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The Procyclicality of Credit Cycle of Islamic and Conventional Banks During COVID-19: Measuring Amplitude and Frequency Indicators

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Abstract: Procyclicality in the banking sector is one of the important indicators that may encourage the systemic risk in the banking system. This study examines banking behavior of the economy during the COVID-19 pandemic and analyze the amplitude and frequency of the credit cycle of Islamic and conventional banks. This study is primarily focused on the credit property of Islamic and conventional banks from 2014 to 2020 with application of Ordinary Least Square (OLS), Frequency Base Filter Analysis (FBF) and Turning Point Analysis. Our study finds that the size of Islamic bank's amplitude is larger than the size of conventional bank's amplitude. This is characteristic of Islamic banks based on the pattern of financing of the real sector. Meanwhile, conventional banks encourage the creation of bubble capital because it is related to the credit pattern grounded in speculative activities based on the interest system. Therefore, conventional banks need to encourage credit patterns based on capital. Meanwhile, the size of the frequency of Islamic banks has a longer frequency measure than conventional banks, but the number of cycles formed is the same as a perfect cycle.

Keywords: Amplitude and Frequency Indicators, Conventional Banks, Islamic Banks, Islamic Finance, Frequency Base Filter Analysis, Turning Point Analysis.

JEL Code: E51, G01, G21

1. Introduction

In the time of pandemic diseases, the current study focuses on the impact of the country's pandemic death rate on its economic outcome. The outcome in the economic sector is represented by a rate of GDP or real per capita consumption (based on data on real personal consumer expenditure). In the case of the Great Influenza, known as the Spanish flu, it has declined by 6 percent for GDP and 8 percent for private consumption. These economic declines are comparable to those last seen during the global financial crisis in 2008-2009. In this condition, the possibility exists not only for unprecedented numbers of death but also for a major global economic contraction (Barro, Ursúa, & Weng, 2020). On the other side, negative labor supply shock and demand reacting very little would be affecting the output. And there was little damage done to the balance sheets of the non-financial or financial sector (Velde, 2020). The financial crisis, market failures, and economic bubbles have repeatedly occurred. Those phenomena were triggered by developing a modern financial system that had begun after the Bretton Woods Agreement collapsed in August 1971 (Ascarya, Rahmawati, S., & Karim, 2016). In line with the statement as expressed by Bordo, Eichengreen, Klingebiel, & Martinez (2001) that after the Bretton Woods Agreement collapse that abolished the standard system of currencies converted to gold, financial crisis frequently occurred more and had a systemic impact that increased even wider spread. Since then, we have witnessed at least 431 events of the financial crisis that hit the world, with153 being exchange rate crises, 100 banking crises, and 18 debt crises. Moreover, there is a composite crisis which includes 68 twin-crisis and 8 triplet-crisis. Banking crises are the second most recorded in the case of financial distress (Laeven & Valencia, 2008).

Banking credit or, what is known in Islamic finance as financing, has a very important role in financing the national economy and it drives the national economic growth rate. Availability of credit allows both households to consume and companies to conduct investment activities which are very difficult if only financed with personal funds (Kusuma & Duasa, 2016; Malik, Aziz, Saiti, & Din, 2021; Mastilo, Štilić, Gligović, & Puška, 2024). When economic growth increases and macroeconomic stability is maintained, the confidence and optimism of the market to transact capital will continue to increase, thereby encouraging increased credit growth (Utari, Arimurti, & Kurniati, 2012; Mdaghri and Oubdi, 2022). Banks have suffered more impact not only relative to other sectors but also the comparison with previous crises. Despite the recent partial recovery, the decline of bank stock prices is currently on a par with that over an equal period following the collapse of Lehman Brothers in 2008. In line with these developments, banks' long-term rating outlooks have begun to deteriorate, reflecting concerns

over the impact of Covid-19 on bank earnings (Aldasoro, Fender, Hardy, & Tarashev, 2020).

The sluggish domestic economy was followed by an increase in problem financing (NPL) which encouraged banks to behave more rationally and be careful in channeling their loans to the business world. Moreover, entering the period of economic stagnation just now, businessmen tend to refrain from applying for credit transactions in the banking sector. However, the problem that is feared arises if a significant increase in credit growth is even too far above normal. In this condition, banks are said to be able to trigger a crisis in the monetary sector that has a further impact on the real sector and banks are also said to be procyclical (Ganić, 2023). The procyclicality is known as the big issue with many roots such as the tendency to make a more lenient assessment of risk-taking behavior and it can be used as a prominent indicator which the procyclicality will be categorized as bad or good procyclicality (Buesa, Población García, & Tarancón, 2020). Procyclicality itself can be understood briefly as a phenomenon that enlarges feedback between the financial system and macroeconomic conditions (Deryugina, Guseva, & Ponomarenko, 2022). Besides, procyclicality in the banking system refers to the interaction of the real banking and economic system that mutually reinforces and tends to strengthen the amplitude of the business cycle. It means that procyclicality is one of the important sources that cause systemic instability in the financial system as pointed by Landau (2009), Bank for International Settlement (2010), Jeong (2012), Ascarya et al., (2016). This phenomenon will later exacerbate an unsustainable boom and it occur when the boom period became a bust. In the perspective of measuring systemic risk, Minsky's thinking is supported by Adrian & Brunnermeier (2011). According to this literature, the systemic ratio is born not when the volatility is high but on the contrary, it occurs with low volatility or what can be called paradox volatility. The amplitude in the cycle of economic activity refers to the relationship between the economic periods of boom and bust. The boom period indicates a positive amplitude in banking procyclicality towards economic activities. While bust indicates the occurrence of negative amplitude in banking procyclicality towards economic activities (Dupraz, Nakamura, & Steinsson, 2018). Positive or negative amplitude on the economic activity cycle towards the credit cycle is prepared based on the extent to which bank credit capacity can encourage economic activities when economic conditions lead to expansion or contraction (Oman, 2019).

Since Islamic finance and banking have dramatically been growing, the requisite for research and studies related to Islamic studies and its perspectives are increasingly being sought. This is driven by the increasing number of stakeholders requiring studies as the application of financial practices is increasingly being

applied to the financial and banking sector. Moreover, with the growing body of research on macroprudential policy, both Islamic and conventional banking have expanded significantly. Unfortunately, there is still a lack of sufficient literature on monetary policy under dual banking systems (Zulkhibri, 2019). Indeed, at present, amid increasingly erratic economic conditions and less responsive market players at the discretion of the monetary authority, the behavior of banking procyclicality can become an obstacle for monetary authorities to transmit monetary policy through interest and credit channels. As a result of the rigidity of bank interest rates, it gives the impression that the central bank's policy rate to encourage the growth of the real sector becomes less effective. Thus, understanding the banking credit cycle needs to be understood in depth. So that this research is expected to be able to provide appropriate policy recommendations to maintain the stability of the banking system in the dual banking system.

This paper is organized as follows: Section 2 gives the related literature review after following Section 1. Section 3 describes the data and quantitative technique used in the study. Section 4 discusses the empirical results and analyses of the evidence. Finally, section 5 provides conclusion and recommendations.

2. Literature review

2.1. Related Studies on Procyclicality and Credit Cycle

Several studies examine related amplitude and length or frequency of the cycles in economic activity which is represented by connecting the financial cycle and business cycle. As pointed by Landau (2009), Aikman, Haldane, & Nelson, (2010), Borio, (2012) and Alamsyah, Adamanti, & Yumanita, (2014). Aikman et al., (2010) based on his research which focuses on credit cycle analysis and its relationship to the business cycle, states that the credit cycle has a difference with the business cycle, this is evidenced by the different size of the frequency and amplitude. Meanwhile, according to Borio (2012) that determines the length of wave amplitude in the financial system (credit growths cycle) is the policy regime that is applied. Besides, Landau (2009) has reviewed Islamic banking and came to the conclusion that the procyclicality of Islamic banking is not categorized as poor procyclicality which increases the amplitude of a business cycle, creates bubbles economy, and financial instability.

Alamsyah et al. (2014) seek to investigates Indonesia's financial cycle. This study explained that financial liberalization was one of the factors that caused the size of the financial cycle amplitude to below. Also, the implementation of monetary

policy was considered too loose during the period of economic expansion, which was also driven by the determination of policies in the real sector which mismatches with monetary policy contributing to the size of the amplitude and frequency of the financial cycle. This in turn will have a strong impulse from the turning point (boom) of the cycle to the contraction phase (bust). Aikman et al. (2015) which was focusing on the credit cycle, trying to recognize the distinction of credit and real economy cycle, documenting the medium-term cycle, and relating the boom-and-bust credit cycle to banking crises. By using the band-pass filter proposed by Fitzgerald & Christiano (2003), this research finds that credit-to-GDP growth has a strong relationship with a financial crisis; an increase in credit growth has always been accompanied by a rise in the probability of banking crises over the last century (Kyriakopoulos, Koulis, & Varvounis, 2023). Another empirical finding of the study identifies that the length and amplitude of financial cycles are distinct from those of the business cycles, as explained by Claessens, Kose, & Terrones (2011) and Drehmann, Borio, & Tsatsaronis, (2012).

Research as conducted by Claessens et al. (2011) which was focusing on analyzing the relationship between the financial cycle and business cycle. The methodology used is turning point analysis based on Granger, Bry, & Boschan (1972). Some conclusions from the findings obtained from this study: (1) Interaction between the business cycle and financial cycle: Recessions accompanied by disruptions to the financial system tend to be deeper and have a longer period. Besides, the recovery during the recession was accompanied by a boom in credit and housing prices interacting with output growth. (2) Effect of duration and amplitude on business cycle: The duration of recession and recovery is influenced by the strength and intensity of the financial cycle. Recession accompanied by a bust in housing prices tends to be longer and deeper, compared to other recessions, while the recovery accompanied by an increase in credit and housing prices tends to be strong. Furthermore, Wimanda, Permata, Bathaluddin, & Wibowo (2012) was motivated by the fact that the financial sector has an important influence on economic movements. The focus of the study follows the steps taken by Drehmann et al. (2012) who examined financial conditions in developed countries. By using the same methodologies, the conclusion that can be derived from this research is that real credit and stock prices have movements in line with economic development (financial sector developments are procyclical), but not for the government securities variable. So the steps that may need to be taken by the monetary authority in determining policy should take into account the medium-term conditions in the cycle. If not, this will lead to a recession in economic activity accompanied by a large reduction in output in a large number and for a long period of time.

Drehmann et al. (2012) sought to characterize empirically the financial cycle and its relationship with the business cycle. It found the evidence by combining turning-point analysis and frequency-based statistical methods in the 1960s by examining the behavior of six variables for representing seven countries (Australia, Germany, Japan, Norway, Sweden, United Kingdom, and the United States) over the period 1960-2011. The conclusions that can be drawn from their study are as follows: first, a medium-term approach is crucial when identifying macroeconomic disruptions, as it is more informative than using only business-cycle frequency (i.e., cycle lengths). Second, peaks tend to coincide closely with financial crises and are therefore associated with serious damage to economic activity. In addition, the cycles captured in this study are most effectively identified by combining credit and property price indicators. Similar study was done by Utari et al. (2012) and it focused on factors affecting the banking procyclicality in Indonesia by using credit growth data. In addition, this study examines the characteristics of the banking system that have the potential to improve procyclicality conditions. The methodology used is turning point analysis, and the empirical approach uses simple regression. The conclusion is that there is procyclicality behavior in the credit cycle which has strong procyclical characteristics during the expansion period compared to the contraction period. The effect of GDP growth is not significant on consumption credit because consumption credit is used as a buffer for banks in a downturn in economic conditions. Finally, the procyclicality behavior of banks is not only influenced by macro variables but also by capital conditions, bank risk level, bank size, and bank ownership.

Borio (2012) attempts to explore the behavior of the financial cycle, starting that the financial cycle is the result of interaction among perceptions regarding value and risk, behavior to risk, and financial constraint. Borio concludes his research by outlining six main characteristics of the financial cycle: (1) the nearest indicator on financial cycle is credit and property price; (2) financial cycle has a lower frequency than the business cycle; (3) the peak of the financial cycle has a strong relation to the financial crisis; (4) it can detect early risk of financial stress; (5) the length and amplitude of financial cycles are influenced by prevailing policy regime; (6) the determination of financial related to total financing of the economy. Gorton & Ordonez (2013) argued, under the concept of implication justification for using credit and asset prices on financial cycle, that financial crises do not necessarily signal the presence of credit booms. In addition, Jeong (2012) examines the procyclicality of bank lending and its funding structure in Korea. Using panel data analysis, this study examines how credit standards fluctuate over the business cycle and their financial behavior. The main finding is that during financial crises, the sensitivity of the real growth rate of corporate lending to real GDP growth changes and amplifies fluctuations in the real economy. In addition, the

interaction term between real GDP growth and wholesale funding is positive and highly statistically significant. These results indicate that lending becomes more sensitive to business-cycle conditions.

The study undertaken by Ibrahim (2016) attempts to assess the relative procyclicality of Islamic bank financing and conventional bank lending during economic downturns. By considering the dual banking system as the study has recently pursued, it is found to be no more pro-cyclical than conventional bank lending. Indeed, there is some evidence to indicate that Islamic banks in general and full-fledged Islamic banks can even be counter-cyclical in their financing decisions. Indeed, as stated in the conclusion that along the line of Farooq & Zaheer (2015), the Islamic principles governing Islamic banking operations together with religious concerns may have made Islamic banks more stable. However, to be more concrete, we also believe that further analyses are needed. Perhaps the issue of Islamic financing procyclicality should be extended to other dual banking systems or should cover more banks under different jurisdictions. Ascarya et al., (2016) attempt to investigate the differences between the procyclicality of Islamic bank financing and conventional bank credit under the dual financial system in Indonesia's monetary policy landscape. Using a combination of several methodologies such as OLS, ECM, and ARDL, crucial evidence is found. This study finds that Islamic banking is more procyclical than conventional banking, and that both are procyclical with respect to the business cycle. Another important finding is that procyclicality in Islamic banks does not fall into the category of "adverse" procyclicality; rather, this type of procyclicality does not contribute to the formation of financial bubbles. However, procyclicality of conventional banking does create a credit bubble so it can be said that conventional banking is characterized by bad procyclicality and builds up systemic risk and also causes financial instability. Because of this finding, this paper suggests that the crucial issue in understanding differences between Islamic and conventional banking is transmission of macroprudential instruments to prevent risks and financial crises.

The study by Sakti & Zulkhibri, (2018) provides evidence that conventional banking is procyclical, while Islamic banking is not procyclical in its financial behavior. Moreover, during the economic downturns, Islamic banking is countercyclical as opposed to conventional banking. Th e above research supports the other evidence research conducted by Farooq & Zaheer, (2015). In Indonesia's case, Islamic banking has been able to stabilize its financing on the recent economic recession. Lastly, the evidence that may be given an understanding that Islamic banking in Indonesia is behaving counter-cyclical, while conventional banking is behaving procyclical in their financing behavior. For this reason, dif-

ferences in policy response may be needed in order to maintain both Islamic and conventional banking, especially during the times of economic downturn.

2.2. Macroprudential Policy: Credit Cycle, Amplitude and Frequency Measurements

The macroprudential concept has no new term in the economics literature. It was mentioned in 1979 by the Bank for International Settlement concerning the goal of meaning how to deal with systemic financial implication to the economy (Baker, 2013; Zulkhibri, 2019). Until the early 2000s, macroprudential concepts were largely neglected; in subsequent years, they were only rarely applied and attracted limited interest in the context of monetary policy (Blanchard, Dell'Ariccia, & Mauro, 2010). Bank for International Settlement (1986) itself defines macroprudential policy as a set of policies to promote the soundness of the overall financial system and payment mechanism, and the Bank for International Settlement (2010a; 2010b) has completed this definition by adding that macroprudential policy aims to ensure financial stability and reduce systemic risks potential against internal and external shocks by assessing and continuous functioning of the financial system. As pointed by Borio (2009), macroprudential policy addresses two dimensions of systemic risks, namely the time dimension and the cross-sectional dimension. The time dimension concerns the procyclicality aspect in the financial system – the tendency for financial variables to fluctuate during the up phase of the economic cycle, whereas the cross-sectional dimension concerns the interconnectedness of financial institutions and the market itself. It can be seen as an important point that macroprudential policy is a crucial topic that aims to maintain early warning indicators as well as to limit risks by addressing interconnectedness among financial institutions and procyclicality in the financial system (Claessens, Ghosh, & Mihet, 2013; Zulkhibri, 2019).

Since the financial crises have drawn so much attention, macroprudential policy has been frequently discussed by both academics and regulators. Once before it happens, in order to maintain financial stability and to deal with risks, both academics and regulators have frequently discussed the stability of individual financial institutions. Indeed, a common belief is that there is a dichotomy between monetary policy and macroprudential policy in considering policy response for dealing with financial distress. This issue has been addressed in the research by Mishkin (2009). As an example of economic stimulus, he argues that maintaining low interest rates substantially increases the likelihood of credit bubble formation. Therefore, macroprudential policy must ensure that such credit bubbles do not emerge. This implies that macroprudential and monetary policies are

strongly interconnected in the design of effective policy frameworks. From an Islamic perspective, macroprudential policy should likewise be considered an integral part of the interconnected financial system within a dual banking environment. As a matter of fact, many scholars believe that the Islamic financial system is relatively more stable than the conventional system as can be verified by promoting some intrinsic elements and moral values in Islamic principles which use profit-loss sharing (PLS) as an instrument (Zulkhibri, 2019).

Several studies have examined the linkages between the macroprudential policy framework and its relationship with the financial stability system of both Islamic and conventional banks, as shown by Ascarya et al. (2016); Al-Khouri & Arouri (2016); Aysan & Ozturk (2018); Aysan et al. (2018); Sakti & Zulkhibri (2018); Zulkhibri (2019). As a matter of fact, not all the findings have the same conclusion and they may also be considered by the type of the policy responses in certain countries. Even though the same term is called as under dual banking system. In these issues, up to the recent Islamic developing concept no longer same consensus Islamic banks better or it can be called has differences to the conventional bank. So that, it is a kind of a challenge in making a new approach how to confirm that the Islamic bank system needs a different approach for maintaining roundly financial stability.

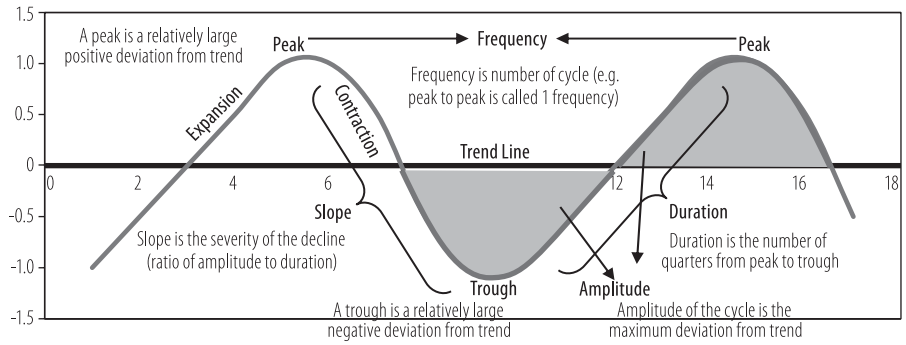
Table 1: Credit Instrument of Macroprudential Policy

No	Issue	Instrument	Targeted	% *
1.	Credit	1. Caps on LTV Ration	Procyclicality	41
		2. Caps on Debt-to-Income Ration	Procyclicality	27
		3. Caps on Foreign Lending	Procyclicality	18
		4. Celling on Credit or Credit Growth	Procyclicality	14

* Based on IMF Financial Stability and Macroprudential Policy Survey, 2010

The study undertaken by Wimanda et al. (2012) argues that LTV credit instrument could be applied as the most used instrument in addressing the macroprudential policy. The reasons are (i) decreasing housing credit and mitigating credit boom on real estate price; (ii) mitigating default probability on the diminishing market of housing; (iii) cutting market loses when encountering default.

Figure 1: Interpreting Components of the Cycle



Source: Authors' compilation

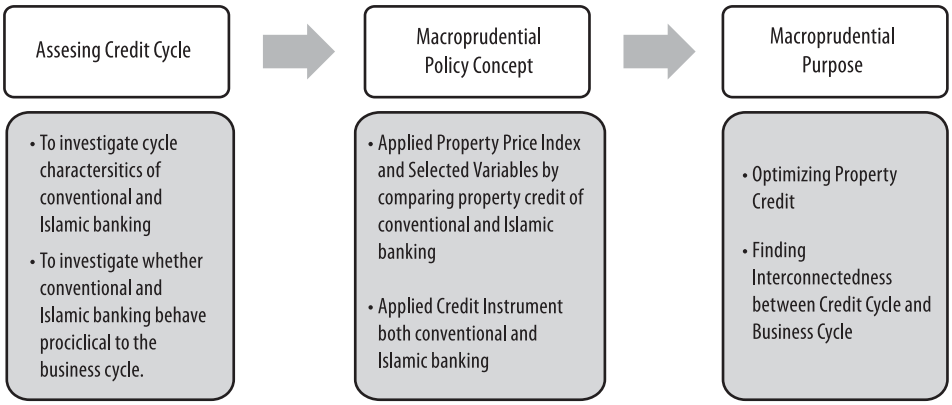
As explained by Baker (2008), people increasing their wealth had led to the consumption boom in the late 1990s. It is a simple logic that a housing bubble might grow up alongside the stock market. In this case, housing credit boom may be amplified by the time people buy bigger and /or better homes. If we look more closely the 2008/2009 global financial crisis, it had begun with the bust in early 2007. The boom period indicates a positive amplitude in the procyclicality of banks towards economic activity. Meanwhile, the bust indicates a negative amplitude in the procyclicality of banks on economic activity. The positive/negative amplitude of the cycle of economic activity against the credit cycle is structured so that the extent to which bank credit capacity can drive economic activity when economic conditions go towards expansion/slowdown (expansion/contraction). Contraction amplitude measures the maximum value of changes in financial variables from peak to trough position.

Meanwhile, the amplitude of expansion is defined as the maximum measure of changes in financial variables from the trough position to the peak point. The amplitude in this case can describe the level of depth of the cycle when it is in the contraction or expansion phase. Apart from amplitude and frequency, there are other terms in the financial cycle and business cycle, namely slope and duration. Slope is the quotient (ratio) between the size of the amplitude (expansion/contraction period) to the duration (expansion/contraction period). The slope in this case measures the rate at which the rate of change in the expansion and contraction period changes. While the duration is the amount of time between the peak point to the valley point and the valley point to the peak point.

2.3. Conceptual Framework

As many scholars believe, there are interconnectedness and operational linkages between conventional and Islamic banking to respond to the macroprudential policy under the dual banking system regime. In doing so, it is crucial to investigate their characteristics since both property credit and property financing have been considered as the main indicators of the financial cycle and credit cycle. To find the characteristics of credit and business cycles, this study assesses the procyclicality behavior of conventional and Islamic banking in addressing property credit-after identifying credit cycles. Based on the results, it may be possible to understand a comprehensive macroprudential policy framework in taking monetary policy response under the dual banking system.

Figure 2: Conceptual Framework



Source: Authors' compilation

3. Research methodology

3.1. Identifying Procyclicality Behavior of Islamic and Conventional Banks

To identify the procyclicality of the credit cycle on Islamic and conventional banking, this study uses OLS and classical assumption by using time series data. This study sets up model specifications by following Jeong (2009), Utari et al. (2012), and Ascarya et al. (2016). We modify model by using Real GDP as forming variable of the business cycle and property credit/financing as forming variable of credit cycle. If banks behave procyclicality, credit/financing growth (demand

side) is procyclical due to positive sign on GDP growth (supply side) (Craig, Davis, & Pascual, 2006;Ascarya et al., 2016).

$$PCONV_t = \beta_0 + \beta_1 GDPREAL_t + \beta_2 PPI_t + \beta_3 NPL_t + \beta_4 IR_t + \in_t \quad (1)$$

$PCONV_t$ = Property Credit of Conventional Banks

$\beta_1 GDPREAL_t$ = Gross Domestic Product Real

PPI_t = Property Price Index for Residential

NPL_t = Non-Performing Loan

IR_t = Interest Rate (BI 7 Days Repo Rate)

$\in_t$ = Error Term

$$PSY_t = \beta_0 + \beta_1 GDPREAL_t + \beta_2 PPI_t + \beta_3 NPF_t + \beta_4 IR_t + \in_t \quad (2)$$

PSY_t = Property Credit of Islamic Banks

$\beta_1 GDPREAL_t$ = Gross Domestic Product Real

PPI_t = Property Price Index for Residential

NPF_t = Non-Performing Financing

IR_t = Interest Rate (BI 7 Days Repo Rate)

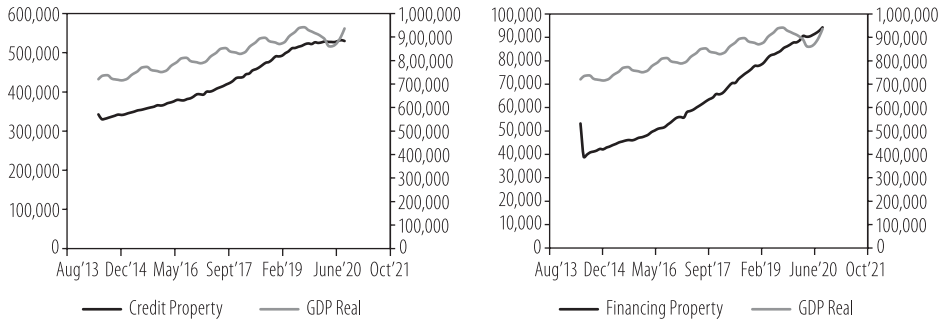
$\in_t$ = Error Term

The object of this study was carried out in the Islamic and conventional banking credit cycles in Indonesia. The period covered is 2014M06 to 2020M09. The selection of the period was carried out by considering availability data and identifying recent historical empirical studies, while subjects used for the research are the total credit property, the total distribution of Islamic bank financing, and real gross domestic product (GDP). The credit cycle is used as a proxy for total credit distribution and bank financing while real GDP is the proxy to compile the business cycle.

Drehmann et al. (2012) and Galati, Hindrayanto, Koopman, & Vlekke (2016) find that a composite financial cycle exploiting the co-movement of credit growth and house prices is the best indicator of systemic banking crises for G-7 countries over the past fifty years. Referring to Aikman et al. (2015), the primary data used to construct the credit cycle are credit and financing variables. Similarly, Drehmann et al. (2012), as cited in Wimanda et al. (2012), suggest that the identification of the financial cycle—proxied by credit in this study—is closely linked to the total financing of an economy, since total financing is one of the main drivers

of economic expansion and plays a crucial role in the accumulation of systemic risk. Furthermore, Drehmann et al. state that, ideally, the loans used include total financing from dominant sources, not only banks. However, bank credit is the largest source of financing in Indonesia with a capacity greater than 60%. Therefore, it is interesting to compile the credit cycle using data on total credit financing both in Islamic banks and conventional banks.

Figure 3: Credit Property (Left) and Financing Property (Right) in Million (IDR)



3.2. Determining the Variable Period of Forming Cycles

The credit cycle is a proxy to compile the financial cycle (Borio, 2012). According to Claessens et al. (2011), credit is the most important variable that represents the formation of the financial cycle. Meanwhile, in the case of Indonesia, one of the compilers of the financial cycle is the total lending (Wimanda et al., 2012). Therefore, in line with the research conducted by Drehmann et al. (2012) that the financial cycle uses medium-term frequencies while the business cycle uses short-term frequency. This is based on the results of the calculation of both standard deviations. According to Aikman et al. (2015), if the ratio of deviation of the compiler of the financial cycle is higher than the standard deviation of the variables which comprise the business cycle, the second variable has different dynamics.

3.3. Cycle Formation Using the Frequency-Based Filter (FBF) for the Credit Cycle

Analysis of frequency-based filter (FBF) is carried out using an analysis tool E-views 10. In these calculations, there are several types of filter options (band-pass filters) including Fixed Length Symmetric (Baxter-King), Fixed Length Symmetric (Christiano-Fitzgerald), and Full-Length Symmetric (Christiano-Fitzgerald). This filter is used to isolate the cycle component of the time series by determining the range for its duration. In general, band-pass filters are linear filters that take two-sided moving averages which are limited by the size of the lower and upper limits. The results of this filter will come out in the form of complex values that form the cycle. The first steps taken in using the band-pass filter are to determine the duration of the research data to be passed. This range is described by formulas (P_L, P_U), determined in units of work file frequencies in E-views. For example, in a study, it is believed that the range used in filtering GDP data (as a business cycle constructing variable) is between 1.5 and 8 years. If the data is used in a quarterly form, then the range to be used is 6 as the lower limit of the range (P_L) and 32 as the upper limit of the range (P_U).

As pointed by Wimanda et al. (2012), Melville (2017) and Alamsyah et al. (2014), the short-term period for the business cycle is 1.5 to 8 years, while the range in the medium term for the financial cycle is 8 to 20 or 8 to 30 years. The data filtering method used in this study is a frequency-based filter from Fitzgerald & Christiano (2003). The data assumptions used are stationary and there is no trend (drift) for all data on total financing, total credit, and industrial production index (IPI). This step is taken to facilitate the interpretation of data (Wimanda et al. 2012). The variable financing and total credit compilation (as a credit cycle preparation variable) was filtered in the medium term. The determination of these limits considers the availability of data with the objectives to be achieved in this study. Whereas GDP real variable (as a business cycle variable) is filtered in the short term.

3.4. Turning Point Analysis for the Business Cycles

Turning Point analysis is done by using Microsoft Excel 2010 analysis tool. This method is used as a step in identifying peak and trough points as applied by Harding & Pagan (2002). This technique was first applied by Granger et al. (1972). The algorithm used in this study uses a BBQ algorithm developed by Harding (2008) and the NBER (National Bureau of Economic Research) based on the economic turning point of the United States. The original version of the BBQ Algo-

rithm program used in the GAUSS and MATLAB applications written by James Engel is available on the NCER page (http://www.ncer.edu.au/data/). Then the IMF (International Monetary Fund) study institute created BBQ algorithm in the form of Excel. The first step that needs to be done is the identification of potential peak points at time t by fulfilling the rules (yt - y (ti))> 0 and potential troughs identified at time t by fulfilling the rules (yt - y (ti)) <0. The second step is to filter out local extreme points in the previous step. This is done to ensure the criteria for a minimum distance of one cycle (from the peak to the trough point, and the next). Then the final output of this process will focus on analyzing the duration, amplitude, and slope.

3.5. Amplitude and Frequency Calculations

Frequency: Frequency is the number of perfect cycles that occur throughout one period. One cycle can be said to be perfectly formed when it moves from the peak point, through the trough, and will return to the peak point again (Peak to Peak). And from the trough, through the peak, and will return to the trough back (Trough to Trough). *Amplitude*: Amplitude can be understood as a way of measuring the percentage change in a financial variable (Yt) from the peak point to the trough point, in this case, called the contraction amplitude. The expansion amplitude measures the percentage change in the financial variable (Yt) from the trough point to the peak point.

4. Empirical results

Lesson learned from global financial crisis over past ten years ago has given rise to numerous studies and various literature regarding the formulation of macro-prudential policy. At least, there are two dominant contributions or two main channels in capturing financial distress in the 2008/2009 global financial crisis. First, the use of potentially flighty short-term funding and the fragilities in the financial system associated. Second, the lending boom unpredictable to the household sector that began in the mid-2008 as pointed by Edge & Liang (2017); Bernanke, (2018); Aikman, Bridges, Kashyap, & Siegert (2019). Related to this study, the household sector needs to be more elaborated. Most of these studies have concluded that an unprecedented surge in US household debt was accumulating in the years leading up to the great recession. That build-up was accompanied and amplified by soaring property prices.

Excessive credit supply, compounded by financial innovation, provided the undercurrent for unsustainable cycles. It means that household balance sheets became increasingly vulnerable to shock as excessive credit was extended to highly indebted households. Identifying policy intervention that might arise from the household sector was relatively straightforward. For example, the Bank for International Settlement was promoting alarms related to the risks from excessive credit in 2004. Furthermore, the IMF's Global Financial Stability in 2005 highlighted the state of household balance sheets in advanced economies.

Macroprudential policies are intended to limit systemic risks by addressing two key externalities of the financial system, namely interlinkages and common exposures among financial institutions, which can give rise to joint failures and procyclicality behavior. As we have discussed in the study background, procyclicality can stimulate the emergence of an unsustainable boom that can magnify disruption by the time of deep economic recession. However, not all procyclicality is categorized as a negative term in taking monetary policy response. An understanding of the credit cycle cannot be separated from the financial cycle terms. Many studies suggest that credit is the main variable forming the financial cycle and numerous studies regarding the credit cycle are mostly motivated by the desire to find out whether credit cycle movement is one of the main sources of the financial crisis.

Common assumption states that the crises in many countries that occurred over one decade, such as the monetary crisis in 1997/1998, the mini economic crisis in 2005/2006, and the global financial and economic crisis in 2008/2009, were primarily by vulnerabilities in the banking system. However, the understanding of what is meant by the banking credit cycle is still very diverse, depending on the focus of the study of each research being examined. In a booming economy, the economy is leading to excess credit accumulation. During this boom, the size of the bank credit cycle expands. The size of this cycle is known as the amplitude of the cycle. The amplitude, in this case, is intended to illustrate the extent to which the expansion can lead to being stress or being a crisis in the financial system.

In terms of the duration of credit cycle formation, it can be understood through the extent to which the cycle is formed in a one-period unit, which in this case is known as frequency. The cycle frequency provides an understanding that the duration of any cycle moves in the period of expansion and/or vice versa in the period of contraction. This means that by knowing when a cycle is formed through the frequency indicator, an early warning indicator will be identified, which serves as a signal to be able to provide information when a cycle enters a period of expansion, contraction, or even crisis.

4.1. Empirical Results: Constructing the Credit Cycle

4.1.1. Testing Procyclicality in Islamic and Conventional Banks by using OLS and Classical Assumption

According to empirical results, Islamic and conventional banks are procyclical to the business cycle. It can be seen by testing the OLS mode, our study finds a positive relationship between the credit cycle and the business cycle. Real Gross Domestic Product (GDP) significantly affects both Islamic and conventional banks. Besides, NPF/NPL and PPI (Property Price Index) are also found to have a positive relationship with both conventional and Islamic banking. The increasing of NPL/NPF significantly increases property credit/financing. Therefore, it indicates that procyclicality behavior of both Islamic and conventional banks creates bubbles. On the other variables' result, interest rate will not decrease significantly property financing in Islamic banks, but it will increase it substantially in conventional banks. The composite property price index is used to measure the extent to which credit ratings depend on collateral and NPL/NPF is used to investigate risk indicator proxy for credit property. Utari et al. (2012) have sought to assess the banking procyclicality by using credit as a financial cycle proxy. This study finds that NPL (NPF in Islamic banks) has a negative relationship expectation to the business cycle, otherwise property price index has a positive relationship expectation to the business cycle. Regarding the results, we found the similar result for the property price index but a different result for NPL/NPF. It can be concluded that both conventional and Islamic banking are procyclical to the business cycle. Property price represents asset price because property is the principal form of collateral required for obtaining credit (Craig et al., 2006).

With respect to comparing with the previous studies, this study has found the opposite fact when comparing Islamic banks to conventional banks in facing financial distress or crisis by concerning credit/financing bubbles. Landau (2009) and Ascarya et al. (2016) have examined that the procyclicality of Islamic banks is not categorized as bad procyclicality which can amplify and increase the amplitude of business cycle, create bubbles, and cause financial instability. However, this study has different fact by having updated issues and data. During the financial distress (COVID-19 pandemic), both Islamic and conventional banks contributed to financial bubbles.

Table 2: Summary Statistic for the Data Available

Variable	Mean	St. Dev	Minimum	Maximum
GDP Real (GDPREAL)	826415.3	67631.4	715580.1	941265.9
Property Price Index (PPI)	880.4931	2269.551	-952.995	7994.107
Interest Rate (IR)	5,766	1,270	4,000	7,750
Credit Property (PCONV)	413256.5	68637.08	304969	528590
Non-Performing Loan (NPL)	11269.43	2411.04	7189	16978
Financing Property (PSY)	63846.7	17095.05	39047	94301
Non-Performing Financing (NPF)	1637.355	378.277	1166	2697

Source: Authors' compilation

Table 3: OLS Results of Islamic and Conventional Banks Model

Variable	Conventional		Variable	Islamic	
	Coefficient	Probability		Coefficient	Probability
GDPREAL	0.278659 ***	0.0001	GDPREAL	0.121949 ***	0.0000
PPI	-0.529629	0.5702	PPI	0.667495 ***	0.0010
NPL	24.62439 ***	0.0000	NPF	22.08031 ***	0.0000
IR	10564.33 ***	0.0000	IR	-776.1833 *	0.0891
R^2		0.952209	R^2		0.965883
Adjusted R^2		0.949517	Adjusted R^2		0.963961

*) Significant at the 0.10 level **) Significant at the 0.05 level; ***) Significant at the 0.01 level;
Source: Authors' compilation

The study done by Aysan & Ozturk, (2018) procyclicality analysis differs between Turkish Islamic and conventional banks. This study finds that no significant difference during the period of 2005-2012. Furthermore, the study has empirically found that the competition in the Turkish banking services had spurred lending procyclicality. Indeed, this study concludes that, contrary to the intended objectives of the policy, it may actually exacerbate lending procyclicality in the dual banking system. This conflicts with the stabilizing role of Islamic banks during the time of economic downturns on the stability view of the Islamic banks. So alternative welfare analyses could be useful in unraveling the cost and benefits of cycles in Islamic bank lending.

Ascarya et al. (2016) seek to explore the procyclicality behavior, as measured by the Granger Causality method, and concluded that the procyclicality behavior of Islamic banks, which provides a large-amplitude boost, does not reflect the creation of bubbles and cause systemic instability in the financial sector. Meanwhile,

the procyclical behavior of conventional banks is categorized as creating bubbles that can accommodate systemic risk and financial instability. In addition, Landau (2009) states that not all banking procyclical behavior leads to a big boost in the real sector or strengthens the drive for the economic activity cycle (business cycle) that accumulates a crisis. This study categorizes the type of procyclicality into two types: bad procyclicality and good procyclicality. It means that not all procyclicality is bad. It all depends on the causal link: is the financial system the origin or the amplifier of destabilizing dynamics? Or does it simply react to cyclical evolutions in the real economy? We should only be concerned by "intrinsic procyclicality", which is created inside and by the financial system.

4.1.2. Determining the Period of the Forming Variables in both Credit Cycle and Business Cycle

To determine the period in analyzing the financial cycle (property credit as represented variable in forming the financial cycle), this study is calculating the standard deviation ratio between forming variables of the financial cycle and forming variables of the business cycle. If the ratio of the standard deviation of financial cycle variables is higher than the standard deviation of business cycle variables, financial cycle variables have different movements to the business cycle variables. This model refers to studies that have been pointed by Aikman et al. (2010), Drehmann et al. (2012), and Alamsyah et al. (2014).

Table 4: Comparing Ratio Standard Deviation

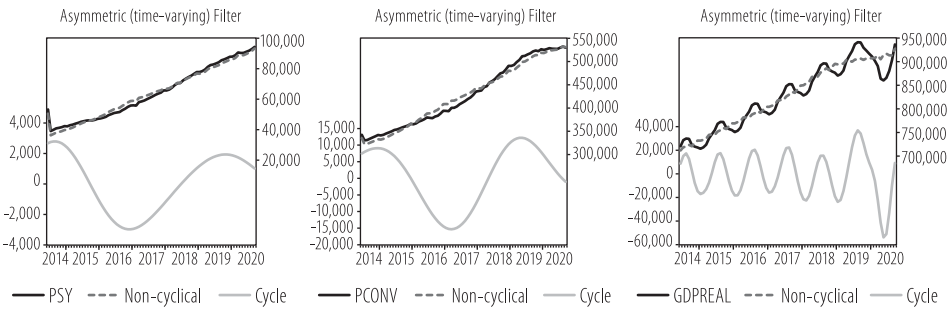
Selected Variable	Standard Deviation	Ratio Standard Deviation
Credit (Financial Cycle)	68362.86	0.163
Financing (Financial Cycle)	16982.17	0.266
GDP Real (Business Cycle)	67184.99	0.081

Source: Authors' compilation

4.1.3. Frequency Based Filter and Turning Point Analyses in Determining the Cycle

As pointed in the methodology section, the detrending data process was carried out by using the Band Pass Filter - Full Sample Asymmetric (Christiano-Fitzgerald) on E-Views 11. In addition, it was assisted by using Microsoft Excel as a step to find out the specific size of the credit cycle.

Figure 4: Frequency Based Filter by using E-Views

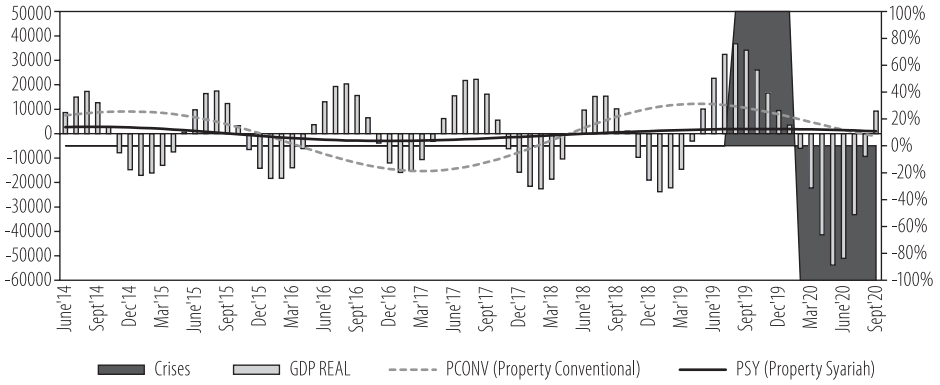


The development of Islamic finance in Indonesia has its advantages, including banking that is basically market-driven and has a button-up push in meeting the needs of society so that it relies more on the real sector. When compared with financial developments in several countries such as Malaysia, Saudi Arabia, and Iran, which are more dependent on the monetary sector rather than the real sector, the government is particularly dominant in driving growth, both in terms of regulation and placement of potential assets. This is also based on the belief that Islamic banks can provide more tangible benefits (*maslahah*) in encouraging equality and economic growth in society. Several characteristics illustrate the Islamic banking is the main driver of the real sector, including:

1) The characteristics of the products offered by Sharia repair using underlying transactions in the real sector provide an understanding that Islamic banks provide a real boost to the real sector.
2) All the products offered by Islamic banks do not have speculative (*gharar*) characteristics, so it can be said to have resistance from a direct hit to the global financial crisis. So it can be said that Islamic banking encourages the creation of financial system stability and national economic growth.
3) The determination of profit sharing, which is a distinctive characteristic of Islamic banks, can bring fairer benefits, both for fund managers and depositors and debtors.

The reality faced by Islamic banks is that most assets come from capital (capital-based operations), such as from deposits. This is in stark contrast to conventional bank operations where a large portion of capital is accommodated from interest gains. That is why basically conventional banks currently create a lot of money (creating money). More than that, based on this characteristic of Islamic banking, capital capacity in Islamic banks will accumulate to encourage an increase in demand, which in turn has the potential to create strong feedback (Landau, 2009).

Figure 5: Credit Cycle and Business Cycle Comparation



Source: Authors' compilation

At the end of 2019 and in early 2020, the Indonesian economy was on an economic downturn, which can be shown by forecasts of the domestic economy and global economic conditions. As we are aware, several countries are working to deal with the effects of financial stress and political uncertainty due to the China and the USA economic war. These constraints have made global trade growth the weakest in 2019 since the financial crisis a decade earlier. The trade war is a major problem today. Two world economic powers, China and the USA, are "at war". This makes other countries get bad sentiment in the import-export process. While nearly every economy faces headwinds from the trade war, the poorest countries face the most daunting challenges due to fragility, geographic isolation, and deep-seated poverty.

The decline occurred when viewed from the period of economic growth in the fourth quarter of 2019 which was only 4.97%. This is lower than the growth in the fourth quarter of 2018 which amounted to 5.17%, as well as the growth in the third quarter of 2019 which was 5.02%. Moreover, as a matter of fact, at the end of 2019, Indonesia had faced democracy election in voting for the new presidential cabinet. For this reason, political situation affected the economic circumstances as well. In addition, the decline in Indonesia's economic growth is inseparable from the four main trading partner countries whose economies have slowed down throughout 2019, namely Singapore, China, South Korea, and the United States. All of this shows that the global economy is still weak and unstable due to weak global trade, particularly the unstable investment and financial sectors.

Table 5: Characteristics of the short-term components identified by the Bry-Boschan Quarterly Algorithm

Component	Duration				Amplitude	
	Number of Quarters				In Percent	
	Average Duration of Contraction	Average Duration of Expansion	Cycle		Average Duration of Contraction	Average Duration of Expansion
			Peak-Peak	Trough-Trough		
GDP Real	5.6667	5.8571	6	6	32779.8607	58926.0071
Credit Property	2.3333	17	3	3	0.0029	0.1112

Source: Authors' compilation

4.1.4. Measuring Amplitude and Frequency of the Cycles

Procyclicality in the banking system leads to expansionary conditions when the economy is growing and leads to contraction conditions when the economy is in decline. The interaction between the banking system and the economic system affects the amplitude size of the economic activity cycle. The size of the excess cycle amplitude provides an understanding that there is procyclicality behavior, which in turn will encourage high credit growth. The phenomenon of procyclicality in this condition is the main cause of economic and financial crisis. However, it should be understood that not all procyclical phenomena are to be avoided and have a bad impact on economic growth. This depends on the causal relationship between the two (Landau, 2009). The intrinsic procyclicality created from within the financial system itself leads to accumulated credit growth which needs to be monitored. If the procyclicality that occurs is driven by the existence of financing that is channeled to the real economy, this will be very good, especially in the long run, which affects economic growth.

Research on the credit cycle is mostly motivated by finding out whether the movement of the credit cycle is one of the financial crisis sources. The public opinion states that the crises in Indonesia that occurred at the end of this decade, such as the monetary crisis in 1997/1998, the mini economic crisis in 2005/2006, and the global financial and economic crisis in 2008/2009, was caused by vulnerabilities in the banking system. However, the understanding of what is meant by the banking credit cycle is still quite diverse, depending on the focus of the study of each research being built. The financial crises, which were accumulated from the vulnerability of the banking sector (particularly in credit) in the last 30 years, have become the main trigger for the global crisis. In fact, the crises in Chile (1982), Denmark, Finland, and Sweden (1990/1991), and the East Asian crisis which had a major impact on Thailand and Indonesia (1997/1998) were ini-

tiated by credit boom (Utari et al., 2012). Moreover, in many cases, especially in Indonesia, there are monetary policies that are oriented towards a low inflation rate and fiscal policies that encourage supply-oriented accumulation. Both are the main factors causing a long duration of economic expansion, thus high credit growth will occur (boom), and in the end, it will accumulate a deep crisis (bust).

The duration of credit cycle formation can be understood by the extent to which the cycle completes within a given period or unit, which is commonly referred to as its frequency. The frequency of the cycle provides an understanding that the duration of any cycle moves in the period of expansion or, vice versa, in the period of contraction. It means that by knowing when a cycle is formed through the frequency indicator, an early warning indicator will be identified to serve as a signal to be able to provide information when a cycle enters a period of expansion, contraction, or even a crisis period. In a booming economy, expansionary financial conditions often lead to excessive credit accumulation. During this boom, the size of the bank credit cycle increases. The size of this cycle is known as the amplitude of the cycle. Amplitude can be interpreted as the percentage change in the expansion condition towards the contraction condition or vice versa. The amplitude in this case is intended to illustrate the extent to which the expansion can lead to pressure or crisis in the financial or banking system.

Banking behavior that leads to speculative activities drives banking financing transactions further away from the real sector. This means that banks do not fully concentrate on public financing needs to support businesses in the real sector. Moreover, banks are faced with the fact that the transactions that occur are only borrowing short and lending long, so that in turn, this banking action results in errors in fund allocation which leads to a high proportion of bad loans. This phenomenon will only occur in banks that use interest as a screening mechanism. This is consistent with Minsky's (1982) argument that financial crises are inherently cyclical in nature and closely linked to the business cycle. Financial market players, both financial institutions and investors will behave aggressively in credit transactions when faced with an economic boom (expansion) and will take the opposite action when faced with an economic bust (contraction), so that in this condition the market will be driven to high practice speculation in financial markets. An act of speculation relies on a zero-sum game profit, which means that one party's gain is the other's loss. In this case, the economy is certainly not said to have experienced an increase or has not had a real impact on the economy.

Meanwhile, conventional finance/banking is based on a capital-based economy which is only based on trading money and capital to finance investment. So, investment in this case is, of course, classified as debt accumulation-based invest-

ment (both from banking and foreign debt). Especially when faced with conditions of maintained inflation stability at the assumed level and low-interest rates, it will increasingly attract prospective borrowers to attract financing from conventional banking. In such conditions, this will be a land for speculative investors and Ponzi to reap profits that are not based on the real sector. So, according to Minsky (1982), the source of instability is stability itself (stability is destabilizing), which in turn will lead to a prolonged crisis. The accumulation of excess debt is at the root of the historical problem of crises that have hit the world. Moreover, credit bubbles that occur earlier and then encourage procyclicality of the economic activity cycle have become a common phenomenon in assessing the occurrence of crises (Claessens et al., 2011 and Claessens et al., 2013).

The procyclicality that carries systemic risk, which then drives the financial crisis, is housing bubbles and edit bubbles, as well as accumulation of foreign debt and volatility in foreign capital flows. An imbalance between the monetary sector and the real sector will lead to an economic bubble. In this case, one of the triggers is decoupling, which can be understood as a phenomenon of mismatch between the monetary sector and the real sector. This imbalance is caused by high speculative transactions, where the economy in the financial sector is growing rapidly, but on the other hand, there is stagnation in the real sector. It should also be understood that the turnover of transactions in the real sector is limited by the ability of inputs to produce the output required by the market. This is different from the transaction cycle in the monetary sector, where there are no restrictions on transactions, and every transaction that occurs is driven by the extent of the perpetrators' ability and desire to get the maximum benefit. The fact that transaction patterns in the real and monetary sectors conclude that economic bubbles will continue to occur when the interest system is used as an absolute reference in public transaction activities.

Likewise, this will happen to the banking sector in Indonesia, especially in conventional banking. The interest rate becomes the benchmark in transaction patterns, both in the form of credit extended to the business world, especially the real sector, as well as the money market. Both are the main sources of a bubble in the financial sector in Indonesia. Therefore, it can be interpreted that creating credit will create money and this is the fault of conventional banking operations. It can even be said that conventional banking does not lend money, but instead creates money.

5. Conclusion and recommendations

Using the frequency-based filter (FBF) method demonstrates that the amplitude of the credit cycle of Islamic banks compared to the amplitude of conventional banks has a different size. The amplitude of Islamic banks is bigger than the conventional banks. This is because the operations of Islamic banks are based on a capital-based financing pattern. Meanwhile, it is different from conventional banks where the pattern of credit extended is based on the proportion of capital which is mostly accommodated from interest gains. Moreover, conventional bank operations excessively create money by ignoring the credit extended to the real sector. Besides, the frequency of the credit cycle of Islamic banks compared to the conventional banks also has different sizes. The Islamic bank credit cycle has a longer cycle frequency than the conventional bank. But in terms of the number of cycles, the cycles formed have a similar number. These results provide an understanding that both Islamic banks and conventional banks have cyclical characteristics. It means that the time required for expansion and contraction periods to accommodate the crisis will be longer.

Islamic banks demonstrate that they have different characteristics from conventional banks, basically in the accumulation of credit patterns extended to customers. In this case, Islamic banks are not categorized as financial institutions that are vulnerable to the impact and/or causes of a crisis. However, Islamic banks have the financing characteristics which focus on the real sector. It is very reasonable to have a higher amplitude size than conventional banks. Therefore, policymakers need to maintain the level of financing that encourages the credit/financing pattern to the real sector under a dual monetary system. Meanwhile, for conventional banks, it is necessary to maintain the level of credit to be channeled to the real sector. This may occur because Islamic banks are relatively more vulnerable and can contribute significantly to the onset of a banking crisis. Therefore, the composition of financing/credit assets channeled to the real sector must have a larger proportion. This is for the sake of safeguarding banking institutions as intermediary institutions for the business world in the real sector.

According to the hypothesis, the relationship between the financial sector and the real sector behaves procyclicality. So, for further research, an analysis is needed to test the procyclicality behavior between the credit/financing cycle of banks and the business cycle. Using a single research methodology does not allow for a meaningful comparison of results with those obtained from alternative methodologies. Therefore, further research is necessary and the use of another methodology for comparing and obtaining a deeper understanding of the matter. This is also intended to minimize the shortcomings of each research approach. This case

is an example of the turning point analysis methodology using the MATLAB analysis tool. Limitations in the use of credit cycle-forming variables which are only based on total financing are a separate limitation. Therefore, it is necessary to consider other variables forming the credit cycle, both in Islamic banks and conventional banks, A key limitation of this study concerns the use of financing data for Islamic banking in Indonesia. This limitation arises from data availability, as Islamic bank financing data are not available for the period of the 1997–1998 monetary crisis. The crisis period would have been particularly valuable for analysis, as it could have provided an important basis for comparison between the pre- and post-crisis periods.

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