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## The Length of Financial Cycle and its Impact on Business Cycle in Poland

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**Abstract:**

**Purpose:** The article aims to identify Poland's financial cycle and verify whether it affects the business cycle. Moreover, the analysis will concern whether these cycles are synchronized and whether the financial cycle led to a crisis or vice versa.

**Design/Methodology/Approach:** Considering Poland's case, we use Beveridge-Nelson multivariate decomposition to estimate the impact of financial cycles on Poland's business cycle during the period 1992:1-2018:4. The data are collected from BIS.

**Findings:** Our research confirms the existence of the financial cycle in Poland. Financial cycles in Poland last on average, 14.1 quarters compare to normal business cycle which is 12.6 quarters. The paper's empirical results show that financial cycles significantly impact Poland's business cycle, influencing long-term growth.

**Practical Implications:** To achieve long-term and sustainable economic growth, policymakers should monitor financial cycles and revise fiscal and monetary policy accordingly. The results should help policymakers and financial practitioners build and maintain a sound financial policy to avoid future financial national and global crises.

**Originality/Value:** This paper is among the first the use a set of econometric filtering techniques to identify financial cycles in Poland and its link to business cycles.

**Keywords:** Financial cycle, business cycle, Beveridge-Nelson multivariate decomposition.

**JEL codes:** C14, E30, E44, P20.

**Paper type:** Research article.

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## 1. Introduction

Financial development through credit and financial cycles will positively impact economic growth and, in turn, business cycles. The real mechanism behind the model and channels through which financial markets affect business cycles remains unanswered. The importance of credit and financial cycles was first put forward by Minsky (1957) in the hypothesis of financial instability. The financial instability hypothesis is based on the asymmetrical information assumption of the financial markets leading to future asymmetric shocks and, thus, a financial crisis. We already know that the financial cycle is a source of the financial crisis and business cycles. In the last century, the world has seen much crisis while sources of the crisis, its duration, course, and scale of effects were different. The crisis from 2008 confirms the existence of the financial cycle, and for this reason, it is even more critical to identify, measure, and monitor the financial cycle (Thalassinos *et al.*, 2015; Skare and Porada-Rochoń, 2020a).

Since 2008 there has been a significant interest in financial cycles in science. The number of publications confirms that it is essential to forecast crises today to avoid the effects of the recent crisis in particular: high economic and opportunity costs of the crisis to government, business (banks), and people as well. The concept of financial cycle was initiated by Fisher (1933), Keynes (1936), and further developed by Minsky (1964). An immense contribution to understanding financial cycles is attributed to Borio and Drehmann (2011), Drehmann *et al.* (2012; 2013), Borio (2014). There should be no doubt about the crucial role of finance in macroeconomic movements and cycle peaks, and the role of finance, its excessive expansion in deepening cycles, and increasing systemic risk. It is not easy to object to Stiglitz that finances destabilizing features (Stiglitz, 2010) towards secular stagnation (Summers, 2014).

The financial crisis of 2008 once again turned to focus on Minsky's financial instability hypothesis – cycle, as well as a crisis, are unavoidable, which does not mean unpredictable. Financial cycles lead to business cycles. Business cycles are an economy reaction to them and change in the Minsky moment (Porada-Rochoń and Skare, 2020) as Keen (2020) mentioned “*System dynamics enables the modeling of the structure, the history, and the dynamics of the economy. Minsky's genius was that he perceived, without this technology, the essential elements of all three that make capitalism prone to crises.*” Therefore, the critical issue is to focus on finding an enforceable method to forecast crisis.

The experience in measuring the financial cycles is relatively small and reaches back to Borio *et al.*'s (2001) work. Nearly two decades of research on cycle measurements have shown several of their methods. As there is no single proper method, they start with the traditional business cycles turning point analysis (Burns and Mitchell, 1946; Claessens *et al.*, 2012; Hiebert *et al.*, 2018) to structural trend-cycle decomposition

(Bonis and Silvestrini, 2013), univariate spectral analysis (Aikman *et al.*, 2015; Skare and Porada-Rochoń, 2020), multivariate spectral analysis (Strohsal *et al.*, 2018; Schuler *et al.*, 2014) unobserved component models (Koopman and Lucas, 2005; Galati *et al.*, 2016), wavelet analysis (Ardila and Sornette, 2016) Scharnagl and Mandler, 2019), TVP-VAR (Wen *et al.*, 2019), bibliometric analysis (Qin *et al.*, 2021). Skare and Porada-Rochoń (2020a) by using Diebold-Mariano (2005) test results with several forecast accuracy scores showing big financial data ensures higher forecast accuracy for forecasting financial cycle components used in the study of the financial cycles.

Although there is still no theory to explain the current financial cycles, what we know from research findings is that financial cycles are longer than business cycles. They are characterized by different duration depends on countries, financial cycle led business cycle and the amplitude of the financial cycle changed by policy – case of U.K. (Skare and Porada-Rochoń, 2020). The question can be asked if the financial cycles exist in Poland? If yes, do they impact the business cycle in Poland? Is there any synchronization between the financial and business cycle in Poland? Do they lead to crises? How about secular stagnation? Moreover, did any great economists (Fisher, Philips, Minsky) foresee zero or even negative interest rates?

This paper attempts to narrow a gap in the literature on financial and business cycles using Beveridge-Nelson multivariate decomposition to estimate its impact on Poland's business cycle. Empirical results in the paper show that financial cycles could significantly impact Poland's macroeconomic conditions, influencing long-term growth. To achieve long-term and sustainable economic growth, policymakers should monitor financial cycles and revise fiscal and monetary policy accordingly.

The rest of the paper is organized as follows. In section 2, we present the literature review. Then, the research framework in section 3, along with the data. In section 4, we report the results of the empirical analysis. The article concludes in section 5 with a summary of the paper research contribution and recommendations for future research and use by the policymakers.

## **2. Financial Cycle - Literature Review**

The intensity of publishing the results of research on financial cycles in recent years shows the importance of this topic in economics. However, there is still a lack of explanatory theory. Most of the research results are international, much less national. They mainly refer to verification of methods, identifying cycles, their amplitude and duration, synchronization with business cycles, and the global financial cycle's possible existence. Our theory review refers to the newest publications.

Yan and Huang (2020) check synchronization between the financial and business cycle in U.S. between 1970:1 to 2018:4. The empirical results confirm synchronization, especially at medium-term frequencies (8–30 years); the business

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cycle leads the financial cycle with a high positive correlation. The results also show that the financial cycle has a crucial impact on the real interest rate, becomes the main driver of the business cycle, and serves as an essential source of business cycle fluctuations.

Prior study (Škare and Porada-Rochoń, 2020c) of the business and financial cycles interaction from 1270–2016 in the U.K., shows that there is a robust synchronization between financial and business cycles at ten-year intervals (medium-term). Taking into account the same data but using Braitung and Candelon (2006) Granger causality test and discrete threshold model (Hansen, 2005) Porada-Rochoń and Skare (2020) find that financial and business cycles relation varies over time with current financial cycles being longer to their historical versions as well as financial cycles lead business cycles. The critical score indicates that business cycles are an economic reaction to the financial cycle and change in the Minsky moment.

Schüler *et al.* (2019) find that considering G7 countries in the years 1970Q1 until 2018Q4, the financial cycle differs across countries in terms of duration. The narrow financial cycle lasts 15.6 years on average, the most extended cycle is found in Japan (23.0 years), Germany's shortest (7.4 years). Given that the financial cycle may be in a different phase, the macro-prudential policy should refer to the phase in which the cycle is in. Such approaches may affect systemic risk.

Likewise, the results for Germany (1970:1-2013:4) reached Strohsal *et al.* (2019), indicating a shorter financial cycle (2-8 years) and less visible than for the U.S. and U.K. (1960:1-2013:4) – on average 15 years. The observed effects for U.S. monetary policy through the risk-taking channel on financial and real activity in the U.K. and Germany confirm US-driven global financial cycle significantly affects national cycles in the U.K. but not in Germany.

Financial cycles in China (the 31 Chinese provincial areas) have been studied by Chung-Hua *et al.* (2018) between 2001- 2015. Results show that each province has its unique financial cycles and business cycles. Furthermore, the financial cycle leads the business cycle the maximum effect is more robust in rich provinces than in impoverished areas, and most provinces reached their troughs of financial cycles and business cycles in the years 2008 and 2009, respectively.

Considering 34 advanced and developing countries between 1960:1 – 2015:4, Adarov (2018) confirm the existence of financial cycles recurring nature of financial cycles and frequencies 9–15 years on average. Belgium, Denmark, Finland, France, Germany, Italy, Japan, Switzerland, Spain, the USA were investigated by Skare and Porada-Rochon (2020) between 1970:1 – 2018:4. The results confirm the financial cycle's length, on average is 8.9 years with extended memory properties (the most prolonged duration is in Belgium, Germany 10.42).

Euro countries were investigated by Vasicek and Monteiro (2018). They confirm that synchronization occurs to both business and financial cycles however, it is more relevant to business cycles.

The presence of a financial cycle in South Africa (1965:1 – 2016:4) was confirmed by Farrell and Kemp (2020). The results show that the financial cycle has a longer duration and a larger amplitude than the traditional business cycle. At the same time, they find that the financial cycle is distinct from the business cycle in South Africa.

A valuable strand of the literature exploring the nature and interaction between business and financial cycles fluctuations point that the duration and amplitude of the financial cycles differ across the countries. Studies show that the length of the financial cycle is longer than the business cycle. Usually, there is a synchronicity between cycles. Financial cycles are linked to crises and lead to business cycles. There is no consensus on one proper method for measuring financial cycles, and a real theory explaining the financial cycle remains unclear. Nevertheless, most of the results indicate that the financial cycle is significant for financial policies, which should differ in different provinces and countries.

### 3. Data and Methodology

This study uses quarterly data for Poland (1992:1-2018:4) and the credit-to-GDP gap as a proxy for financial cycles. The data were collected from the Bank for International Settlements, and credit to GDP gap is the difference between the credit-to-GDP ratio and its long-run trend. The Basel III package has become the basis for introducing the gap indicator as a standard benchmark to guide the build-up of countercyclical capital buffers. We tested the integration properties of the data to evaluate their methodological possibilities. We provided relevant evidence in favor of four methods for decomposing the trend and cycle component from the real output, namely Hodrick-Prescott filter, Baxter and King filter, Christiano-Fitzgerald filter, and Beveridge-Nelson decomposition method.

*Hodrick and Prescott H.P. filter (1980)*: It is the most common technique for extracting business cycles from economic variables. It allows the identification of an estimated stochastic trend that is not correlated with the cycle. The main goal to use H.P. filter is to remove a smooth trend  $\tau_t$  from some given data  $y_t$  by solving the next equation."

$$\min_t \sum_{t=1} ((y_t - \tau_t)^2 + \lambda((\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}))^2) \tag{1}$$

So, the residual  $y_t - \tau_t$  is then commonly referred to as the business cycle component.

*Bandpass filter, Baxter and King (1999) and Christiano and Fitzgerald filter C.F. (2003):* Both filters isolate the cyclical component of a time series by specifying a range for its duration. The periodicity of the business cycles we want to isolate is key to the application of these filters.

It is calculated as:

$$c_t = B_0 y_t + B_1 y_{t+1} + \dots + B_{T-1-t} y_{T-1} + \tilde{B}_{T-t} y_t + B_1 y_{t-1} + \dots + B_{t-2} y_2 + \tilde{B}_{t-1} y_1 \quad (2)$$

$$B_j = (\sin(jb) - \sin(ja))/\pi j, j \geq 1, \text{ and } B_0 = (b - a)/\pi, a = 2\pi/p_u, \quad (3)$$

$$b = 2\pi/p_l \quad (4)$$

*The Beveridge-Nelson filter B.N.:* Decomposing such a nonstationary series into a permanent and a transitory is possible due to the B.N. filter. The permanent component is shown to be a random walk with drift and the transitory or cyclical component is a stationary process with mean zero, the optimal long-horizon forecast (in a minimum-mean squared error sense) will be equal to the conditional expectation of the permanent component (Beveridge and Nelson, 1981).

The trend is a random walk with drift, whereas the cyclical component is stationary:

$$gt = g0 + a1 t + A(1) \sum_{s=1}^t \varepsilon_s \quad (5)$$

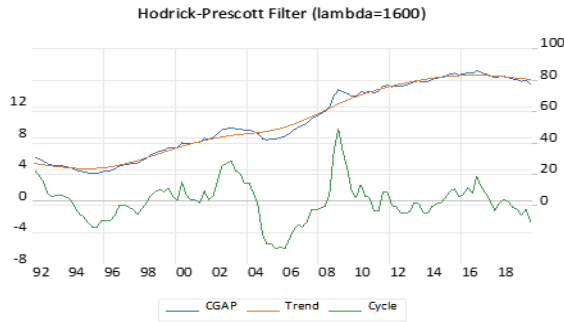
$$ct = A^* (L) \varepsilon_t \quad (6)$$

Data are transformed in their logarithmic form. To extract the financial / business cycle component that presents the variable's stationary cycle applied four extracting procedures (H.P. filter, B.K. filter, C.F. filter, B.N. filter). Generally, the figures and tests confirmed the absence of a unit root in the observed variables, which is an essential property of detrended variables.

#### 4. Empirical Results

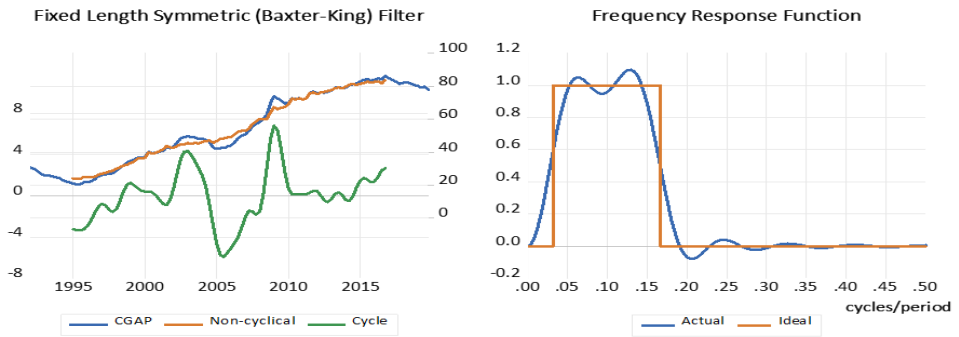
In Figure 1, using the H.P. filter, we can observe isolated financial cycles with a periodicity of 7 years, 5–5.6 years, eight years with relatively small amplitude. The patterns in the cyclical movements are similar and present in the same period using the B.K. filter (Figure 2) and C.F. filter (Figure 3) for the period 1996-2004 and 2004-2010. We identify several statistically significant cycle lengths. This means that in that time, several distinct financial cycles were present.

**Figure 1. Financial Cycle in Poland H.P. Filter**



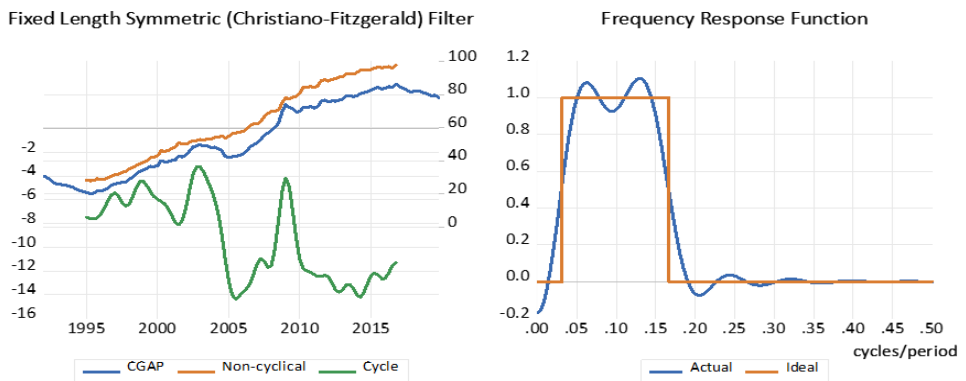
Source: Author's calculations.

**Figure 2. Financial Cycle B.K. Filter**

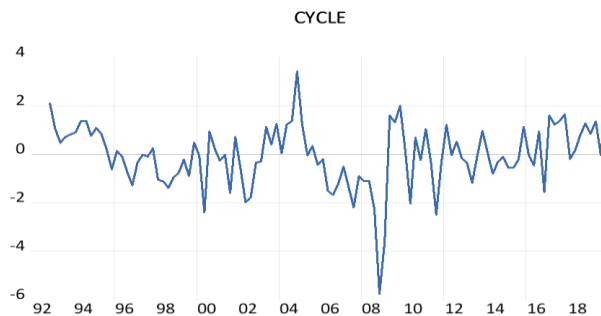


Source: Author's calculations.

**Figure 3. Financial Cycle C.F. Filter**



Source: Author's calculations.

**Figure 4.** Financial Cycle - Beveridge – Nelson decomposition

**Source:** Author's calculations.

Figure 4 presents different volatility from the previous figures. Following the methodology presented in section 3, we calculated cycle similarity (across four different cycle extraction methods). All filters give almost the same results and confirm the existence of a financial cycle in Poland. Using all these filters financial cycle lasts on average from 5 to 8 years. The average duration of the financial cycle (Table 1) lasts on average for 14.1 quarters with amplitude, on average, 5 quarters.

**Table 1.** Financial Cycle in Poland

Turning points for CYCLE:	
Duration:	
Expansion	7.833333
Contraction	6.333333
Amplitudes:	
Expansion	5.368165
Contraction	-5.262830

**Source:** Author's calculations.

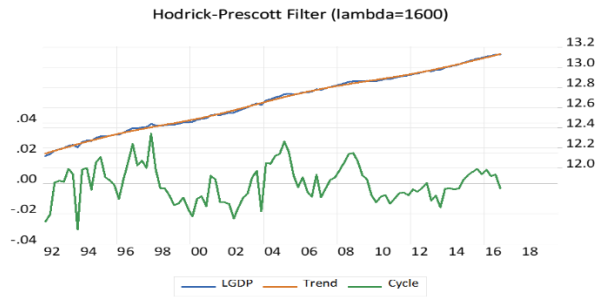
We apply the same methods to isolate business cycles in Poland. From Figures 5 to 8, we can see that Poland's business cycles over the observed period change in dynamics and length. There is no consistency and similarity of the amplitudes between financial cycles and the business cycle.

In the first half of the period, (Figure 8) business cycles show more coincident and converging behaviour than it was in the rest part of the period and greater amplitude of fluctuations than in the previous period. To sum up, (Table 2) we find evidence on 12.6 quarters on average business cycle with amplitude below one quarter.

The fluctuation and amplitude for the business cycle are much lower than for the financial cycle. An intersection point between both cycles is getting in the time of the global crisis 2007/2008.

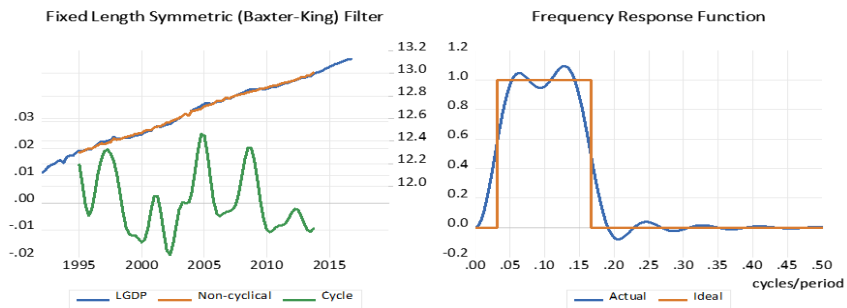


**Figure 5. Business Cycle in Poland H.P. Filter**



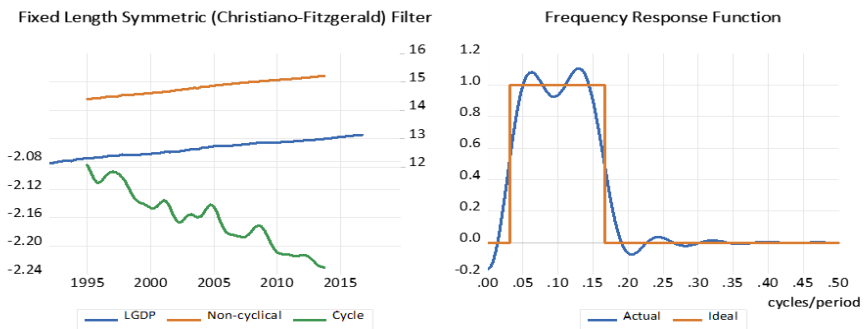
Source: Author's calculations.

**Figure 6. Financial Cycle in Poland B.K. Filter**

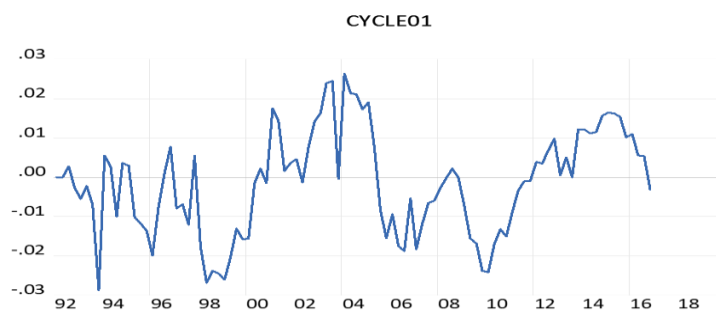


Source: Author's calculations.

**Figure 7. Financial Cycle C.F. Filter**



Source: Author's calculations.

**Figure 8. Business Cycle in Poland: Beveridge – Nelson decomposition**

*Source: Author's calculations.*

**Table 2. Business Cycle in Poland**

Turning points for CYCLE01:	
<u>Duration:</u>	
Expansion	7.142857
Contraction	5.571429
<u>Amplitudes:</u>	
Expansion	0.033862
Contraction	-0.033871

*Source: Author's calculations.*

To understand the variable's cyclic characteristics, we used the four cyclic extraction methods explained in section 3. The cyclic behavior of the variable under study seems consistent throughout the whole period and in all four-cyclical extraction procedures, which means that we can use any method to explain the cycle dynamics. We can conclude that there is no universal fit for the financial cycles and business cycle with changing nature and time dynamics. Since financial cycles change over time and space, it is significant to explore how these changes impact the economy (spectral coherence between financial and business cycles). Using:

1. Hodrick – Prescott filter of financial and business cycles we find correlation (0.00029)
2. Baxter – King filter of financial and business cycles (-0.0746)
3. Asymmetric filters Christiano – Fitzgerald (0.88) (strong connection)
4. Hamilton filters of financial and business cycles in Poland (-0.03)

Financial and business cycles series do not move along over the searched period. The correlation between financial and business cycles in Poland used 3 filters is not existent but using asymmetric filters Christiano-Fitzgerald the correlation is confirmed. The financial cycles have a low impact on the business cycle in Poland.

## 5. Conclusions

Our research confirms the existence of the financial cycle in Poland. Financial cycles in Poland last 14.1 quarters in relation to the business cycle lasting 12.6 quarters. The paper's empirical results show that financial cycles could significantly impact Poland's business cycle (Christiano-Fitzgerald filter), influencing long-term growth. To achieve long-term and sustainable economic growth, policymakers should monitor financial cycles and revise fiscal and monetary policy accordingly. Poland is a particular case because it avoided a recession after the global crisis from 2008 occurred. During 19/20, the financial industry's centuries were not so crucial for economic growth in contrast to the output. Moreover, today is the opposite; the finance sector is more important than production. Nowadays, there is a need to rethink finance in times of instability and unsustainability because financial factors drive economic fluctuations. As Dainaug (2017) highlighted, financial deregulation influences the financial cycle, stimulated credit expansion (Reinhart and Rogoff, 2010), the development of shadow banking, a rise in interconnectedness, and an increase in the fragility of the international financial system. As implications for monetary policy, a significant "*lean against the wind*" approach should be implemented. It requires policy to take financial developments into account systematically (Juselius *et al.*, 2016).

Philips wrote to design optimal economic policy we should know that employment, inflation, and growth are the same goals and economic policy instruments. Therefore, it is possible to consider whether monetary policy can be based on inflation? Jusellius *et al.* (2016) suggest that inflation may be a short guide for monetary policy. At the same time, we currently have the lowest interest rates for the last 5000 years. How about Fisher, Philips, and Minsky' theory about that? The answer is not clear, but Fisher does not expect negative interest rates, Philip's curve is already broken, and Minsky does not expect inflation expectation close to zero.

There is a need for a better understanding of proper financial cycle's nature (Skare and Porada-Rochoń 2020a) for closely monitoring the evolution of financial cycles and for policy measures to curb extreme fluctuations in order to mitigate the effects of the global financial cycle (Strohsal, 2019) and global crisis and improving their forecast accuracy (Skare and Porada-Rochoń, 2020a).

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