

Financial cycle. How does it look like in Romania?

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Abstract. *The paper aims to identify the main characteristics of the financial cycle for Romania using both the classical and growth cycle approaches. The turning point methodology represents the classical approach, while a band-pass filter is applied to capture the growth cycle. First, the paper assesses the significance of the medium-term cyclical component and finds that its importance increased since 2000s. The second purpose is to identify the relevant variables for the construction of a composite measure of the financial cycle. The results reveal that total credit and real estate prices are the best candidates. Regarding cycles' characteristics, the classical approach shows that credit cycles tend last around 10 years, while the real estate cycles are longer and exhibit higher corrections during downturns.*

Keywords: financial cycle, turning-points, band-pass filter, macroprudential policy.

Introduction

Since 2008, the need to understand financial crises and the way they unfold gave traction to a new concept among central banks, the macroprudential approach. The final objective of the macroprudential policy is to ensure financial stability by decreasing the build-up of systemic risks and increasing the resilience of the system. Under this approach the financial system is treated as a whole and the risk assessment considers not only the exogenous, but also the endogenous risks (Davis and Karim, 2009). Given that the macroprudential policy aims to tackle the pro-cyclicality in the system, some of its instruments are defined or tailored in relation to the financial cycle (for e.g. the countercyclical capital buffer). Therefore, a correct and timely identification of the financial cycle became a priority for macroprudential authorities.

This paper contributes to the literature on identifying and characterizing financial cycles, offering the perspective of a small and open emerging economy, Romania. It aims to evaluate the features of the Romanian financial cycle, in order to provide support for policy makers for implementing the appropriate macroprudential instruments. In order to achieve these goals, some questions are followed through the paper: Why is it important to identify the financial cycle and how do we define it? What variables are better suited for a composite measure of the financial cycle? What are the features of the financial cycle and its frequency?

While for the business cycle analysis the purpose is to predict recessions, from a financial stability perspective the interest lies in predicting the booms. The literature has shown that generally vulnerabilities accumulate during booms and materialize in risks during the following downturns. Therefore, an important prerequisite for policy makers to take informed decisions is to correctly identify the phase of the financial cycle.

The next question refers to what variables better capture the potential of a systemic risk and are suited for a composite measure for the financial cycle. The existing literature points to credit, real estate prices and stock prices. Credit qualifies for the first place as it

continues to occupy the central position in financial stability analyses, accounting for the largest share of financial intermediation, especially for emerging economies. Regarding the real estate prices, the recent findings show that countries with important dynamics in these sectors have a higher probability of ending up in financial crises (Claessens (2011a, 2011b), Cerutti et al. (2015)). Equity markets on the other hand tend to exhibit higher frequencies and a lower synchronization with credit or real estate cycles (see Drehmann et al. (2012), Borio (2012), Giordana and Gueddoudj (2016)).

In practice, there is no consensus on the appropriate methodology for the identification and characterization of the financial cycles. As a first step, the paper proposes an investigation on each individual series included in the composite measure for the financial cycle. In order to identify the duration and amplitude of the cycles, and to establish the adequate frequency, the following methodologies are applied: (i) the turning point methodology (the classical approach) and (ii) the frequency based approach (growth cycles). The last part of the paper proposes a composite measure for the financial cycle.

Literature review

Financial cycles

The literature on identifying, dating and characterizing the financial cycles is growing rapidly, especially in the context of the new financial regulatory measures.

Borio (2012) and Claessens et al. (2011a, 2011b) give a comprehensive overview of the financial cycles. Borio (2012) defines them as "the self-reinforcing interactions between perceptions of value and risk, attitudes towards risk and financing constraints, which translate into booms followed by busts". He argues that cycles' characteristics are determined by the economic environment, but also by the political regime and that booms not only that they precede the busts, they also determine them. Claessens (2011a) characterizes the starting phase of the credit cycle by an easy access to funds, potential low (real) interest rates, a rise in collateral and an easing of lending standards and the busts as a reversal of these trends and stricter provisioning. However, it evaluates only the individual components of the financial cycle, with a focus on the linkages among markets and countries and the potential amplification effects. Grinderslev et al. (2017) define the financial cycle in terms of deviations from the trend of those variables which are important for financial stability.

In order to characterize financial cycles a composite measure is normally used. In practice however, there is no consensus on the methodology used to identify and characterize financial cycles. Drehmann et al. (2012) propose different approaches for combining individual cycle series for the turning point methodology and frequency-based filters, starting from the co-movement of the individual series. They find that credit and real estate variables are representative, while stock prices tend to tell a different story. Stremmel (2015) follows the same approach and constructs several synthetic measures for the financial cycle in Europe. It finds that the best composite measure for the financial cycle contains the credit-to-GDP ratio, credit growth and house price-to-income ratio.

The most recent findings show that financial cycles tend to be longer than business cycles (Detken et al. (2014), Drehmann et al. (2012), Altar et al. (2011)), but the debate is still open for emerging economies. Drehmann et al. (2012) show that financial cycles became longer after 1985, similar to Claessens et al. (2011a).

Methodology

Following the findings in the literature, the paper analyzes the developments for the following sectors: banking, real estate and stock markets. Credit is of particular importance for Romania, given that the banking sector holds the largest share of the financial sector (around 75 percent of total assets). Both credit and total indebtedness of the non-financial private sector were used. The total indebtedness is defined as credit in the large sense (Detken et al., 2014)¹. For the real estate market, the variables are: the residential real estate prices and gross value added (GVA) for construction and real estate sectors. For stock markets, the BET index is used.

The data is expressed in real terms and logarithms, has quarterly frequency and covers the period 1992 - 2017 for the credit variables, while for the other variables the availability starts at the end of 1990's, restricting the time frame necessary for testing the long cycle hypothesis². Another caveat is the number of full cycles covered. However, the abrupt changes in the political and economic regime in Romania would also hamper the long term cycles hypothesis. Therefore, the paper doesn't aim to provide the recipe for the way future financial cycles will unfold. It proposes an examination of past events, with the aim to guide the policy makers in monitoring financial developments and implementing the appropriate measures.

For financial cycle' identification and characterization two methodologies are applied. The turning point methodology (TPM) is the classical approach, proposed by Bry and Boschan (1971) and updated by Harding and Pagan (2002). It allows the identification of peaks and troughs, the turning-points (TPs) of the cycle and considers that a complete cycle has two phases: expansion (from trough to peak) and recession or downturn (from peak to trough). In order to identify the turning points, some restrictions are applied: (i) under the short cycle hypothesis (lasting from 1 to 8 years) each phase has at least two quarters and the whole cycle at least five quarters; (ii) for medium-term cycles (lasting from 8 to 32 years) the entire cycle has at least nine quarters. Starting from these assumptions the following characteristics are computed: duration, amplitude and slope³.

For the growth analysis, the frequency based filter facilitates the decomposition for different frequencies of variables. Similar to Drehman (2012) and Giordana and Gueddoudj (2016), the Christiano and Fitzgerald band-pass filter is used. It can identify short-term cycles (with a duration between 5 and 32 quarters) and medium-term cycles (with a duration between 8 and 20 years²). The filter isolates the components of the raw data (x_t) which oscillates between some pre-specified frequencies (p_l and p_u)⁴, by minimizing the mean square error.

¹ Total indebtedness of the private sector (corporate and households) is the sum of total debt including loans granted by credit institutions and non-bank financial institutions, residents or foreign and write-offs.

² Due to data limitations, the parameters for the medium-term component are set to a maximum of 20 years.

³ The definitions are according to Claessens et al. (2011a): (i) duration for expansions (contractions) represents the number of quarters between peak (trough) and trough (peak), while duration for upturns is defined as the time it takes to reach the level at the previous peak, (ii) the amplitude of a downturn measures the change in the variables from the peak to the next trough and (iii) the slope refers to intensity of the changes (the amplitude of downturn (expansion) divided by the duration of downturn (expansion)). The statistics are calculated using an excel with a VBA adapted toolbox for the turning point methodology and Stata.

⁴ P_u and P_l are the frequencies under which the data oscillates. Using quarterly data, the lower and upper values are 6 and respectively 32 (quarters).

The next step is to evaluate the synchronization between the individual cyclical components using several approaches: (i) the concordance index (CI) proposed by Harding and Pagan (2006), (ii) a principal components analysis and (iii) correlation coefficients.

The Concordance Index is defined as: $CI_{xy} = \frac{1}{T} \sum_{t=1}^T [C_t^x C_t^y + (1 - C_t^x) * (1 - C_t^y)]$

where:

$C_t^x (C_t^y) = \{0, \text{if } x (y) \text{ is in recession at time } t \text{ and } 1 \text{ if } x (y) \text{ is in expansion}\}$

The last part proposes a composite measure for the financial cycle (a common cycle). Different aggregation methods are applied for each of the methodologies defined above, based on Drehmann et al. (2012). For the TPM the next steps are followed to identify the common cycle: (1) for each variable y_t at each moment in time (t) the minimum number of quarters until the next peak/trough is calculated; (2) the median for the values from point 1 is calculated; (3) the local minima is searched among the median values; if several peaks/troughs are identified, an interval of 6 quarters around the peak/trough of the common cycle is imposed for each individual variable. For the growth analysis, the composite measure is calculated as the average value of the filtered series.

However, the relationship among variables changes through time and this might require a dynamic aggregation of the individual cycles, in order to allow a higher share for the periods in which important changes appear in all financial sector segments (for e.g. credit, equity, bond markets), which can be a sign of systemic developments. For robustness, an aggregation based on a dynamic correlation between the credit variables and the other components is proposed.

Results and discussions

In the first place the turning point methodology is applied to each individual variable. All available information is used, considering the specifications for both medium and short term cycles (Table 1, Figure 1).

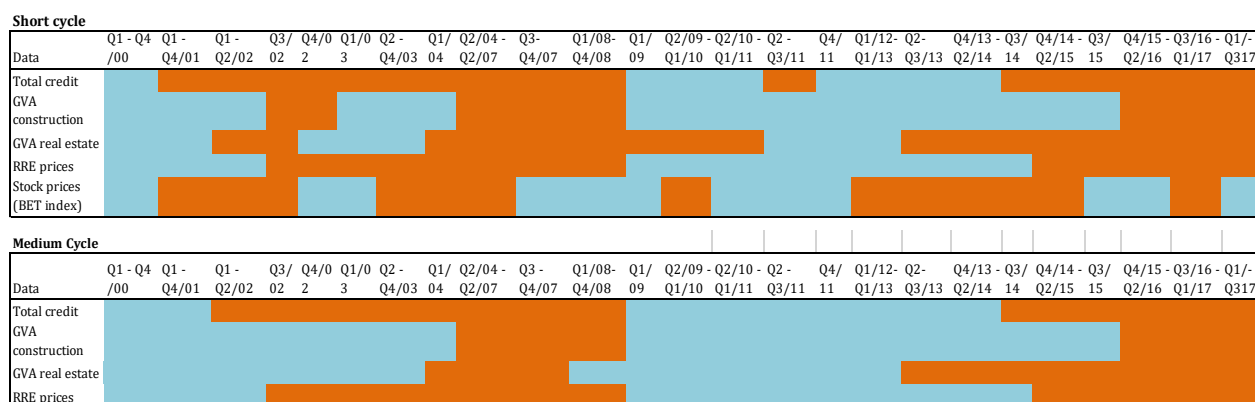


Figure 1. Short and medium-term individual cycles⁵

Note: The blue area represents the downturn and the orange area the expansion, identified using the turning point methodology. No medium term component was identified for stock prices under the standard assumption of a minimum complete cycle of 5 years.

Source: NBR, NSI, Eurostat, author's own calculations.

⁵ Due to space reasons only the results for total credit are presented in Figure 1.

The short-term cycle assumption reveals greater dispersion for real estate variables' position in the cycle, compared to the medium term specification. For the medium term cycle, an ex-post assessment validates the pre-crisis events: prior to 2008 all variables in the expansion phase. However, if taken alone, credit variables could not reflect the excessive phase of the cycle, especially due to the very low levels of financial intermediation from the starting point (around 10 percent at the beginning of 2000). The dynamics at the beginning of the period should be interpreted with caution, given that they incorporate a base effect.

Under the medium term hypothesis, the results show that credit cycles are slightly longer compared to indebtedness cycles (10 years vs. 8.5 years), compared to 5 years for both under the short term cycle specification (Table 1). In general, contractions last less compared to expansions, except for the construction sector. In addition, the real estate prices exhibit higher amplitudes compared to other indicators, as well as the highest duration for expansions. Moreover, real estate prices seem to lead the activity in construction and real estate sectors (Figure 1). Finally, contractions' amplitude is lower compared to expansions, reflected also by the slope of the two phases; the smallest corrections were seen in the credit cycle, and the highest in the real estate markets.

Table 1. Characteristics of individual cycles (Turning Point methodology)

	Duration (years)		Amplitude (%)		Slope	
	Contractions	Expansions	Contractions	Expansions	Contractions	Expansions
Short cycles (minimum 1.25 years)						
Total credit	2.13	2.94	-38.76	89.04	-18.24	30.31
Total indebtedness	1.75	2.80	-30.71	79.71	-17.55	28.47
GVA construction	4.00	2.63	-41.36	64.89	-10.34	24.72
GVA real estate	2.17	2.83	-40.69	26.08	-18.78	9.20
RRE prices	5.75	6.50	-120.07	154.89	-20.88	23.83
Stock prices	1.30	2.00	-53.28	66.72	-40.98	33.36
Medium cycles (minimum 5 years*)						
Total credit	5.00	5.13	-59.42	159.98	-11.88	31.22
Total indebtedness	4.38	4.17	-56.23	120.91	-12.85	29.02
GVA construction	6.75	4.75	-76.51	126.92	-11.34	26.72
GVA real estate	5.25	4.00	-28.70	85.38	-5.47	21.35
RRE prices	5.75	6.50	-120.07	154.89	-20.88	23.83
Stock prices	1.38	6.25	-82.72	154.02	-60.16	24.64

Note: * for the stock prices (BET index) a minimum cycle of 2.5 years was used. The duration of the expansions is calculated from trough to peak, while the duration of downturns from peak to trough. The amplitude represents the percentage change from trough to peak (expansion) or from peak to trough (contractions) and the slope measures the intensity of each cyclical phase (amplitude/duration).

Source: NBR, NSI, Eurostat, author's own calculations.

Nevertheless, one disadvantage of the dating methodology is that lack of information on the intensity of the phases. This is the case for the more recent results (Figure 1), which identify an expansion for all variables since the end of 2015, but offers no information on the distance to the future peaks.

Further on, starting from a common finding in the literature, which shows that financial cycles are longer compared to business cycles, the next question that arises is: *Is the medium term component important?* Drehmann et al (2012) document an increase in the duration of the financial cycles after mid-1980s, especially after 1998 since when the cycles last around 20 years, compared to 16 years on average (1960-2011).

This paper evaluates the importance of the medium term component for the case of Romania. As a first step, using the Christiano and Fitzgerald filter (CF filter), the cyclical components of the individual series are obtained, under the specifications for both short-term and medium term cycles. Second, in order to assess the importance of the medium term components, the ratio between the volatility of the medium-term and the short-term cyclical component is calculated (Table 2). The ratio is higher than unity for all variables, pointing to higher amplitude for the medium term component, a pattern especially relevant for credit variables. Unlike the turning point methodology, the band pass filter identifies an important medium term component in the stock prices variables.

Table 2. Relative volatility of short and medium term cycles^{6*}

Variables**	Q1 2000 - Q2 2017
Total credit	4.19
Total indebtedness	4.33
Total indebtedness/GDP	4.98
GVA Construction	3.05
GVA Real Estate	2.00
Real estate price	3.64
Stock prices	1.57

Note: * The values indicate the ratio of the standard deviation for the medium-term cycle component to the volatility of the short term cycle component. A value higher than 1 indicates more volatility on the medium term. ** All variables are expressed in real terms and in logarithm, except for Total indebtedness/GDP.

Source: NBR, NSI, Eurostat, author's own calculations.

Even though the medium-term component has a higher amplitude, a new question emerges: *Does the medium-term component contributes to a larger extent to the total cycle?*⁷ Therefore, following Grinderslev et al. (2017), we estimate the total cycle (lasting from 1 to 20 years) and compute the contributions from both short and medium term components. The results show that in particular for real estate related variables, the medium term component explains between 70 and 80 percent of the total cyclical developments, while for credit the value is around 63 percent. This supports the results presented Table 2. An interesting aspect revealed is that medium-term components became only recently (after 2000s) the main contributor to the total cycle. This is not true for the stock prices, in which case there is no clear cut evidence.

The results support the importance of the medium term cyclical component of the variables analyzed, but nonetheless the developments under the short term specification of the cycles deserve a close monitoring.

The next question regarding the co-movement of individual cycles requires further inquiries. First, the visual inspection of the medium-term cycles shows a common trend for all variables during the last expansionary phase (Figure 2), with the exception of stock prices, which act as a leading indicator. The results are confirmed by the concordance indicators (CI) (Table 3). The CI between stock prices and all other variables are around 50 percent, while the synchronization between credit variables and real estate prices are above 85 percent.

⁶ The results are similar for the variables in nominal terms and for the standardized variables, therefore in the paper only the results for the variables expressed in real terms are presented

⁷ The total cycle represents the cyclical component covering both short term and medium term specifications.

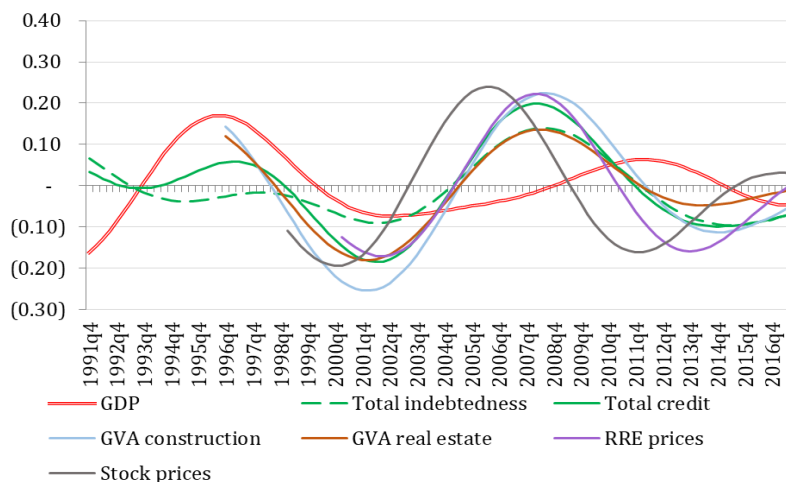


Figure 2. The medium-term cycle components of individual series

Note: The medium term cyclical components are extracted using a CF filter applied for the entire available period available for each individual series.

Source: NBR, NIS, Eurostat, author's own calculations.

For robustness, the correlation coefficients between individual medium-term cycles are computed and the principal component analysis (PCA) is used to evaluate the individual contributions to a composite measure (similar to Grinderslev et al. (2017)). The correlation coefficients confirm the strong relationship between credit variables and real estate market variables (Table 4). Stock prices show no significant correlation except for the RRE prices.

Table 3. Concordance index (CI): turning point methodology

Medium cycle / Short cycle	Total Indebtedness	Total credit	GVA construction	GVA Real Estate	Real estate prices
Total Indebtedness		87%	63%	57%	70%
Total credit	89%		76%	59%	90%
GVA Construction	61%	72%		83%	85%
GVA Real Estate	56%	66%	72%		77%
RRE prices	72%	87%	87%	69%	
Stock prices	52%	56%	46%	57%	52%

Note: The CI is calculated using the entire available information for each variable (for e.g. the states of credit variables, expansion or downturn, using data starting Q4/1991 and the CI between two credit variables uses the entire information, while the CI between a credit variable and real estate prices uses data on credit starting with 2000s). The states of each variable was obtained by using the TPM methodology.

Source: NBR, NIS, Eurostat, author's own calculations.

Table 4. Correlation coefficients for the medium-term cycles' phases: frequency-based approach

Variables	Total credit	Credit/GDP	GVA construction	GVA real estate	RRE prices	Stock prices
Total credit		0.980*** (0.035)	0.959*** (0.053)	0.857*** (0.104)	0.907*** (0.095)	0.298 (0.202)
Credit/GDP	0.980*** (0.038)		0.943*** (0.074)	0.858*** (0.125)	0.818*** (0.139)	0.126 (0.211)
GVA	0.959***	0.943***		0.957***	0.905***	0.168

Variables	Total credit	Credit/GDP	GVA construction	GVA real estate	RRE prices	Stock prices
construction	(0.027)	(0.037)		(0.074)	(0.064)	(0.138)
GVA real estate	0.857*** (0.110)	0.858*** (0.084)	0.957*** (0.072)		0.847*** (0.099)	0.063 (0.130)
RRE prices	0.907*** (0.051)	0.818*** (0.083)	0.905*** (0.062)	0.847*** (0.076)		0.563*** (0.120)
Stock prices	0.298* (0.166)	0.126 (0.194)	0.168 (0.131)	0.063 (0.130)	0.563*** (0.107)	

Note: HAC standard errors are calculated using Newey-West procedure (following Giordana and Gueddoudj, 2016).

Source: NBR, NIS, Eurostat, author's own calculations.

The PCA is applied for the medium term components. Considering the loadings as the tool to evaluate the co-movement with other variables, the results show that stock prices and household credit tend to follow a different common factor and it may not be relevant to consider them as potential candidates for a composite measure of the financial cycle. All series, except for stock prices have higher loadings in the first component, while for the second component only household credit and stock prices pose significant loadings (Figure 3).

These results support the decision on which variable to use in order to construct a financial cycle composite measure. Real house prices and credit are both highly correlated with the first common component of the analyzed financial variables. Furthermore, the concordance index shows a high synchronization between credit and real estate prices and significantly lower values for stock prices. Therefore, for the Romanian financial system a composite measure comprising credit and real estate variables would be appropriate to capture a common financial cycle.

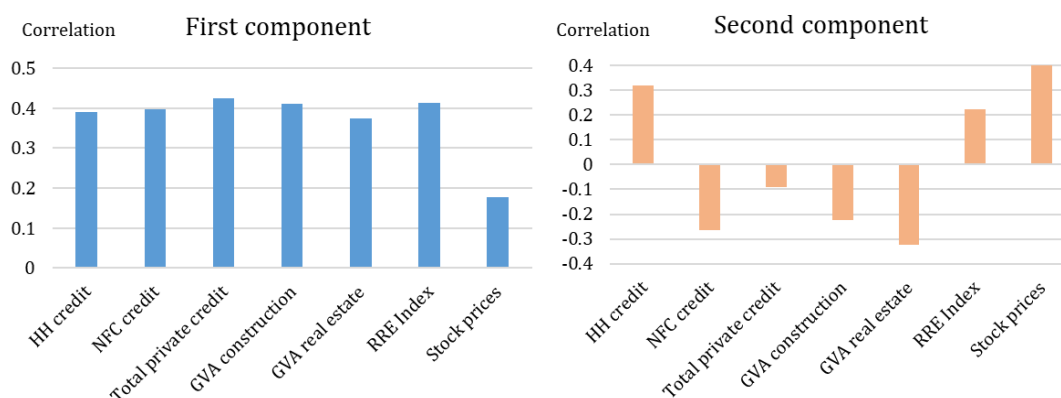


Figure 3. A principal component analysis (PCA) of the individual medium term cycles

Note: The principal component analysis (PCA) is applied to the cyclical components of the individual series, after the trend extraction with a CF filter, for a cycle with length between 8 and 20 years. The first two components explain around 95 percent of the total variance.

Source: NBR, NIS, Eurostat, own calculations.

Based on the previous findings, the paper proposes a composite measure for the financial cycle. This is important, considering that monitoring only individual series might undermine the systemic risk due to the be amplifications generated by the inter-linkages

among financial sectors (for e.g. the big share of banking loans with relation to real estate markets⁸). Following Stremmel (2015), several combination of variables are obtained, by aggregating the medium and total cycle components of the analyzed variables. Also, based on the methodology proposed by Drehmann et al. (2012), a common cycle was identified for the turning point methodology.

Four synthetic measures are defined by averaging the individual series⁹. Credit cycles are generally considered the baseline approach and are presented in Figure 4 (right panel), together with a measure of the credit-to-GDP ratio, the benchmark indicator for the calibration of the countercyclical capital buffer (Detken et al. (2014), ESRB Recommendation 2015/1¹⁰). However, this indicator shows a higher amplitude compared to the other composite measures. All composite measures show a similar pattern during the previous boom and overlap with the peaks identified for the common cycle under the TPM methodology (Figure 4, left panel).

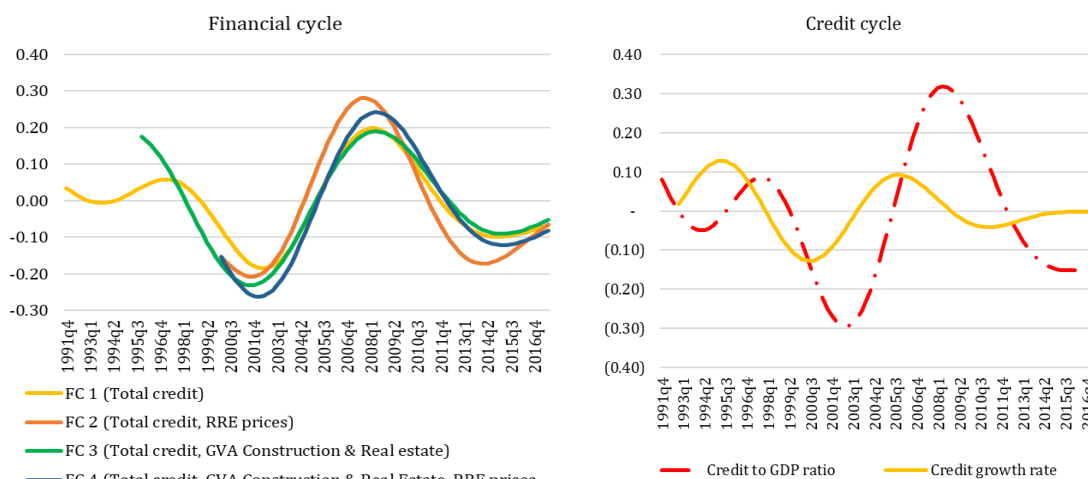


Figure 4. Composite measures for the financial cycle (1991 Q4 - 2017 Q3)

Note: The composite measures for the financial cycle represent an average aggregation of the medium term cyclical components calculated using the CF filter for the entire period available for each variable.

FC 1= the cyclical component of total credit; FC 2 = the average between total credit and residential real estate prices; FC 3 = the average between total credit and the gross value added from construction and real estate sectors; FC4 = adds to FC3 the residential real estate prices.

The yellow and red points represent the peaks and troughs determined by the turning point methodology applied to the common cycle. The red area represents the peaks and the yellow area the troughs.

Source: NBR, NIS, Eurostat, own calculations.

The lack of a systemic banking crises in case of Romania does not allow for a statistical

⁸ Financial Stability Review, No.2, 2017.

⁹ The weighting method is a difficult task especially given data limitations. The most common methodology is using similar weights. For robustness, an alternative composite measure is calculated based on the correlations between the credit variable and the real estate indicators. However, given the highest share in the financial system, credit gains a larger share if the composite measure and the other component are adjusted based on their correlation with credit. In addition, the correlation coefficients show no important differences for the two phases of the cycle (expansion and downturn), therefore the correlation for the entire period is used. For space reasons the results are not presented in the paper.

¹⁰ ESRB Recommendation on recognizing and setting countercyclical buffer rates for exposures to third countries (ESRB/2015/1). Nevertheless, additional variables can be included in the monitoring framework for the calibration of the CCyB, according to the decision of the national authorities.

evaluation of the early warning capacity of the financial cycle measures. However, under all the composite measures the peak of the financial cycle coincides with the ex-post assessment carried on for the banking sector by Neagu et al. (2015), which dates the late phase of the excessive credit growth in 2007-2008.

Conclusion

The paper aims to answer some questions related to the identification and characterization of the financial cycle, which are important for the implementation of the macroprudential policy. Considering that this policy aims to tackle the pro-cyclicality in the system, having a clear view on the components of the financial cycle as well as its current phase it's a prerequisite for taking the appropriate policy measures.

The most relevant components for the financial cycle, based on the literature findings and assessed for the Romanian financial system are credit lending and real estate related variables (real estate prices and gross value added for construction and real estate sectors). The co-movement between the individual financial variables shows that while stock prices exhibited a similar behavior in the previous crisis, they are less synchronization with the other variables and behave as a leading indicator. Four composite measures for the financial cycle are proposed, calculated using a weighting of medium term cyclical components for total credit granted to the private sector (non-financial companies and households), residential real estate prices and gross value added generated by construction and real estate sectors. The four measures proposed show a similar pattern and capacity to identify the accumulation of vulnerabilities prior the 2008 boom. This highlights the need for policy makers to closely monitor the dynamics from both credit and real estate sectors.

Nevertheless, further investigations are required to better account for the change in the relationship between the variables and for a stricter evaluation of the early warning capacity of these composite measures.

Regarding the debate between short and medium term financial cycles, the paper finds clear evidence that medium term frequencies gained importance starting with the beginning of 2000s. This is especially true for credit and real estate variables. This is also supported by of cycles' characteristics, credit cycles being around 10 years long and the real estate cycles around 12 years. Generally, expansion phases tend to be longer than contractions and with higher amplitudes.

Therefore, when considering the implementation of the countercyclical capital buffer, it would be appropriate to analyse the benchmark indicator (credit-to-GDP ratio) under both the long term perspective proposed under the current framework, but also under the medium term perspective. Dynamics stemming from the real estate markets and other additional indicators should be monitored as well.

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