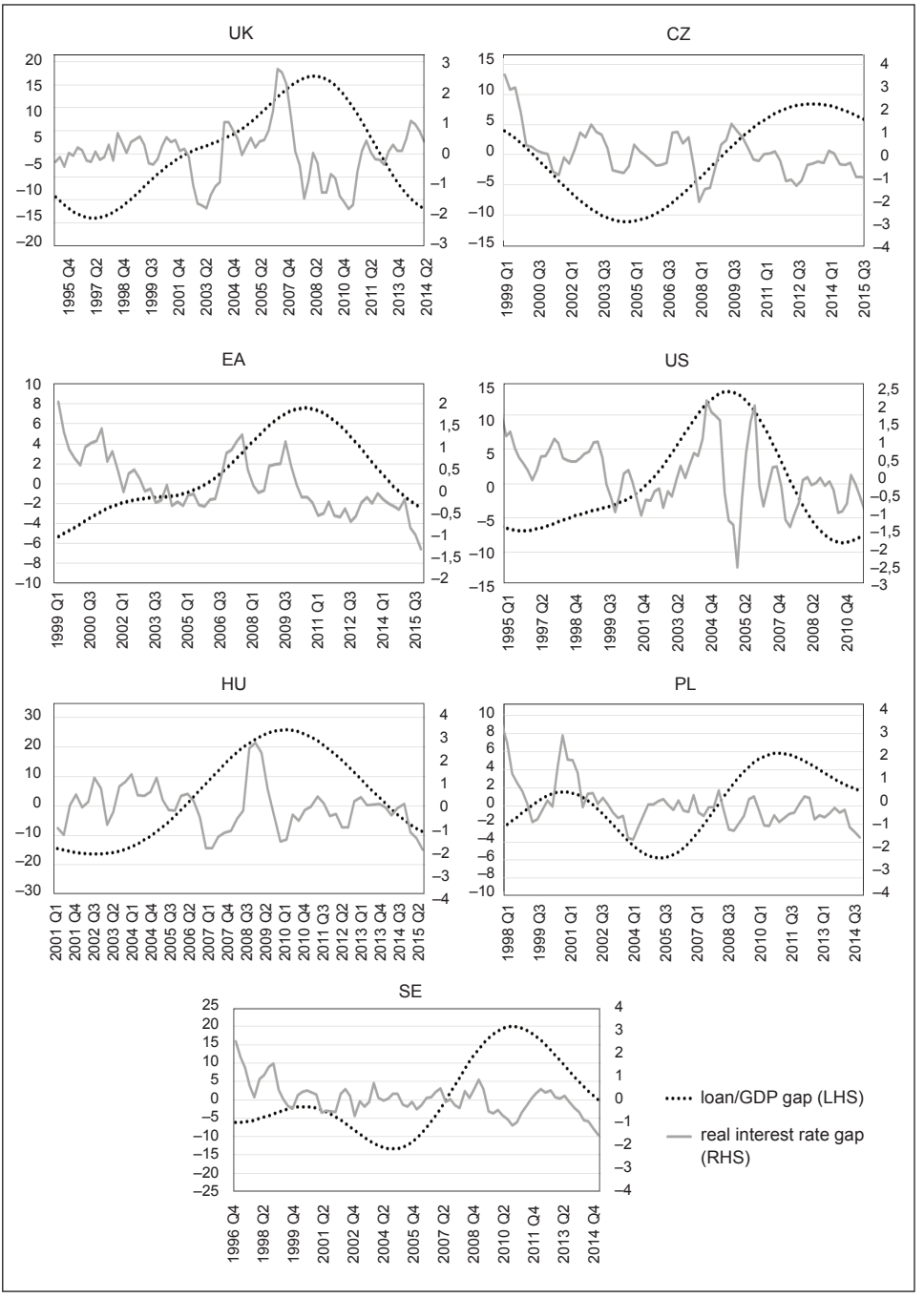
$$\pi_t^e = \mu_0 + \pi_{t-1} + \mu_1 \left(\pi_{t-1} - \pi_{t-2} \right), \tag{2}$$

where π indicates inflation level and μ_0, μ_1 are equation parameters. Such trend extrapolation approach was used for example by Ross and Schmidt (2011), Blanchard *et al*. (2015) and reflects accommodative inflation expectations. In case of medium-term monetary policy strategy (for example in Poland since 1998 to 2004) the inflation target in the each quarter was set up based on the logarithmic interpolation. We show estimation results for expected inflation in Appendix.

4. Stylised Facts about Monetary Policies and Financial Cycles

The monetary policy frameworks are similar in the analysed central banks, as they all announced numerical inflation target. Adapting inflation targeting strategy is a result of the gradual strengthening of monetary policy frameworks in NBP, MNB and CNB after the transformation and of the legal amendments induced by the requirements of membership in the ESCB. Central banks' fledgling monetary policy frameworks in Poland, the Czech Republic and Hungary faced legacy problems of the former regime and the ensuing transformation crises in the 1990s of the 20th century (*i.e*. hyperinflation, easing the transition into a free-floating currency regime and maintaining nascent banking sector stability). Over the course of time, their monetary policy frameworks began to catch up, while dealing with the risks of converging small open economies (*e.g*. excessive credit growth), as fostered by the increasing role of foreign capital in the banking sector (Iwanicz-Drozdowska and Witkowski, 2016). On the contrary, central banks in the United Kingdom, euro area, Sweden and the US were more experienced in the conduct of monetary policy, faced less volatile inflation and more stable currencies, and operated in significantly larger economies and banking sectors. In terms of financial stability objectives, the mandates of the analysed central banks were defined or strengthened only after the recent GFC, along with entrusting central banks with the (leading) role in macroprudential policy. Thus, the monetary policies in the period pre-GFC had lower incentive to consider the financial cycle.

Figure 1 | Financial Cycles and Real Interest Rate Gap Paths in 1995–2015



Source: own calculations based on BIS data.

The development of financial cycles in our sample differed in the period of 1995−2015 (see Figure 1). The peaks in credit-to-GDP gap were recorded early in the US, UK, the euro area and Hungary, while in Poland, Sweden and the Czech Republic the peaks were observed much later. In each country, amplitude of the gap level varies, thus indicating a diverse scale of cyclical systemic risk accumulation. Gap volatility was the highest in the United Kingdom and Hungary and the lowest in the Euro Area and Poland. On average, the highest credit-to-GDP gaps were recorded in Hungary and Sweden (close to 20 p.p.). In the Euro Area, Poland and the Czech Republic, the gaps did not exceed 10 p.p. over the analysed period.

The real interest rate gap paths in the sample period were similar in the Czech Republic, the euro area, Poland and Sweden. In the late 1990s interest rates were on record high levels but since then have started to decline gradually. Recently, real interest rates have gone into the negative territory or have remained at a very low level, reflecting prolonged expansive monetary policy.

5. Cross-Country Results

We conduct the analysis in two stages. First, we compare the monetary policy stance (expansive/restrictive) with four financial cycle phases (by aggregating the outcomes of MPA for each country in each quarter) to assess procyclical or countercyclical outcomes. Yet, we acknowledge that impact of interest rate change on the financial cycle might be additionally influenced by realized shocks that also drive the financial cycle at the same time. Such shocks include *e.g.* sudden repricing of risk premia, credit supply and demand shocks or shocks related to real estate. Therefore, we interpret the monetary policy stance as a factor potentially contributing to, but not solely determining the cyclical systemic risk. Second, from the policy perspective, we analyse the potential degree of conflicts between price and financial stability objectives by comparing the level of (both current and expected) inflation rate (above or below the numerical inflation target) in four financial cycle phases.

We defined monetary policy as procyclical when monetary expansion accelerates the existing expansionary phase of the cycle or when restrictive monetary policy amplifies the depression in the financial cycle. On the contrary, monetary policy works countercyclically when it is restrictive in expansionary phase of the cycle or expansionary in the cyclical depression. Results for such cases are presented in Table 3.

Several conclusions might be drawn from Table 3. The procyclicality of monetary policy exists in 40–70% of cases in an expansionary financial cycle phase (*e.g.* in euro area, US and Poland). It is in general less visible in times of cyclical depression (0–55% of cases). The countercyclical monetary policy is also more frequent in the depression phase of financial cycle (45–100% of cases, *e.g.* in the Euro Area and in the US) than in the expansionary phase (30–58%, *e.g.* in the Euro Area and in the UK). The procyclicality of monetary policy is on average the lowest (and consequently its countercyclical stance the highest) in the Euro Area and in the US and UK – countries with significant banking sectors. In this group of countries, there are more instances of countercyclical than procyclical monetary policy. At the same time procyclicality of monetary policy is on average a bit higher in countries with relatively smaller banking sectors in the Czech Republic, Poland and Hungary (except

for Sweden), where there are more frequent cases with monetary policy being procyclical, rather than countercyclical. This might be due to their lower effectiveness of their monetary policies. The effectiveness of monetary transmission channels in small open economies is often reduced by dominant impact of global interest rates. Thus, the ability to shape business and financial cycles by those countries is limited (Bauer *et al*., 2016). Therefore it is harder to assess the approach of national monetary policy towards the (national) financial cycle.

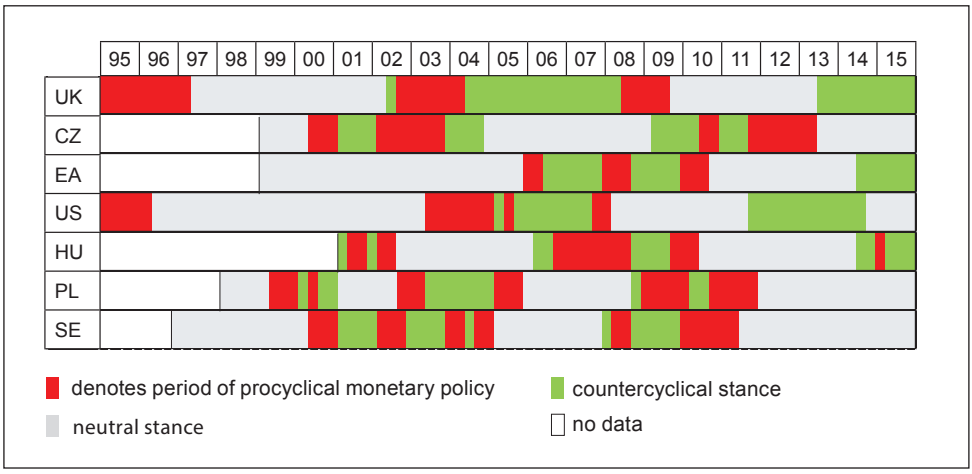
Table 3 | Monetary Policy Stance in Financial Cycle Phases

Country	Monetary Policy Stance	1 or 2*	Expansion	Slowdown	Depression	Recovery
United Kingdom	expansive	1	0.414	1.000	0.550	0.150
		2	0.141	0.176	0.129	0.035
	restrictive	1	0.586	0.000	0.450	0.850
		2	0.202	0.000	0.107	0.202
Czech Republic	expansive	1	0.529	0.563	0.444	0.588
		2	0.130	0.130	0.116	0.145
	restrictive	1	0.471	0.438	0.556	0.412
		2	0.118	0.103	0.147	0.103
Euro Area	expansive	1	0.421	1.000	1.000	0.481
		2	0.116	0.217	0.101	0.188
	restrictive	1	0.579	0.000	0.000	0.519
		2	0.162	0.000	0.000	0.206
United States of America	expansive	1	0.526	0.643	0.706	0.441
		2	0.118	0.106	0.141	0.176
	restrictive	1	0.474	0.357	0.294	0.559
		2	0.107	0.060	0.060	0.226
Hungary	expansive	1	0.647	0.563	0.615	0.286
		2	0.183	0.150	0.133	0.067
	restrictive	1	0.353	0.438	0.385	0.714
		2	0.098	0.115	0.082	0.164
Poland	expansive	1	0.700	0.652	0.538	0.438
		2	0.192	0.205	0.096	0.096
	restrictive	1	0.300	0.348	0.462	0.563
		2	0.083	0.111	0.083	0.125
Sweden	expansive	1	0.571	0.556	0.500	0.320
		2	0.103	0.128	0.128	0.103
	restrictive	1	0.429	0.444	0.500	0.680
		2	0.078	0.104	0.130	0.221

*Note: 1 – share of quarters in the total number of quarters with the given financial cycle phase; 2 – share of quarters in the total number of quarters. Monetary policy is categorized as restrictive when real interest rate gap is above zero and as expansive when real interest rate gap is below zero.

Source: Authors

Figure 2 | Heatmap of Monetary Policy Procyclicality



Source: Own work

We analyse how the procyclicality of monetary policy developed over time, especially in the run-up and after the start of the GFC (see Figure 2) in each country, as indicated by Laeven and Valencia (2012). Here, the results are heterogeneous. Both in the Euro Area, the UK and the US, central banks run countercyclical monetary policy during a few years before the outbreak of the crisis, and mainly natural afterwards. At the same time in Hungary, the monetary policy stance was procyclical in the run-up to the GFC and neutral in Sweden. In Poland and the Czech Republic, where no crisis was recorded according to Laeven and Valencia (2012), the monetary policy stance was natural before the GFC and later mixed.

The procyclicality of monetary policies towards a financial cycle mirrors the potential conflicts between monetary and macroprudential policies. The conflicts between both policies may be caused by i) different objectives (price and financial stability, ii) assigning mandates for price and financial stability to different authorities and iii) interrelations between macroprudential and monetary policy transmission channels that depend on tools used to achieve their objectives. However, both policies affect credit growth and lending rates.

The theoretical literature provides a common example of potential conflicts between these polices (see Table 4), for example, when inflation is below target and a strong risk of asset bubble exists at the same time. Macroprudential policy in this case should restrict bank credit growth, but it leads to the prolongation of the low inflation level and affects the monetary transmission mechanisms. Conversely, the monetary policy expansionary stance has an aversive effect on the systemic risk level. The low interest rate through the risk-taking channel may promote the accumulation of financial imbalances.

We empirically explore examples of conflicts between achieving price stability and stabilizing the financial cycle (see Table 5). We calculate the share of quarters in total sample in particular financial cycle phases with different policies interactions. We conduct

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the analysis under assumption that the inflation is either above or below the official numerical target. We calculated the instances of conflicts using both current and expected inflation, but the results were very similar (see Appendix for estimation method of expected inflation).

Table 4 | Theoretical Instances of Relations between Monetary and Macroprudential Policies

	Inflation above Target	Inflation Close to Target	Inflation below Target
Financial exuberance (boom)	Complementary	Neutral	Conflicting
No imbalances	Neutral	Neutral	Neutral
Financial deflation (bust)	Conflicting	Neutral	Complementary

Source: Beau *et al.* (2012)

Table 5 | Empirical Examples of Potential Conflicts between Price Stability and Stabilizing the Financial Cycle (current inflation)

Country	1 or 2	Expansion	Slowdown	Depression	Recovery
United Kingdom	1	0.262	0.179	0.107	0.119
	2	0.082	0.000	0.129	0.118
Czech Republic	1	0.087	0.000	0.058	0.072
	2	0.162	0.235	0.206	0.176
Euro Area	1	0.116	0.130	0.000	0.319
	2	0.162	0.088	0.103	0.074
United States of America	1	0.190	0.071	0.095	0.214
	2	0.035	0.094	0.106	0.188
Hungary	1	0.267	0.167	0.083	0.150
	2	0.016	0.098	0.131	0.082
Poland	1	0.233	0.055	0.055	0.082
	2	0.042	0.264	0.125	0.139
Sweden	1	0.077	0.026	0.077	0.013
	2	0.104	0.208	0.182	0.312

Note: 1 –current inflation above target; 2 – current inflation below target
Source: Own work

Overall, the share of periods with conflicting objectives is rather small but not negligible. In general, the degree of conflicting objectives (inflation above target in depression or inflation below target in expansion) is higher in expansion phase rather than in depression phase, where financial bust is usually associated with depression in the real economy. In case of the Czech Republic, the UK and Sweden the potential conflicting objectives are present in around 20% of quarters, while only in 10% of quarters in Poland and Hungary. However, the differences cannot be considered as significant.

The share of quarters with complimentary objectives is noticeable. Also the propensity of complimentary objectives (inflation above target in cyclical expansion or below target in cyclical depression) is lower in depression phase than in expansion phase. In expansion, the credit boom might be moderated "as a by-product" of restrictive monetary policy targeted to reduce inflationary pressure in the overheated economy, thus contributing to the achievement of both price and financial stability. In depression phase of the financial cycle expansionary monetary policy helps achieve the inflation target and supports financial stability by decreasing the negative credit-to-GDP gap. However, the question of whether or not unconventional monetary instruments can help fulfil central banks' inflation target and financial stability mandates remains. An increasing number of studies have provided evidence that unconventional monetary policy and negative interest rate policy can also increase systemic risk *via* channels that are not reflected in the financial cycle gap (*e.g.* increase in risk of asset bubbles and market volatility, see Borio and Zabai, 2016). Therefore, macroprudential policy should be more active in an unconventional monetary policy environment than when interest rates are above zero.

The share of quarters with complimentary objectives relatively high in Hungary, the UK and Poland (reaching 36%–40%). Overall results shows that, on average, cases of complementariness between price and financial stability are more prominent (22%–40% of quarters) than cases with conflicting objectives (10%–22% of quarters), which holds for all countries in the sample. At the same time, the expansionary phase of the cycle is the most frequent case of either conflicts of complementariness of objectives.

The implications for the central banks as indicated in Tables 3 and 5 are similar: monetary policy decisions might contribute to build-up of cyclical financial imbalances. Therefore active macroprudential policy action is warranted, especially when the financial cycle is expanding. We cannot exclude the existence of potential conflicts between price and financial stability objectives, and central banks would pursue inflation as the primary target in case of any conflict. Mitigating conflicts between objectives may require establishing coordination mechanisms, which, however, depend on the institutional safety net arrangements. For example in the UK, the Czech Republic and Hungary, the central bank has the final say in both monetary and macroprudential policies, while in the US, Poland and Sweden the central bank is only sharing the responsibility for macroprudential policy with other safety net bodies. In the first case, the conflict might be at least somewhat eased by strengthening the internal coordination mechanisms within the central bank. In the second case clear cooperation and accountability mechanisms between safety net institutions – having their separate objectives – are necessary.

Our results support the central banking framework proposed by Frait and Komárková (2012), who argued that financial stability is an objective of the central bank, which determines its short-term policy choices but does not change its medium- to long-term commitment to price stability. However, as micro- and macroprudential tools and prudential regulations may be insufficient in curbing systemic risks, monetary policy can be used pre-emptively when cyclical imbalances accumulate but only as a secondary measure (co-insurance). Targeted prudential tools may be prone to regulatory arbitrage. This situation entails communication challenges when implementing *leaning against the wind*. Financial stability should be a factor for monetary policy decisions, especially when systemic risk assessment indicates that a certain degree of financial vulnerability (*e.g.* credit-to-GDP gap threshold) has been exceeded. However, to what extent monetary policy (*e.g.* by the interest rate changes) is effective in *leaning* without excessively damaging the real economy remains to be seen (Assenmacher-Wesche and Gerlach, 2010). The need for coordination and synergies between monetary and macroprudential policies is especially prominent in small open economies, where the effectiveness and independence of national monetary policy may be impeded by capital flows, exchange rate fluctuations and foreign monetary policy.

6. Conclusions

Using different approaches, we assessed monetary policy procyclicality of seven central banks towards financial cycle phases in 1995−2015. Our research provides evidence that in financial cycle expansion phase, monetary policy is on average expansive for more than 50% of cases. This indicates procyclical behaviour of monetary policy which may potentially amplify cyclical financial imbalances (as measured using the credit/GDP gap). Monetary policy is more likely to work countercyclically in the depression phase of financial cycle supporting the recovery of both financial and real spheres of the economy. Yet, the complementariness between both objectives is much more frequent than cases with conflicting objectives in UK, Euro Area and the US.

Our results show that the monetary policy procyclicality is a non-negligible issue, which contributes to the ongoing discussion in the literature on how to limit the conflicts between price and financial stability. The interrelations and the degree of the need for coordination among analysed policies remain controversial. Scholars such as Hahm *et al*. (2012) have suggested that monetary and macroprudential policies should be separated. Conversely, others provide evidence that monetary policies that systematically include financial factors support the dampening of the financial cycle, thus improving output in the long run (Borio *et al.*, 2016). Our results support the views of Malovaná and Frait (2016) that monetary tightening coincides with lower credit-to-GDP and that accommodative monetary policy may contribute to a build-up of financial vulnerabilities.

The analysed co-movement between monetary policy and the financial cycle does not directly translate into exploring causality links and transmission channels between monetary policy, macroprudential policy and the financial cycle. As the macroprudential measures

have been introduced only in recent years, exploring their impact on the financial cycle – apart from the impact of monetary policy - would be the desired direction of research in the future. There are already first attempts to comprehensibly conceptualize and model the interactions between transmission mechanisms of monetary policy and prudential policies (Beyer *et al.,* 2017). Further, studying the effect of macroprudential tools on business cycle/inflation is a valuable research area. Apart from obtaining a wider country sample, our study may be extended by considering not only the financial cycle but also the housing and equity market cycles. Moreover, whether or not monetary policy procyclicality depends on the interrelations between business and financial cycles and on structural factors (*i.e*. currency regime or institutional design) is worth exploring.

Appendix

Expected Inflation and Financial Cycle

Empirical Examples of Potential Conflicts between Price Stability and Stabilizing the Financial Cycle (expected inflation)

Country	1 or 2	Expansion	Slowdown	Depression	Recovery
United Kingdom	1	0.226	0.167	0.096	0.131
	2	0.119	0.012	0.133	0.107
Czech Republic	1	0.103	0.000	0.074	0.088
	2	0.147	0.224	0.191	0.162
Euro Area	1	0.118	0.132	0.000	0.269
	2	0.162	0.088	0.103	0.119
United States of America	1	0.179	0.083	0.096	0.214
	2	0.048	0.083	0.096	0.190
Hungary	1	0.233	0.183	0.085	0.133
	2	0.050	0.083	0.119	0.100
Poland	1	0.236	0.056	0.056	0.085
	2	0.042	0.264	0.125	0.127
Sweden	1	0.078	0.039	0.078	0.026
	2	0.104	0.195	0.182	0.289

Note: 1 – expected inflation above the target, 2 - expected inflation below the target
Source: Authors.

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Parameters for Estimation of Expected Inflation

Country	μ_0	μ_1
United Kingdom	−0.0239 (0.6764)	0.3383*** (0.0018)
Czech Republic	−0.0105 (0.9171)	0.3973*** (0.0001)
Euro Area	−0.0109 (0.8341)	0.311** (0.0104)
United States of America	−0.0182 (0.8292)	0.2112* (0.0561)
Hungary	−0.1 (0.4077)	0.4375*** (0.0005)
Poland	−0.1021 (0.3081)	0.4578*** (0.0001)
Sweden	0.0094 (0.8892)	0.3870*** (0.0006)

Note: *t*-statistics are in parentheses, *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

Source: Authors.

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