

## THE DYNAMICS OF THE CREDIT CYCLE IN SELECTED ASIAN COUNTRIES<sup>1</sup>

ŁUKASZ LENART

Cracow University of Economics, Department of Mathematics  
*e-mail: lenartl@uek.krakow.pl*

MATEUSZ PIPIEŃ

Cracow University of Economics, Department of Econometrics and Operations Research  
*e-mail: eepipien@cyf-kr.edu.pl*

### STRESZCZENIE

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W artykule przedstawiono cechy cyklu kredytowego w wybranych krajach azjatyckich. Zasadniczym celem analiz jest omówienie różnic w cyklu w świetle zróżnicowanego wpływu kryzysu azjatyckiego z lat 1997–1998 na gospodarkę regionu wschodniej Azji. W pracy zastosowano nieparametryczny test, umożliwiający wnioskowanie o statystycznie istotnych częstościach dyskretnego spektrum procesu opisującego cykliczne fluktuacje.

Uzyskane rezultaty empiryczne pozwalają stwierdzić, że cechy cyklu kredytowego znacznie się różnią w regionie azjatyckim. Kraje najsilniej dotknięte kryzysem, to jest Korea Południowa i Malesja, charakteryzują się cyklem kredytowym o długim okresie, przekraczającym dwie dekady. Cykle kredytowe w krajach słabiej dotkniętych kryzysem, takich jak Singapur i Tajwan, charakteryzują się okresami znacznie krótszymi i relatywnie silniejszymi amplitudami wahań.

### ABSTRACT

In the paper the empirical properties of the credit cycle in selected Asian countries are discussed. The main goal of the analyses was to check whether the basic properties of the credit cycle, like the period and amplitude, may vary across countries. The Asian financial crisis from 1997 and 1998 had diverse impact on countries from the East Asia region. We discuss the properties of the credit cycle with respect to such diversity.

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The results obtained in the paper indicate substantial differences in properties of the analysed cycle. Countries like South Korea and Malaysia, affected seriously by Asian financial crisis, are characterised by the credit cycle with period greater than two decades. Much shorter credit fluctuations (6–10 years) were obtained in case of Taiwan and Singapore, not seriously affected by the Asian crisis.

#### SŁOWA KLUCZOWE — KEY WORDS

cykl kredytowy, cykl deterministyczny, subsampling, funkcja prawie okresowa, filtr HP  
credit cycle, deterministic cycle, subsampling, almost periodic function, HP filtration

## 1. INTRODUCTION

The global financial crisis occurred in the late 2000's has shown again the thrilling influence of financial system to the business cycle. The role financial markets should play in developed economies has been also a subject of the post-crisis policy debate, making substantial effort towards design of macroprudential policy. A careful insight into the empirical properties of the financial cycle in general and credit cycle particularly was motivated by the existence of risk that excessive credit growth may result in contraction or even deep recession. Hence, a variety of macroprudential policy tools have been designed in order to reduce the vulnerability to crises by smoothing the credit cycle. The effectiveness of macroprudential policy is still at preliminary stage, but there is no doubt that financial cycle and its components is crucial for assessment.

A particular interest in empirical properties of the cyclical fluctuations of financial variables prompted new methodological studies resulting with more advanced techniques of modelling economic cycles. The stylized facts concerning credit cycle for developed economies are well-documented. Recently the credit cycle was examined by Lenart and Pipień (2015a) and (2015b) on the basis of discrete spectral analysis and the notion of deterministic cycle.

A decade before the global financial crisis has its origins in USA mortgage market countries like South Korea, Malaysia, Taiwan and others from region of East Asia suffered great economic downturn due to Asian financial crisis. On the field of empirical analyses of the nature of linkages between financial markets Asian financial crisis is treated as a reference example of existence of the contagion effect. However many economists represent the point of view that the crisis was created by a more fundamental issues than market psychology; see Krugman (2000). To understand the origins of the Asian crisis one has to consider importance of the relationship between lender and borrower. Krugman (2000) claims that wrong activity in the financial systems in South Asia countries amplified large quantities of credit that became easily available. It generated a highly leveraged economic climate and pushed up asset prices to

an unsustainable level. In the preliminary stage of the Asian crisis these asset prices began to collapse, causing individuals and companies to default on debt obligations. Again Debt Deflation Theory (DDT) discussed many decades ago by Fisher (1933) turned out to be empirically supported again.

However Asian economies were affected by the crisis in diverse way. South Korea and Malaysia were substantially hurt by economic slump. Singapore and Taiwan were less affected while Japan did not undergo financial contagion. The main goal of the paper is to characterize the credit cycle in selected Asian economies. In the empirical part of the paper we analyze differences in properties of cyclical fluctuations in the credit series with respect to the magnitude of impact of Asian financial crisis on a particular country. The subsampling test of the significance of a particular frequency is used to make a comparative analysis mentioned above. We discuss the empirical features of the cyclical components within the proposed methodology, and finally we extract them on the basis of the HP filter with an indirectly estimated smoothing parameter.

## 2. RESEARCH METHODOLOGY

Our methodology is based on the generalization of the concept of a deterministic cycle. According to the seminal paper by Harvey (2004) the deterministic function describing cyclical variations is described only by a single common frequency. Hence it is not flexible enough to describe observed changing dynamics of business or credit cycle. The natural generalization to multi-frequency deterministic cycle concept can be found in Lenart and Pipień (2013a), (2015a), (2015b) and (2016). This generalization is based on representation of the unconditional expectation function of observed cyclical process of the following form:

$$\mu_p(t) = f(t, \beta) + \sum_{\psi \in \Psi_p} m_p(\psi) e^{i\psi t},$$

where  $f(t, \beta)$  is related to long term fluctuations (trend pattern) and  $g(t) = \sum_{\psi \in \Psi_p} m_p(\psi) e^{i\psi t}$  is an Almost Periodic (AP) function related to analyzed cyclical or seasonal fluctuations; see Lenart and Pipień (2013b) or trading-day fluctuations — see Lenart (2015) and (2017). In the aforementioned framework one has to estimate frequencies from the set  $\Psi_p = \{\psi \in [0, 2\pi); |m_p(\psi)| \neq 0\}$ . In order to perform this task we use methodology presented in a series of papers Lenart (2013); Lenart and Pipień (2013a), (2015a), (2015b), (2016) and (2017). The asymptotic distribution of the estimator depends on unknown spectral density function. This spectral density function is not easy to estimate in the case of process with unknown mean function with almost periodic structure. And thus the identification of frequency related to cyclical fluctuations is based on subsampling methodology.

### 3. PRESENTATION OF THE DATA

We examine the dynamics of the credit cycle in selected Asia countries, namely Japan, South Korea, Malaysia, Singapore and Taiwan. The choice of countries was mainly caused by accessibility of data. We consider monthly data of total loans. Except Singapore the series start in late 90's when the Asian financial crisis occurred. The length of the sample may change across countries. According to Table 1 the shortest series was collected for Singapore. In all remained cases the dataset consists of at least 234 observations. For Japan we analyze the longest series, covering period from January 1995 till June 2016.

Table 1

Length and span of analyzed credit time series

Country	Start of the sample	End of the sample	Length of the sample
Japan	January 1995	June 2016	258
South Korea	January 1997	June 2016	234
Malaysia	January 1997	June 2016	234
Singapore	March 2004	June 2016	148
Taiwan	January 1997	June 2016	234

### 4. EMPIRICAL RESULTS

We focused on the basic properties of the credit cycle, namely the length and amplitude. Figure 1 presents results of testing statistical significance of frequencies parameterizing unconditional mean of the APC process (the set  $\Psi_p$  mentioned above). We utilize testing procedure (6) and (7) from the paper by Lenart and Pipień (2015a) to identify statistically significant frequencies describing the analyzed cycle. The test statistics calculated for each frequency is presented as a solid line, while dotted lines represent regions of rejection of a null hypothesis. In Table 2 we present the length of the cycle corresponding to a particular statistically significant frequency. The series clearly support frequencies corresponding to much longer cycle in case of Japan, South Korea and Malaysia. In case of Singapore and Taiwan the series support even twice shorter cycle. The economic progress and evolution of the financial system that has been done after the Asian financial crisis in South Korea and Malaysia seems explain our results. Financial system in South Korea and Malaysia affected seriously by the financial contagion in 1997 evolved in such a way the cyclical aspect of its activity is comparable to the results obtained for well developed

economies; see Lenart and Pipień (2015a). Long credit cycle with the period expanding on a more than two decades, common for developed economies (USA, UK, Japan) is empirically supported also for those Asian countries.

In case of Singapore and Taiwan the data support much shorter cycle. The cyclical component for Singapore in credit can be described by three frequencies statistically significant with the length of corresponding cycles about 11, 5 and 3 years; see Table 2. Even shorter fluctuations in credit can be observed for Taiwan. In this case the credit cycle can be decomposed into three cycles of length 6, 3 and 2 years. Asian financial crisis had much weaker impact on Singapore and Taiwan. Our results confirm conclusions drawn by many authors that the weak impact of the Asian crisis did not prompted authorities to reform financial system in some countries. The short term fluctuations in the credit seems procyclical and may be the source of financial distress in the future; see evidence for Singapore Abeyasinghe (2001) and Abeyasinghe and Choy (2004), and for Taiwan see Kil (2004).

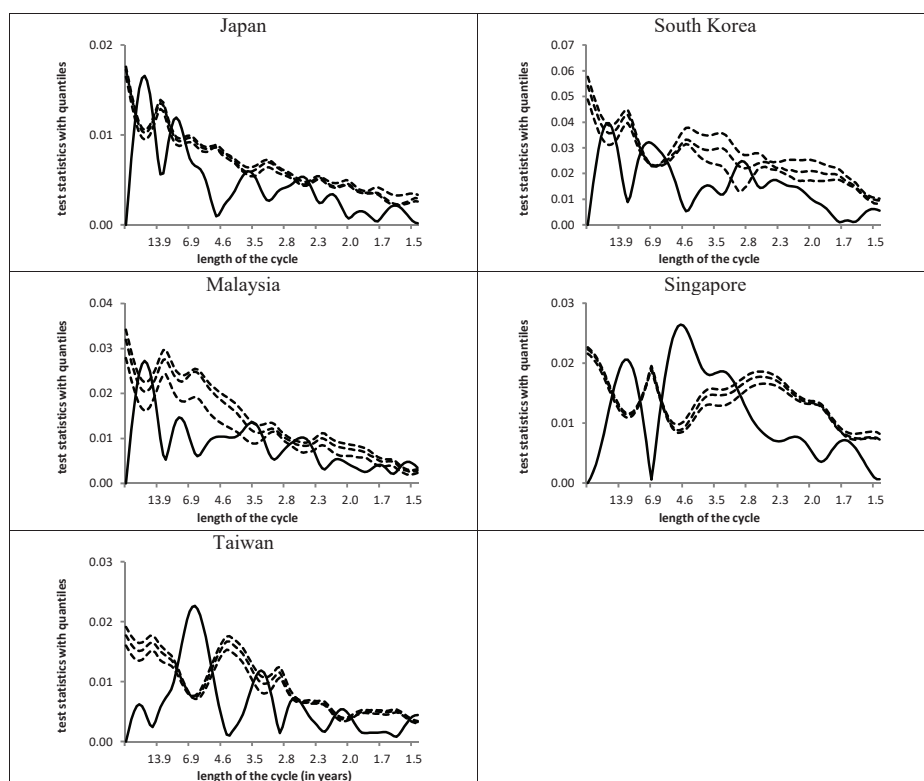


Figure 1. The test statistics (solid lines) with rejection regions at nominal levels 2%, 5% and 8% (dotted lines)

Table 2

The estimated lengths of the credit cycle (in years) in analyzed countries

Country	Estimated length of the cycle in years			
Japan	23.8	8.8	2.5	
South Korea	20.8	7.2		
Malaysia	23.8	3.5	2.5	1.6
Singapore	11.1	4.8	3.3	
Taiwan	6.4	3.3	2.0	

We extract the cyclical components from the analyzed monthly series; see Figure 2. The extraction procedure is based on the HP filter with a smoothing parameter corresponding to the frequency of a period of 5 years (solid line) and 10, 15 and 20 years (appropriate dashed lines). We see regular cyclical changes and clear indication of expansion and contraction phases for Japan, Singapore, Taiwan and South Korea. The amplitude of the credit cycle, as measured by the percentage of maximum deviations from the long-term trend, is not precisely identified and exhibits substantial variability with respect to changes in the smoothing parameter in the HP filter. This result was obtained in our previous analyses; see Lenart and Pipień (2015a) and (2015b).

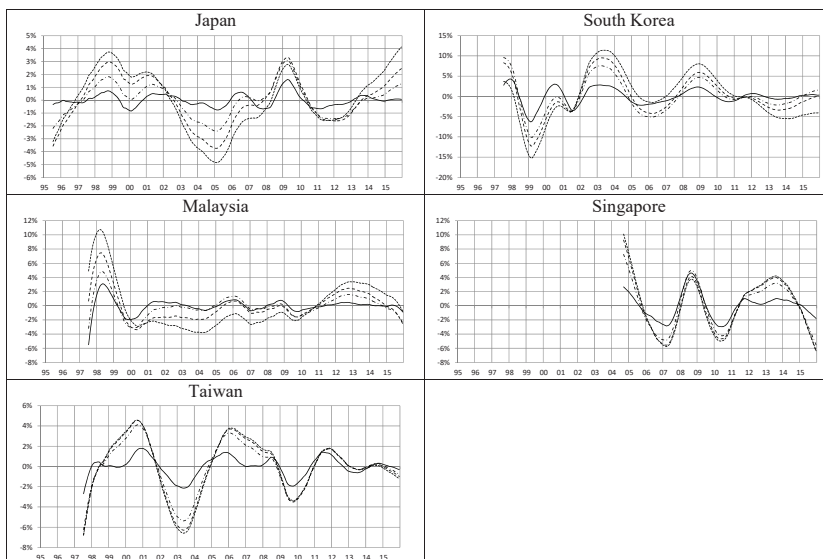


Figure 2. The cyclical components extracted from the credit series. Smoothing parameter in HP filter corresponds to the length: 5, 10, 15, 20 years (solid and dotted lines respectively)

Interestingly analyzed economies had different cyclical position in the credit during the outbreak of the Asian financial crisis. According to Figure 2 Japan was in neutral position changing the dynamics of the cyclical component from the phase of recover (mid 90's) to credit expansion unaffected by the crisis with resulting peak localized at 2000–2001 year. Prior to the crisis South Korea was characterized by expansion phase and with peak occurred in 1997 year. The crisis seriously changed credit conditions generating long lasting contraction and recession phases. The positive deviation of the credit cyclical component from the long term trend was reached in South Korea not earlier than seven years after the crisis. The cyclical position for Malaysia is not clearly identified. As the smoothing parameter in HP filter change, the cyclical position also changes from neutral to expansion phase with peak in 1997. Asian financial crisis occurs in parallel with abrupt contraction in credit conditions in 1998 year. Since then deviations from the long term trend of the credit does not indicate any cyclical nature in financial system in Malaysia up to 2010. In case of Taiwan the amplitude of cyclical component is relatively small as compared to Japan, South Korea and Singapore. Asian financial crisis did not provoked credit crunch but contrariwise occurred together with recovery and expansion phases reaching peak in 2000. Due to accessibility of the monthly dataset the cyclical component for Singapore was extracted on time span from 2005 up to 2016. This case can be characterized by existence of a regular cycle with short period with relatively great amplitude.

#### 4. CONCLUSION

The analyses of cyclicity of the financial system was prompted by the global financial crisis occurred in the late 2000's. However a decade before the global financial crisis has its origins East Asia countries like South Korea, Malaysia, Taiwan and others suffered great economic downturn due to Asian financial crisis. There is vast literature analyzing this crisis as a reference example of existence of the contagion effect. We present a some insight into the role the financial system played during the crisis.

In the paper the empirical properties of the credit cycle in selected Asian countries were discussed. The main goal of the analyses was to check whether the basic properties of the credit cycle, like the period and amplitude, may vary across countries. The Asian financial crisis from 1997 and 1998 had diverse impact on countries from the East Asia region. We discuss the properties of the credit cycle with respect to such diversity.

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