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Financial Instability and Money Velocity: Evidence from the Financial Crisis

Svatopluk Kapounek, Jana Králová

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Research Centre
Faculty of Business and Economics
Mendel University in Brno
Zemědělská 1, 613 00 Brno
Czech Republic
http://vyzc.pef.mendelu.cz/en
+420 545 132 605

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Abstract

Kapounek, S.; Králová, J.: **Financial Instability and Money Velocity: Evidence from the Financial Crisis**

We focus on the financial instability hypothesis defined as rapid credit growth accompanied with a significant increase in asset prices. We used contribution of the national banking systems within the euro area and identified significant relationship between the money velocity and asset prices before the financial crisis in the year 2007. Finally, we applied cointegration analysis and weak exogeneity tests to identify causality between the money supply created by the national banking systems, economic activity and asset prices. We found heterogeneity in cointegration relations within the euro area. Our recommendations follow Post Keynesian assumptions in relation to the endogeneity of money.

Key words

Financial instability hypothesis, national contribution to the monetary aggregate, money velocity, weak exogeneity test

JEL: E58, E12

Contacts

Svatopluk Kapounek, Department of Finance, Faculty of Business and Economics, Mendel University in Brno, Zemedelska 1, 613 00 Brno, email:kapounek@mendelu.cz

Jana Králová, Department of Finance, Faculty of Business and Economics, Mendel University in Brno, Zemedelska 1, 613 00 Brno, j.kralov@gmail.com

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Introduction

The financial crisis pointed out the new phenomenon, financial instability, which makes the central bank's top focus. Nevertheless, the financial instability hypothesis was pioneered and developed by Minsky already in the sixties and seventies (Minsky, 1963 and 1972). He based the theoretical background on the two theses, (1) capitalism is endogenously prone to growth and (2) that growth endogenously turns into the financial system instability and financial crisis. He argued that an extended period of prosperity increases money velocity and decrease liquidity. Finally, these compounded changes will result in an inherently unstable money market and financial crisis. His recommendation for central bankers was "not to stabilize the economy so much as to act as a lender of last resort" (Minsky, 1982). Subsequently, the idea of unstable money market and passive role of the central banks was contributed by Moore (1979) and developed in the context of endogenous money.

Minsky provided rather a philosophical reasoning such as 'success breeds success breeds failure' or 'success breeds excess breeds failure'. These ideas gained a real form at the beginning of the third millennium. Kindleberger (2000) described 3 types of a speculative bubble and simultaneously found that bubble in asset markets and excessive credit growth threats to financial stability. Borio and Lowe (2002) showed the relationship between the credit money creation and asset prices and defined financial instability as twin phenomenon, (1) rapid credit growth combined with (2) large increases in asset prices. Unfortunately, they were right which turned out in 2007 in the form of mortgage crisis.

However, the financial crisis is a monetary phenomenon. If so, what should be the optimal strategy of central banks to prevent from this type of crises? Borio and Lowe (2002) concluded that central bankers are able to increase interest rates if asset prices and credits accelerate and stabilize the financial markets. On the contrary, Mishkin and White (2002) recommended passive role of the central banks because of the exact unpredictability of financial instability. They proposed to focus on the role of the lender of last resort and consequences of the crises. The limitation of the financial instability predictions confirmed Schinasi (2004) as well. He argued that all indicators based on the analyses of historical data do not include all information about the future turmoil. However, Bauducco et al. (2011) showed that central banks have privileged information about credit risk and are able to reacts instantly. Still, the current empirical literature focuses mostly on the early warning indicators of financial crises (Bussiere and Fratzscher, 2008; Alessi and Detken, 2009 or Babecký et al., 2011). The authors deal with potential leading indicators, lags and differences between the countries.

The fact is that monitoring of financial stability is inherently more difficult than the monitoring of price stability. The key problem is that financial instability affects output and inflation with a significant lag. Therefore an increase of the asset prices within the huge currency union could be wrongly identified as increase at the local market without any risk at the macroeconomic level. If so, the financial instability can spread from the local markets to the whole region without any intervention of the central bank.

The objective of this paper is to identify the relationship between the increase in credit and assets prices in the selected euro area member countries, especially to point out the heterogeneity across the euro area. Finally, we focus on the development of this relationship before and after the outbreak of the financial crisis. Our theoretical contribution is in analysis of money velocity as the indicator of the financial instability.

1 Currenty used methods

Firstly, we revised methodological approach applied by Borio and Lowe (2002). We identified relations between the credit money creation and asset prices. We applied rolling correlation and described changes in time in two currency areas, (1) the United States (US) and (2) the euro area. After that we focused on the selected core and periphery euro area member countries, specifically Germany, France, Italy and Spain. Subsequently, we add to our analysis two EU Member States, which have so far adopted the euro, the United Kingdom and the Czech Republic.

In the second step we follow the contribution of Minsky, that money velocity plays the crucial role in the financial instability, especially that money velocity increasing brings the inflation. We employed traditional `Fisher Identity` and focus on the relation between the money velocity and asset prices.

Finally, with respect to the Post Keynesians` assumptions, we tested possible impact of the investment activities (money demand) and money supply on the asset prices. In this step we applied weak exogeneity test.

1.1 Testing weak exogeneity

To identify the long-term causality and short-term adjustments we applied cointegration analysis. The cointegration analysis assumes that if two series are integrated to different orders, then linear combinations of them will be integrated to the higher of the two orders. 'If yt and xt are each drifting upward with their own trend, then unless there is some relationship between those trend, the difference between them should also be growing, with yet another trend. ... if the two series are both I(1), then this partial difference between them might be stable around a fixed mean. The

implication would be that the series are drifting together at roughly the same rate' as reports Greene (2003). Such as these time series are cointegrated, there exists a cointegrating vector [1; -β]. We applied Johansen's approach (Johansen 1988 and Johansen 1991), which is based on estimation of the Vector Error Correction Model (VECM) in the form:

$$\Delta y_t = C y_{t-1} + \sum_{i=1}^{q} B_i \Delta y_{t-1} + \varepsilon_t \quad (1)$$

where $Cy_{t-1}=A(B'y_{t-1}+c_0)+c_1$ and represents error-correction term. We suppose intercepts in the cointegrating relations and linear trends in the data. This is a model of deterministic cointegration, where the cointegrating relations eliminate both stochastic and deterministic trends in the data. Matrix A represents adjustment speeds and matrix B represents specific relations among the variables in y_t.

This approach reflects that all variables are possibly endogenous. All zero-rows in matrix A indicate a variable that is weakly exogenous with respect to the coefficients in matrix B. According to the Johansen approach, such a variable may affect other variables, but does not adjust to disequilibrium in the cointegrating relations. We tested lag interval in the range from 0 to 2.

In this methodological approach the time series involve nonstationary and trending variables. In this sense we use the Augmented Dickey Fuller test (ADF test) to test the variables for their order of integration:

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{i=1}^{p-1} \phi_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

where α represents deterministic term (constant). The p is the lagged difference terms, Δy_{t-i}, are used to approximate the ARMA structure of the errors, and the value of p is set so that the error ε_t is serially uncorrelated. The optimal lag length of the AR-model is obtained on the basis of Akaike´s and Bayesian information criterion. The criterions are selected according to the parsimony optimality.

1.2 Data

As we mentioned in introduction, our contribution is in heterogeneity identification between the euro area member countries. Therefore, we use the national contributions of the local banking systems to the euro area M3 aggregate. We follow the ECB's definition of monetary aggregates. Datasets are calculated from the national bank's balance sheets of the euro area monetary and financial institutions, excluding currency in circulation. The datasets are provided by public available

database Eurostat in the period 1999Q1-2012Q4. Despite the fact that the national contributions to euro area monetary aggregate M3 are not equivalent to the national monetary aggregates that existed prior to the start of the monetary union, this indicator is widely used in the empirical analysis of the euro area money market heterogeneities (Poměnková and Kapounek, 2013) and published by the central banks (Mehrotra, 2007).

Furthermore, we use quarterly values of the gross domestic product (GDP), house price index and total loans provided to the residents (except the monetary and financial institutions). The calculation of the money velocity we used harmonized index of consumer prices (HICP), GDP and monetary aggregates (M3). The datasets were obtained from the Eurostat database, Federal Reserve System Statistical Releases and Bank of England Statistical Database. All indicators are deflated to the prices of the year 2005. In the correlation analyses we transformed data by the first differences.

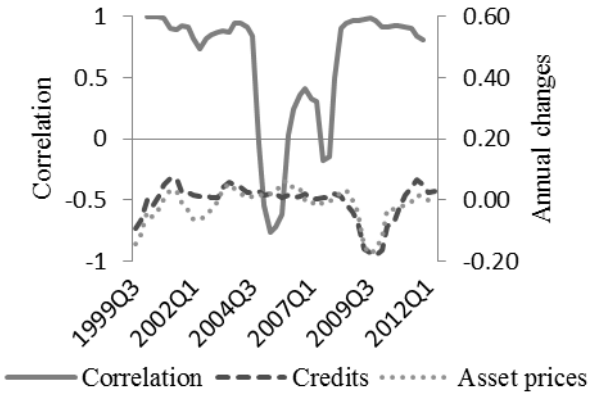
2 Results

The Figures 1–8 present relations between the credits and asset prices. Correlation is calculated as the rolling with rolling window of 9 quarters. Surprisingly, we did not meet results provided by Borio and Lowe (2002). In the case of the US (Fig. 1) we can see significant and positive correlation between the asset prices and credits until the year 2004 and after the year 2008. After the year 2008 there is significant decline in asset prices and credits, caused by financial crisis consequences. However, we did not identify rapid increase of the credits followed by asset prices before the crisis. In the case of the euro area (Fig. 2) we can identify variability of the correlation. Even in this case, there is no evidence of credit growth and asset prices increasing before the crisis.

However, there is significant heterogeneity of correlation in the selected euro area member countries. The existence of financial instability (according to the Borio and Lowe (2002) definition) is showed only in the case of France. In Italy and Greece correlation decreased after the year 2005. Controversial results we obtain in Germany. Last two samples include data of the United Kingdom and the Czech Republic (Fig. 7 and 8). In the case of the United Kingdom, there is evidence of higher correlation between the analyzed variables before the crisis, but asset prices are stable or slightly decreasing during the years 2006 and 2007.

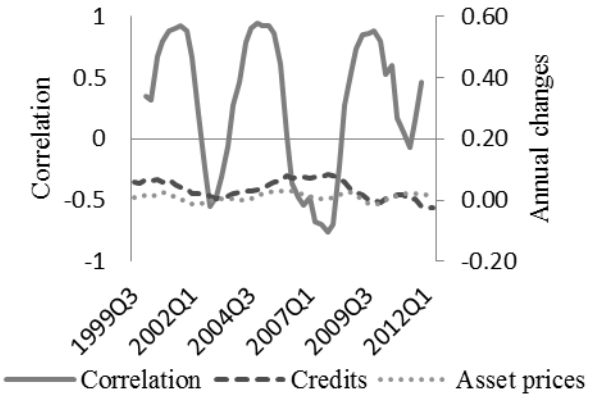
We assume that we could not identify financial instability not only due to the specific conditions at the local asset markets but primarily due to the different strategies of the central banks during the financial crisis. While the Czech national bank and the Bank of England withdraw liquidity surpluses from the banking systems, the Federal Reserve System massively purchased assets to support US

Fig. 1. Correlation of asset prices and credits in the US



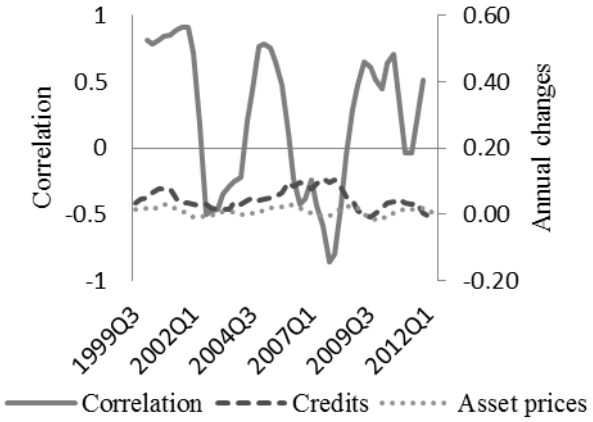
Datasource: Eurostat

Fig. 2. Correlation of asset prices and credits in the euro area



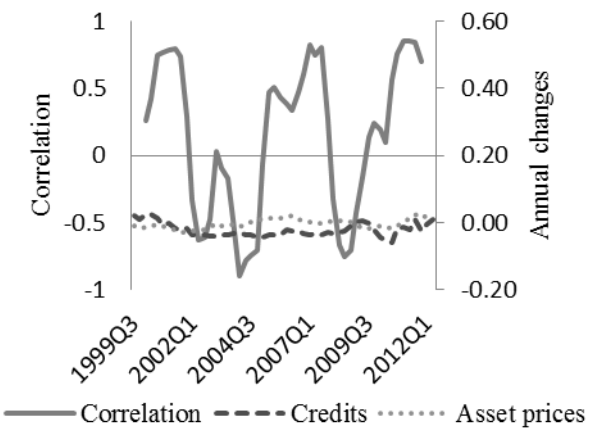
Datasource: Federal Reserve System

Fig. 3. Correlation of asset prices and credits in Germany



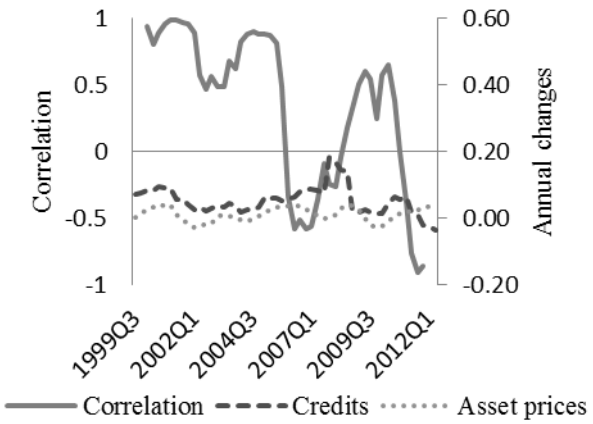
Datasource: Eurostat

Fig. 4. Correlation of asset prices and credits in France



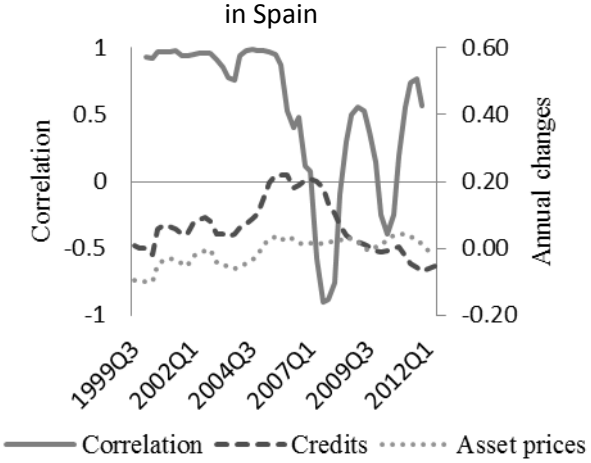
Datasource: Eurostat

Fig. 5. Correlation of asset prices and credits in Italy



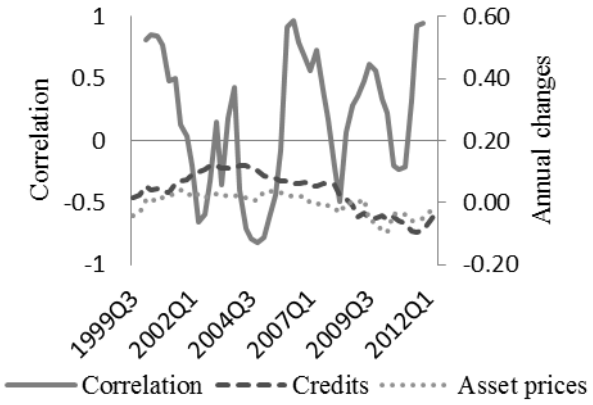
Datasource: Eurostat

Fig. 6. Correlation of asset prices and credits in Spain



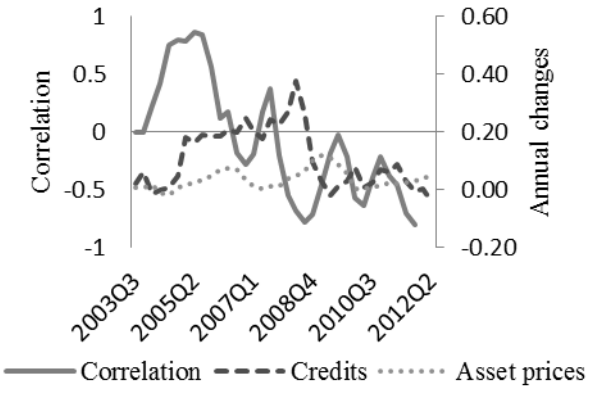
Datasource: Eurostat

Fig. 7. Correlation of asset prices and credits in the United Kingdom



Datasource: Bank of England

Fig. 8. Correlation of asset prices and credits in the Czech Republic



Datasource: Eurostat

economy. The ECB stop pumping liquidity on the internal market at the first quarter of 2012 and gradually started to reduce its balance sheet.

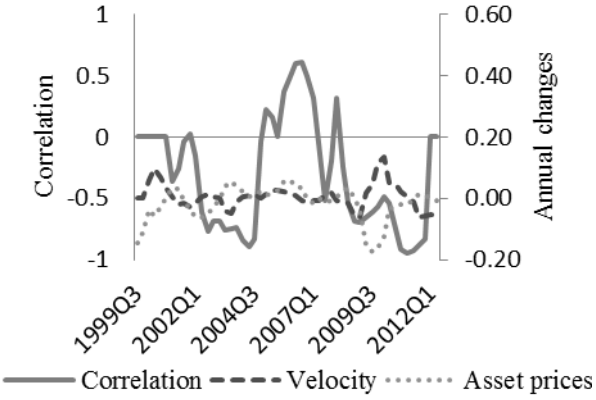
Next part of the paper focuses on the money velocity calculated as the money aggregate M3 divided nominal GDP. We identified close relationships between the asset prices and money velocity in the all selected countries in the years 2005 and 2006 (Fig. 9–16). In the US, the highest correlation and increase in asset prices is evident in the year 2006 (Fig. 9 and 10). Consequently, we confirm financial instability before the beginning of the financial crisis when we cover money velocity in the analyses.

In the euro area, in Germany, France, Italy and Spain we cannot see rapid increase in credits and asset prices but there is significant increase in correlation between these two indicators before the financial crisis. Similar results were identified in the case of the Czech Republic, not in the case of the United Kingdom.

In the core euro area countries (Germany and France), the rolling correlation gradually decreases? between the years 2002 and 2005. It was caused by economic stagnation and its impact on the money velocity. After the year 2005 money velocity increased to the same level as the asset prices (its annual changes). However, at this step we cannot conclude that there is causality between the money velocity and asset prices.

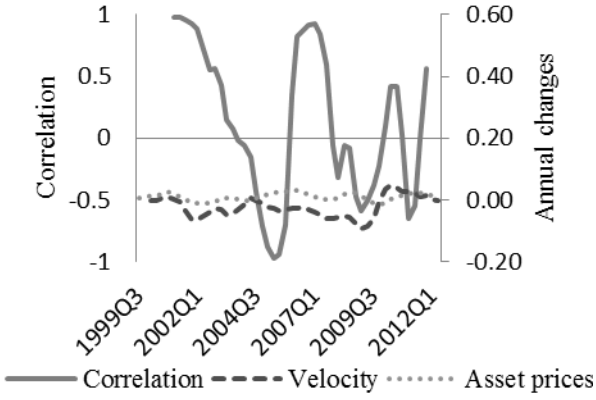
While we showed heterogeneity of the credit development after the year 2007 (Fig. 1–8), the financial crisis emerged as a negative shock in the all euro area member countries in the same way. Blumenstein et al. (2012) showed that this shock affected economic activity at the all range of frequencies and calling it as a symmetric shock. The reduction of the economic and investment

Fig. 9. Correlation of asset prices and money velocity in the US



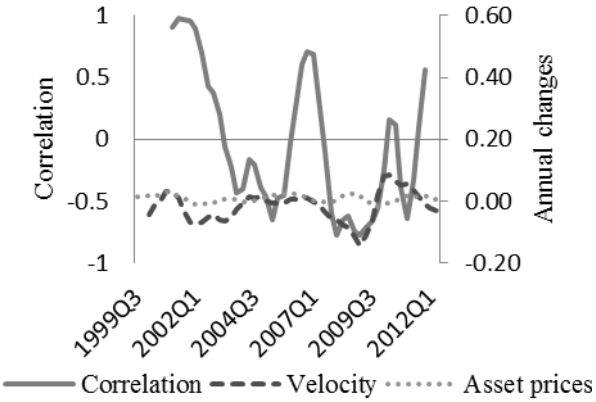
Datasource: Eurostat

Fig. 10. Correlation of asset prices and money velocity in the euro area



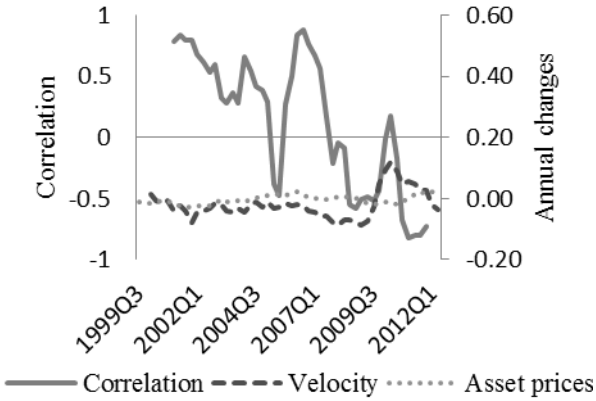
Datasource: Federal Reserve System

Fig. 11. Correlation of asset prices and money velocity in Germany



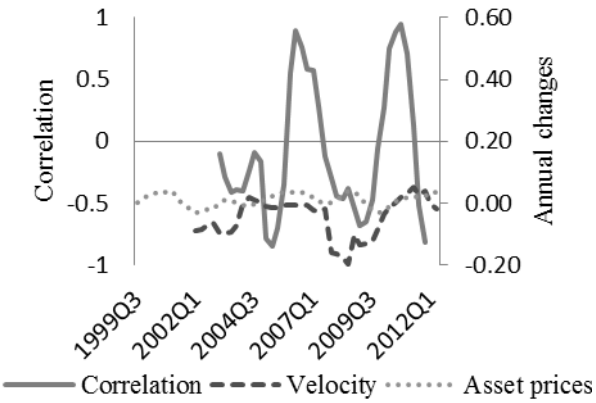
Datasource: Eurostat

Fig. 12. Correlation of asset prices and money velocity in France



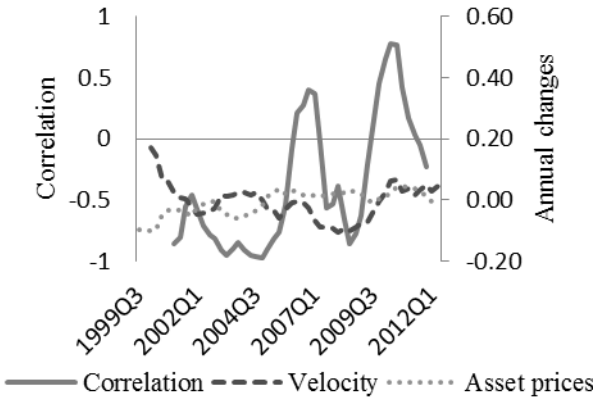
Datasource: Eurostat

Fig. 13. Correlation of asset prices and money velocity in Italy



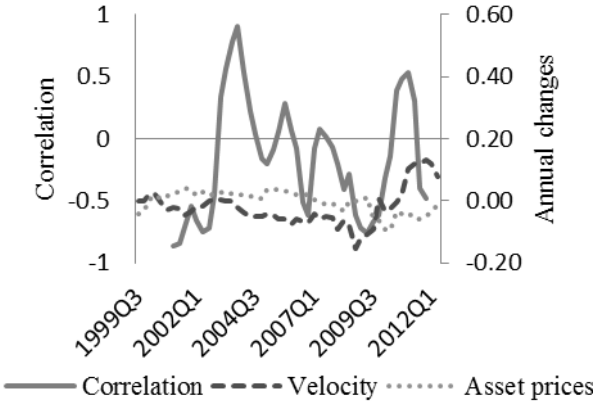
Datasource: Eurostat

Fig. 14. Correlation of asset prices and money velocity in Spain



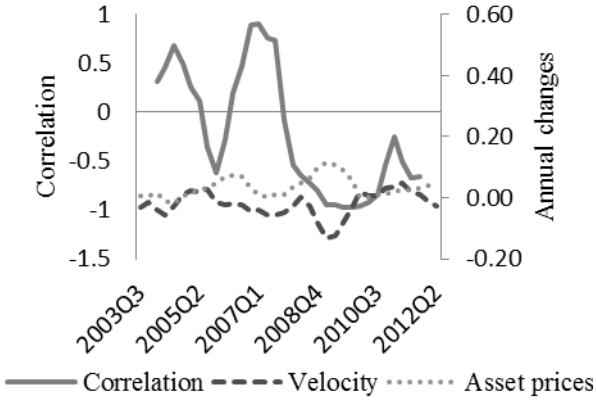
Datasource: Eurostat

Fig. 15. Correlation of asset prices and money velocity in the United Kingdom



Datasource: Bank of England

Fig. 16. Correlation of asset prices and money velocity in the Czech Republic



Datasource: Eurostat

activity reduced number of the transaction within the economies and led to the significant drop in the money velocity (Fig. 9–16).

In contrast with the money velocity development, the asset prices change heterogeneously across the whole euro area after the year 2007. Significant reduction of the asset prices occurred only in the US and the United Kingdom. Slight decrease can be seen in the Czech Republic. As well as, the correlation is different in the all selected countries in the years 2009–2012.

In this paper we started with financial instability definition as the credit money creation surplus followed by asset prices increase. From the results we obtained we conclude that money velocity decreases with the economic recession and increases during upturns. Thus, the money velocity represents liquidity surplus over the current money market demand (given by investment and economic activity).

Finally, we focus on the causality between the asset prices, national contribution to the monetary aggregate and economic growth. Table 1 and 2 summarize unit root tests of the asset prices, economic growth and monetary aggregates at levels and first differences. According to the ADF unit root tests we conclude that most of the time series are first-order integrated. Higher order integrated time series were excluded from the cointegration analysis (Spain, the United Kingdom and the Czech Republic).

Tab. 1. Unit root ADF test at levels

	P	*Y*	*M*
US	-1.4484	-1.5032	-0.3701
Euro area	0.4850	-2.2003	-1.4239
Germany	-0.7894	-1.4411	-0.7298
France	-2.3408	-2.0118	-1.6265
Italy	0.5583	-1.6854	-1.1867
Spain	-0.5012	-1.8168	-2.3705
United Kingdom	-1.0044	-2.3220	-1.2532
Czech Republic	0.3469	-1.8751	-1.4720

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

Source: own calculation

Tab. 2. Unit root ADF test at first differences

	P	*Y*	*M*
US	-4.6094***	-4.3252***	-5.3511***
Eurozone	-3.5178**	-3.6521**	-3.9321***
Germany	-5.1664***	-4.2489***	-5.1482***
France	-1.0863	-3.4486**	-1.7881
Italy	-3.1391*	-3.5546**	-6.4111***
Spain	-3.2175**	-1.7269	-4.6133***
United Kingdom	-1.9021	-3.0328*	-6.0498***
Czech Republic	-2.6058	-2.7742*	-1.6285

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

Source: own calculation

Tab. 3. Johansen rank tests for cointegration

		Trace test		
	lag	*r=0*	*r=1*	*r=2*
US	0	46.4341***	12.6582	1.8432
Euro area	0	43.5438***	10.8044	0.9371
Germany	0	31.5666**	8.7239	1.7118
Italy	0	38.7379**	5.5390	0.3704

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

Source: own calculation

Tab. 4. Johansen constraint test

	Weak exogeneity test*	Adjustment Speeds	
		Y	*M*
US	0.0000	0.0028	-0.0001
Euro area	0.4887	-	-
Germany	0.0796	-0.0051	0.0026
Italy	0.0000	-0.0042	0.0043

* p-value (we test linear constraints on the error correction speeds)

Source: own calculation

Table 3 presents results of the Johansen trace test for the cointegration rank. We assessed null hypothesis of cointegration rank less than or equal to r. We reject the hypothesis that there is no long-term cointegrated relation between the variables in the all cases. Finally, we employed Johansen constraint test to identify driving forces in the system (Tab. 4). We focused on the asset prices and its adjustment speed to disequilibrium in each of the cointegrating relations.

The results show weak exogeneity of the assets prices with respect to the other variables in the case of the euro area. In the case of US we identified positive impact of the economic activity on the asset prices and very low (discussable) impact of the national contribution to the monetary aggregate. In the sense of money velocity movements, increase of the economic activity and decrease of the money aggregates accelerate money velocity in the economy and credit money creation.

On the contrary, in Germany and Italy we can see that national banking systems and their contribution to the monetary aggregate has direct impact on the asset prices. The negative impact of the economic activity on asset prices cannot be interpreted with quantity theory of money. However, our results provide significant evidence of heterogeneity within the euro area.

Conclusions

The European Union is more reliant on bank credits and bank intermediation of savings, than the United States and rest of the world. Consequently, banking system stability plays a crucial role for sustained recovery in Europe after the financial crises. The risk of financial instability is driven by the economic and credit cycles over time, as well as by the degree of interconnectedness of financial

institutions and markets. On the contrary, the ECB follow the German model of central banking (with price stability as the primary objective).

We started with financial instability definition related to the theoretical foundations of Minsky and Moore. In our empirical analysis we started with approach provided by Borio and Lowe (2002), but we did not find clear relationship between the asset prices and credit growth before the financial crisis in the year 2007. On the contrary, we identified money velocity as the significant indicator of the financial instability in the all analyzed countries.

Finally, we applied cointegration analysis and weak exogeneity test to identify significant impact of the economic activity on the asset prices in the US. In the case of the euro area we did not find cointegration vectors in the most of the member countries. In the euro area as the single currency zone, we find that asset prices are weakly exogenous in relation to the economic activity and monetary aggregate M3. However, we found that banking systems in Germany and Italy significantly contributed to the asset prices in the euro area.

Our results have important policy implications. We recommend money velocity as the indicator of the liquidity surplus at the market and offer financial instability definition as the money velocity increase followed by asset prices.

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