Comparing Credit Procyclicality in Conventional and Islamic Rural Bank: Evidence from Indonesia

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ABSTRACT

Financial instability has been caused by many factors, one of which is the pro-cyclicality of credit expansion. Many empirical studies in developed countries proved that excessive credit during economic booms would be accompanied by financial crisis. In the Indonesian context, Islamic and Conventional rural bank have an important role in the provision of debt since Small Medium Enterprises still dominates economic activity.

This study aimsto examine the pro-cyclicality of the credit channeled into Smalm Medium Enterprises by both conventional and Islamic rural banks in Indonesia; by comparing of both of which are categorized as pro-cyclicality. This study applies bothAutoregressive Distributed Lag (ARDL) model to see how far pro-cyclicality derived from indicator variables of rural banks may affect the real sector, and frequency-based filter to constructcredit/financing cycle formed by credit growth from both conventional and Islamic rural banks.

The results of this study indicate that in the short term, conventional and Islamic rural credit banks do not follow economic growth. This means, both conventional and Islamic procyclicality do not behave in the short term. However, in the long term when the economy has been in the expansion phase, Conventional rural bank tends to be more procyclical than Islamic rural banks. From the capital side, Islamic rural banks show countercyclical behavior compared to Conventional bank both in the short and long term. Moreover, to the credit risk of their bad loans, conventional rural banks have a negative response to the increase in credit risk, while Islamic rural banks arepositively affected by credit risk. Finally, the results of frequency-based filter suggest that credit of conventional rural banks and financing in Islamic rural banks have different cycles in response to changing economic conditions.

Keywords: Procyclicality, Islamic Rural Bank and Bad Credit

INTRODUCTION
Background

After Global Financial Crisis 2008, there have been major changes in the way economists think about crises in particular when dealing with the relationship between financial and real sector of the economy. Unlike classical

views which states there is no significant correlation between both of them in long term since the real sector depends greatly on factors of production, post-crisis paradigms is now attempting to shift the assumption on which pre-crisis analysis was based, arguing that recent crises stemmed from financial sector.In order to prove such a new hypothesis generated after 2008 global crisis, a rapidly growing literature seeks to assess whether the financial factors from total credit, credit to GDP ratio, property price and equity price could characterise financial cycle, which has been important tool through its boom and bust to analyse what main variable may bring about financial imbalances.

There have been more researchers who carry out studies focusing on financial cycle in its correlation with crises, for instance research conducted by Claessens et al. (2011) aims to analyse in detail the interactions between business and financial cycles since recession in numerous developed and emerging market economies have been linked closely with financing distress that tends to be longer and deeper than other recessions. Aikman et al. (2013) seek to explain what the credit cycle really is by measuring the ratio of credit to GDP, which in turn can trigger banking crises and also try to investigate profound difference between financial and business cyclein their amplitudes and frequencies by using credit as a main variable.

Drehmann et al. (2012) succeed in attempt to characterize financial cycle, complementing and extending many previous works by applying two analytical methodologies named turning point analysis and frequency-based filters. In this study, they employ more variables compared to previous works that couldform financial cycle: credit, credit-to-GDP ratio, property prices,

equity prices and an aggregate asset price index. They find four crucial findings, which somewhat differ from those of previous findings as they highlight broad aspects about what they call "financial cycle", one out of those is that medium-term cycles of credit and property prices can accurately identify financial cycle, while the other two variables (equity prices and aggregate asset prices) are not able to characterize the cycle since their volatility is higher than that of the others in short-term frequencies. It could be stated that credit has played an influential role in determining financial stability which, if it fails to be reached, may cause financial imbalances including banking crises.

In response, there have been policy reforms in terms of preventing financial crises. Based on global financial crisis experienced in 2008, policy outlinedby the third Basel Committee on Banking Supervision (BCBS) has been established which focusesprimarily on financial security institutions through the power of capitalization and liquidity with its instrument: *countercyclical capital buffer* (CCB). Such a policy is designed to prevent the rise of the risk that may certainly be higher on banking system which comes from exessive credit growth and aimed at giving the ability for financial institutions to minimize losses incurred when recession looms.

The credit growth that increases substantially can probably create the bubble economy in particular when credit growth is accompanied by the economic growth or called by pro-cyclicality behavior. If left unchecked, therefore the impact is potentially dangerous for financial market participants. This CCB policy is adopted in order to push the credit growth during economic expansion through increasing cost of credit

transmission, which causes banks to increase capital reserves.

The case of Indonesia, based on Badan Pusat Statistik (BPS) data reveal that the number of micro, small and medium enterprises (henceforth SMEs') in Indonesia reach 57.9 milion, this can not be separated from the role and support of banking in credit distribution. Credit distribution to SMEs is not only given by commercial banks but it is disbursed also by rural bank or Bank Perkreditan Rakyat (BPR) both Islamic and Conventional.Given that credit growth accompanied by peaks of financial cycle has been associated with banking crises, it is becomingcrucial to examine boom and bust cycle that may be created especially from rural bank credit whether it will follow the pro cyclical behaviour or not as it can be important for policy decision. The facts explainedpreviously indicates the importance of further research on the distribution credit to private sectors such as done by both BPR (Conventional rural bank) and BPRS (Islamic rural bank). The following data is the total credit that disbursed by BPR and BPRS:
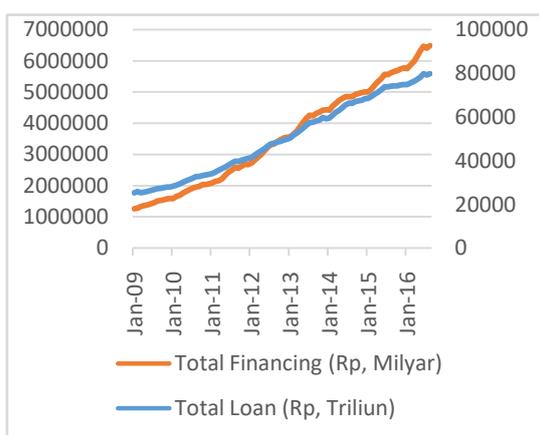
The data above show the increasing of credit or financing given by BPR or BPRS in the midle of uncertainty global economic condition. According to Utari et al (2012), the possibility of procyclicality behavior is linked to creditgrowth in Indonesia. Therefore, this research attempts to compare procyclicality from credit growth on BPR and financing on BPRS.Furthermore, in the context of Indonesia, credit has become an important policy-maker concern in formulating macroprudential policies to preserve financial stability. Research conducted by Alamsyah et al. (2014) has succeeded in forming Indonesian financial cycle by incorporating multiple variables, one of which is credit. Therefore, it is important to examine the behavior of procyclicality of credit growth, in this case, in the sector of BPR and BPRS Indonesia.This study aims to compare the credit procyclicality of conventional and Islamic rural banks in Indonesia.

LITERAURE REVIEW
Credit Procyclicality

Business cycle in the (economic dictionary) is a fluctuation of economic activity that illustrated on real GDP, which interchangeably between peak and trough period. The definition shows that there is a cycle or changes alternately in the economy in which there will be a period of high output growth, and will come a period where a decrease in output at its lowest point. Moreover, the benchmark that used to set the economy fluctuation is real GDP. Therefore, government role is needed for maintaining the economic stability.

According to Mankiw (2007), the main reference in starting a business cycle analysis is real GDP, because it is the widest measure for all condition of economy. In this case, Mankiw emphasizes on stabilization against the shock policy which happen in economy because the fluctuations are difficult to predict.
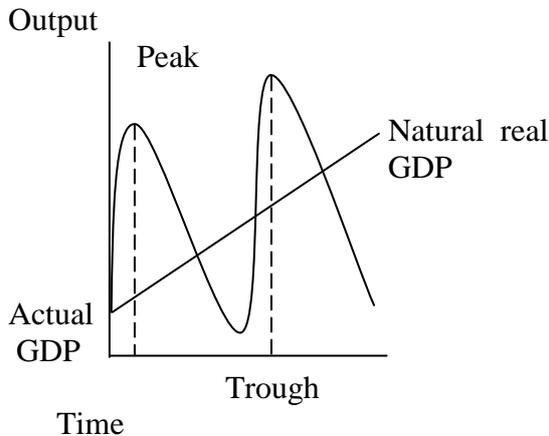
Output

Figure 1.1
Business Cycle Curve

The picture above shows the pattern of fluctuation in the economy, and it moves well toward peak or recession which is decreasing to the lowest point in that cycle. There are 4 stages in the business cycle:

a. The first is expansion, where employment opportunities increase which have an impact on the increasing of wage, also in consumption, and on company profits. It can be ensured if the economy activity moves towards the peak, then the growth is increasing, which marked by the increase of real GDP and called expansion when it happened continuously for minimal 2 quarters consecutively.

b. The second is the peak, where the economy of a country is on full employment, but it will not last because there will be a decline in return.

c. The third is recession, when the economy goes into recession the purchasing power will also decrease because of the declining income. This then causes people to be dependent on government aid, such as social care, free goods, etc. According to Mankiw, a country goes into a recession when the decline in GDP happens for two consecutive quarters.

d. The fourth is the through, the condition when the economy of a country can be called in state of apparent death which happen because the lack of employment

opportunities making the wage rate and purchasing power declining, thus the economic growth will also fall. If the economy of a country drops sharply even reaches the lowest point, it can be said that the country will suffer from depression.

As already disclosed by Mankiw (2007), the government's role is to maintain stability of the economy towards equilibrium, because if it is at the lowest point in the business cycle there will be a loss for the country and its people. According to Mankiw, fluctuation in all economy comes from changes in supply and demand shock.
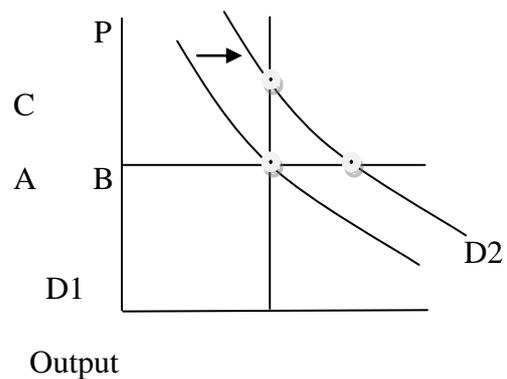

Figure 1.2
Demand curve

The curve above shows that the economy begins in long-run equilibrium at point A. The increase in demand resulting from the increase in the velocity of money is moving the economy from point A to B, where output is above its natural rate. When price rises, output gradually returns to its natural rate and the economy moves from point B to point C.

In this case, shock does not merely happen in real sector but also in monetary sector,because these two sectors have good relation directly or indirectly affecting each other. For instance, if many people make transactions with credit cards, that will reduce the amount of money that wants to be held, so that

the velocity of money becomes faster.If the money supply remains constant and an increase in credit card transactions, in the short term the economy may be booming, because the company produces more goods so that factors of production such as labor, technology, etc., to be encouraged to meet the needs of the market. But it will push the wage and price in the higher rate, the increase of price will make the demand of the good slowly decrease until the economy back to the nature rate of government. When there is a significant increase in credit card transaction, government should reduce money supply to make it balance. Balancing changes in the velocity will stabilize aggregate demand.

In stark contrast, however, financial cycle is different from business cycle in several aspects. The main instrument of busines cyclus is the fluctuation of real GDP, yet according to some experts that the main instrument of financial cycle is credit or bank financing. Since global financial crisis which happened in 2008, research on financial cycle has been carried out by economists in order to know about what the differences and interactions among financial and business cycle or even to analyse and predict accurately the financial system, which may be collapse due to the lack of monitoirng in the movements of financial variables.

In attempt to broaden the understandings about the interactions between business cycles and financial cycles since rarely have the studies been pursued which focus on causal relation between real and financial sector during upturns and downturns of financial cycles, Claessens et al. (2011) conduct the research on this issue usinglarge data of both advanced and emerging market economies. To form business cycles, real output is employed to be the main variable while there are three financial variables they use to characterize financial cycle, namely credit, housing prices and equity prices.

This work relies on "traditional" definition of cycles as they argue that such a method has still been simple and effective methodology to investigate the turning points of the business and financial cycle. This work reveals that credit and house prices cycle are more synchronised with business cycle rather than the cyclical behavoiur of equity prices. In addition, the findings of this study also demonstrate that financial cycle appears to be longer and deeper than business cycle. The assessment of the interactions between both cycles identify: while the duration and amplitude of recessions accompanied by financial distress, especially downturn of house prices, seem to be longer and deeper, the rapid growth of credit and house prices tend to make recoveries much faster and stronger.

Islamic Rural Bank (BPRS)

Islamic rural bank (BPRS) as financial institutions based on real sector, on the external side of BPRS has direct relevance andhigher sensitivity to macroeconomic conditions occur. As the macro variables that are a reflection of the Indonesian economy, the symptoms caused by macroeconomic conditions feared to have negative impacts on the performance of BPRS. When the good macro economic performance, the performance of BPRS financing will also be good and vice versa.

According to Islamic Banking Development Report (LPPS) in 2009, the growth of Islamic bank assets has been slowed in 2009, despite the all of Islamic bank asset tends positive. Slowdown of asset growth affected by the condition of real sector such as the persistence of the

national economic downturn, customer's purchasing power has not fully recovered the high economic costs impacts on their business expansion restriction and reduction of consumption. In this case, the microfinance institution is Islamic rural banks (BPRS), since there have been many Islamic rural banks operating in rural environment. Moreover, Islamic rural banks have been famous in rural communities, so that both parties have as a business partner. The growth of Islamic rural bank can be enhanced with the support of the banking variables and macro economic factors (Widodo & Asas, 2017: 274)

Islamic Rural bank (BPRS) as one of thefinancial institutions of Islamic banking, which is the pattern of operations follows the principles of sharia or Islamic Muamalat. Therationale for the operation of BPRS is in addition based on the demands of implementation shari'a which is the desire of Muslims in Indonesia, as well as an active step in a restructuring economy of Indonesia who poured in a variety of packages of financial prudence, monetary, banking in general. In particular is to fill it up to the wisdom that frees banks in setting interest rate, later known as the bank without interest. The legal basis of Islamic banking is to avoid usury, and the second practice Islamic principle in banking, especially rural banks is the purpose of the benefit. As inscribed in the holy book Quran on the prohibition of usury among Surah Ar-Rum (30): 39, Surah Al-Baqarah (2): 275, Surah An-Nisa (4): 146 (Widodo &Asas, 2017: 275).

Research conducted by Borio (2012) in general can represent the definition of financial cycle, stating that financial cycle is the result of interaction among perceptions regarding value and risk, behaviour to risk and financial constarint. The conclusion of Borio's research figures six main characteristics of financial cycle, those are: 1. The nearest indicator on financial cycle are credit and property price; 2. Financial cycle has lower frequency than business cycle; 3. The peak of financial cycle has a strong relation to financial crisis; 4. It can detect early risk of financial stress; 5. The length and amplitudo of financial cycles are influenced by prevailing policy regime; 6. The determination of finacial cycle relate to total financing of the economy.

Aikman et al. (2013) focus his research on credit cycle, which may bring about banking crises and they also attempt to recognize the distinction of credit cycles and real economy cycles, documenting medium-term cycle and relating boom-and-bust credit cycle to banking crises. They employ four variables in this work: real GDP growth, real bank loan growth, real bank asset growth and real money aggregates. By using band-pass filter proposed by Christiano and Fitzgerald (2003), this research finds that credit to GDP growth has a strong relation with financial crisis; an increase in credit growth has always been accompanied by a rise of the probability of banking crises over the last century. Other empirical finding of this study identifies that the length and amplitude of financial cycles are distinct from those of the business cycles, as explained by Claessens et al. (2011) and Drehman et al. (2012).

There have been relatively small numbers of research since global financial concerning in charaterising financial cycle in Indonesia. Study undertaken by Utari et al. (2012) is aimed at not extensively investigating the financial cycle which is formed by the main financial variable, namely credit, but this work has contributed to

determining the maximum limit of the credit expansion. If credit grows much higher than its maximum limit, it is more likely that excessive credit will produce disastrous effect on the real economy especially on financial stability. This study also seeks to explore several macroprudential policies Reserve Requirement and *countercyclical capital buffer*, both of which will be examined in order to know whether they can control effectively the credit growth. Applying HP filter introduced by Hodrick and Prescott and Markov Switching VECM, this study attempts to draw robust conclusion. There are two main conclucions deived from this research: first, as described by HP filter approach, from 1997 to 2012 the growth in real credit had been in the long-term trend, albeit that expansoin exceeded the maximum threshold during the crisis. However, after crisis, credit to GDP ratio generally was in the long-term trend. The result also demonstrates there is cointegration among variables: real credit, real GDP, inflation rate and interest rate. In the long-term, affected negatively by interest rate and inflation, real credit is positively influenced by real output. Second, Reserve Requirement as macroprudential policy can still be effective in reducing the build-up of credit while Capital Buffer does not statistically affect the credit, though it has negative coefficient as expected.

Following the steps pursued by Drehmann et al. (2012) who have been succesfull in characterizing financial cycle of advanced countries such as Britain and USA, Alamsyah et al. (2014) carry out an extensive research on constructing financial cycle of Indonesia, adopting data and methodology utilized by them. This work is designed to form financial cycle of Indonesia and to contribute positively to a rapidly growing literature in that issue which is considered relatively rare in Indonesia. Not only does they analyse data individually but also the combinations of data are examined by estimating the concordance index suggested by Harding and Pagan to consider co-movement among variables. There are several main conclucions we may obtain: first, it is evident that the duration of financial cycle, which lasts between 9 and 10 years, has been double the length of business cycle. Based on co-movement estimated using concordance index, financial cycle is constructed by employing credit and credit to GDP ratio for both financial cycles whether that is formed through narrow or broad credit. More importantly, it is possible to adopt financial cycle to be the early warning indicators for crises or financial distress. Besides, it is interesting to note that the amplitude of global financial crisis 2008 is even greater than that of economic crisis in 1998.

METHODOLOGY

This study will apply quantitative methods, namelyAutoregressive Distributed Lag (ARDL), which needs time series quantitative data, and frequency-based filter to form cycle. This quantitative data needed by both ARDL and frequency-based filter method will be monthly time series secondary data of January 2009 to August 2016 obtained from several resources, such as Biro Pusat Statistik (BPS), Syariah Banking Statistics of Bank Indonesia (SPS-BI), and Banking Statistics of Bank Indonesia (SPI-BI).

Table 3.1
Description variables

Variables	Description	Frequency	Source Data
LOANr	Total loans disbursed by Conventional Rural bank in real terms. Real value obtained by dividing the nominal value of the CPI; (Loan$_t$/ CPI$_t$).	Monthly	SPI-BI Central Bureau of Statistics
FINCr	Total financing in real terms BPRS channeled to the private sector. The real value of the divide (Finc$_t$ / CPI$_t$).	Monthly	SPS-BI Central Bureau of Statistics
IPI	Industrial Production Index is a monthly index of large and medium industries, as porxy economic growth.	Monthly	Central Bureau of Statistics
CCAR	Total capital to asset conventional rural banks	Monthly	SPI-BI
ICAR	Total Capital to Asset Islamic rural banks	Monthly	SPS-BI
NPL	Conventional Non-Performing Loan	Monthly	SPI-BI
NPF	Islamic rural non-performing financing	Monthly	SPS-BI

Source : Author

Methods of Estimation
Autoregressive Distributed Lag (ARDL) Model

This study uses Autoregressive Distributed Lag (ARDL) model introduced by Pesaran et al. (2001). This approach is relatively new, especially in discussing the cointegration between the variables in the interests of long-term analysis, when compared with the Engle-Granger test, Maximum likelihood or Johansen-cointegration test. The fundamental difference of ARDL than another approaches lies in its flexibility, although the variables there are different levels of integration, either *I*(0), *I*(1) or mutually cointegrated, this approach can be used (Pesaran and Pesaran, 1997; Pesaran et al., 2001). While other approaches, such as Johansen-Juselius cointegration requires all variables have the same level of integration (Shrestha and Chowdhury, 2005). Furthermore, ARDL approach is a model that is more statistically significantto determine the relationship cointegration relation for small samples, while Johansen co-integration models require large samples. Finally, in ARDL model it is possible that each variable can have the different optimal number of lags (Pahlavani et al., 2005).

In addressing the different levels of integration between variables as described, Pesaran et al. (2001) using the bound-testing procedure as co-integration test to estimate the long-term with the F test. The next step is to estimate coefficients of a long-term relationship, followed by short term estimates of all variables in the error correction format of ARDL model. ECM can be determined through the speed of adjustment towards equilibrium (Pesaran and Pesaran, 1997). Followed Pesaran (1998a), the general ARDL *(p, q)* model can be written as follows.

$$\emptyset(L)y_t$$
$$= a_0 + a_1 t + \beta' x_t$$
$$+ \sum_{i=0}^{q-1} \beta_j^{*'} \Delta x_{t-j} - \emptyset^*(L)\Delta y_t$$
$$+ \mu_t \qquad\qquad (3.21)$$

where $\emptyset(L) = 1 - \sum_{j=1}^{p} \emptyset_j L^j$, and $\beta(L) = \sum_{j=0}^{q} \beta_j L^j$, y_t is dependent variable, x_t is Independent variable and L is lag operator. To integrate the short-run dynamics with the long run equilibrium the ARDL model applies error correction. By applying ECM, the speed of adjustment to long run equilibrium will be determined, following Pesaran et al.(2001) as follows

$$\Delta y_t = c_0 + c_1 t + \pi_{yy} y_{t-1} + \pi_{yxx} x_{t-1}$$
$$+ \sum_{i=1}^{p-1} \varphi'_i \Delta z_{t-i} + w'^{\Delta x_t}$$
$$+ \mu_t \qquad\qquad (3.22)$$

Following Ascarya (2016), to study the model is divided into two; ie conventional models procyclicality for rural credit banks and rural banks model for Isamic. With ARDL models are expected to be able to explain the speed of adjustment towards the long-term balance, so it will explore the effects of variables that may bring about credit procyclicality, both in short term and long term.

General model for conventional rural bank procyclicality:
$$\ln LOANr_t = \alpha_0 + \alpha_1 IPI_t + \alpha_2 CCAR_t$$
$$+ \alpha_3 NPL_t + \varepsilon_t \qquad\qquad (3.23)$$

General model for Islamic rural bank procyclicality :
$$\ln FINCr_t = \alpha_0 + \alpha_1 IPI_t + \alpha_2 ICAR_t$$
$$+ \alpha_3 NPF_t + \varepsilon_t \qquad\qquad (3.24)$$

where LOANr / FINCr is total real credit issued conventional / Islamic rural banks in the period t are transformed into natural logarithm (ln); IPI is the index of industrial production as a proxy for economic growth in period t; CCAR

/ICAR is the ratio of capital to assets of conventional rural banks /Islamic rural banks in percent; NPL / NPF is a non-performing loan / financing in period t as a percent.

After forming the ECM model of the equation (3.23) and (3.24) in equation ARDL model (3.22), then we will obtain an equilibrium towards long-term, which can be written as follows,Conventional rural bank model:

$$\Delta \ln LOANr_t$$
$$= a_0 + \sum_{i=1}^{n1} a_1 \Delta \ln LOANr_{t-i}$$
$$+ \sum_{i=1}^{n1} a_2 \Delta IPI_{t-i} + \sum_{i=1}^{n1} a_3 \Delta CCAR_{t-i}$$
$$+ \sum_{i=1}^{n1} a_4 \Delta NPL_{t-i} + \delta_1 IPI_{t-1}$$
$$+ \delta_2 CCAR_{t-1} + \delta_3 NPL_{t-1}$$
$$+ \mu_t.$$

Islamic rural bank model:
$$\Delta \ln FINCr_t$$
$$= a_0 + \sum_{i=1}^{n1} a_1 \Delta \ln FINCr_{t-i}$$
$$+ \sum_{i=1}^{n1} a_2 \Delta IPI_{t-i} + \sum_{i=1}^{n1} a_3 \Delta ICAR_{t-i}$$
$$+ \sum_{i=1}^{n1} a_4 \Delta NPF_{t-i} + \delta_1 IPI_{t-1}$$
$$+ \delta_2 ICAR_{t-1} + \delta_3 NPF_{t-1}$$
$$+ \mu_t.$$

Where parameter $\delta_t, i = 1, 2, 3$ as a long-term multiplier, while a function parameter a_1, a_2, a_3, a_4 as a short-term coefficients of ARDL model.

Frequency-based Filter Analysis

In comparing procyclicality conventional and Islamic rural banks,

required analytical methods to provide an overview of the growth of the credit cycle. Some literature revealed that the methods which have been mostly applied are by selecting one or combining the two, between the frequency-based filter, turning point analysis or Hodrick-Prescott filters (see Alamsyah et al., 2014; Drehmann, 2012; Utari et al., 2012; and Surjaningsih et al ., 2014 to examine the Early Warning Indicators).

Frequency-based filter is a method often used in financial analysis cycle and credit cycle (see for example Strohsal et al., 2015; Claessens et al., 2011). This study is substantially the same with Aikman (2014), which form the credit cycle to further examine its relationship with the financial / banking crises. In his model, Aikman et al. (2010; 2014) included only a single variable to analyze the financial cycle, namely credit. Therefore, credit is closely related to financial instability which repeatedly occurs.

In the context of Indonesia, Alamsyah et al. (2012) has made Indonesia financial cycle by using two complementary approaches: frequency-based filter and turning-point analysis. This paper included several variables forming financial cycle, one of which is credit (narrow or broad).Following Drehmann et al. (2012), this study applies frequency-based filter methods in the study of filtering using band-pass filter Christiano-Fitzgerald (2003) in shaping the financial cycle, with the basic assumption that the rate of growth is stationary and there is no trend *(drift).*

Table 3.2
Data for Frequency-based filter

Data	Source data	Frequncy	Obs Period
Credit growth of BPR	SPI-BI	Monthly	Jan 2009-Aug 2016
Financing growth of BPRS	SPS-BI	Monthly	Jan 2009-Aug 2016

RESULTS AND DISCUSSION
ARDL Model Results

In the ARDL model, needs to be done F-statistic to test the null hypothesis which states that no cointegration can be described($H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$), while the alternative hypothesis (the existence of cointegration between variables) could be described($H_0: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$). In this step, the F-statistic that has been tested to be compared with the critical value as proposed by Pesaran *et al.* (2001). This critical value has a lower limit *(lower band)* and the upper limit *(upper band)* which allows the classification based on level integration $I(1)$, $I(0)$, or the same level of integration. After all variables cointegrated, then could do long-term estimates and estimates of short-term adjustment. In addition, to test the stability of all models used CUSUM and CUSUMQ test, applied to the residual model. CUSUM test is based on the cumulative sum of recursive residuals, if the CUSUM plot is at a critical value of 5 percent (not out of line upper and lower limits), then the estimate is considered stable, and *vice versa*. The same thing applies to CUSUMQ test that is on the basis on a cumulative sum of squares of recursive residuals.

Bound Test

As a first step, the ARDL model does not require the unit root test (unit

root test) to determine if the variables have integration at the level $I(0)$ or $I(1)$, but it is necessary to test the F-statistic or bound test the upper limit value critical level $I(1)$ and a lower limit on the level $I(0)$. By comparing the F-statistic to the critical value, the null hypothesis (null hypothesis) that states there is no cointegration is rejected if the F-statistic greater than the upper limit *(upper bound)* critical value. Meanwhile, if the F-statistic is less than the lower limit *(lower bound)*, the null hypothesis can not be rejected, which means that H_0 is accepted (no cointegration). However, if the value is between lower and upper limits, the results are inconclusive. In this study, 8 (eight) is maximum lag of ARDL model both for conventional and Islamic monetary policy. Here are the results of bound test, in table 4.1:

Table 4.1
ARDL Bound Test

Conventional Model	k	F-Statistic	Islamic Model	k	F-Statistic
$\ln LOANr = f$ (IPI, CCAR, NPL)	3	Lag(1,0,1,0) 22.30***	$\ln FINCr = f$ (IPI, ICAR, NPF)	3	Lag (1,0,2,1) 17.38***
Critical value	Table CI(v): Case V		**Critical Value**	Table CI(iii): Case III	
	Lower $I(0)$	Upper $I(1)$		Lower $I(0)$	Upper $I(1)$
1%	5.17	6.36	1%	4.29	5.61
5%	4.01	5.07	5%	3.23	4.35
10%	3.47	4.45	10%	2.72	3.77

Notes: ***, **,* denotes significant at 1%, 5% and 10%. Critical value of conventional credit model based on table CI(v) Case V: *Unrestricted intercept and unrestricted trend*, while for Islamic model based on table CI(iii) Case III: *Unrestricted intercept and no trend*(Pesaran *et al.* 2001, p. 300-1).

Bound test results above, show that the F-statistic on all models both conventional and Islamic larger than the upper limit *(upper bound)* critical value; even at the level of 1 percent for Islamic model, or 5 percent for conventional model. That is, H_0 saying no cointegration between variables can be refused and accept alternative hypothesis (H_1) that there is cointegration among variables in the model, so that error correction can be estimated to see the long-run adjustment.

Estimation Results

Having escaped perform bound testing, the estimated long-term and short-term adjustment (through *ecm*) possible to do. Based on the Akaike Information Criterion (AIC), ARDL models chosen forconventional credit procyclicality model is (1, 0, 1, 0) whereas for the Islamic model of ARDL *(p, q)* is selected (1, 0, 2, 1). Before analyzing further both short term and long term important indicator that error correction should be observed to determine the short-term adjustment. *Ecm* marked negative and highly significant (level 1 percent), meaning that the existence of cointegration between variables can be confirmed.

Recursive estimation of the error correction model indicating the regression coefficient is generally stable throughout the period of study. The cumulative sum of squares plots based on recursive residuals, both conventional and Islamic models did not show statistically significant breaks; CUSUM plots are within the critical value of 5%,

which means the the model is stable (see Appendix 1).

     Ecm coefficients for conventional credit procyclicality models (-0.971) indicates that short-term errors will be corrected by 0.97 percent during the period (month) towards long-term equilibrium, while to the Islamic model of (-0.859) indicates short-term errors will be corrected by 0.86 percent during one period towards equilibrium. This means that conventional rural banks model has a speed of correction toward long run equilibrium in affecting credit procyclicality, compared with Islamic rural bank model. Here are the results of ARDL model.

Table 4.2
ARDL Estimations For Credit Procyclicality Model

A. Short-run Coefficient

Variable	Conventional		Variable	Islamic	
	Coefficient	T-ratio[Prob.]		Coefficient	T-ratio[Prob.]
Intercept	5.9239	3.2443[0.00]	*Intercept*	11.607	5.7428[0.00]
Δ 0.0284		0.2714[0.78]	Δ 0.1409		1.3633[0.17]
Δ -0.1275		-0.368[0.71]	Δ -0.429		-1.088[0.27]
Δ -0.0719		-3.339[0.00]	Δ -0.047		-2.408[0.02]
Δ 0.0574		2.7025[0.00]	Δ 0.0072		0.3250[0.74]
Δ 0.0321		0.8674[0.38]	Δ -0.046		-2.536[0.01]
Trend 0.0142		5.9903[0.00]	Δ -0.026		-0.430[0.66]
e -0.971		-9.279[0.00]	Δ 0.1995		2.9892[0.00]
			e -0.859		-8.307[0.00]

$R^2 = 0.722$, Adjusted $R^2 = 0.702$, F-stat = 36.4[0.00], DW-stat = 1.99, BG-LM test = 0.00[0.9], ARCH= 0.00[0.98].

$R^2 = 0.804$, Adjusted $R^2 = 0.787$, F-stat = 48.1[0.00], DW-stat = 1.94, BG-LM test = 0.40[0.81], ARCH = 0.57[0.45].

B. Long-run Coefficient

Variable	Coefficient	T-ratio[Prob.]	Variable	Coefficient	T-ratio[Prob.]
Intercept -3.529		-2.065[0.04]	*Intercept*	11.17	6.3423[0.00]
I 1.985		5.9014[0.00]	I 0.099		0.2439[0.80]
C 0.034		2.1682[0.03]	I -0.100		-12.65[0.00]
N -0.153		-4.047[0.00]	N 0.129		3.3238[0.00]

$R^2 = 0.445$, Adjusted $R^2 = 0.427$, F-stat = 23.6[0.00], DW-stat = 2.46

$R^2 = 0.751$, Adjusted $R^2 = 0.742$, F-stat = 88.67[0.00], DW-stat = 1.74

Notes: BG-LM (Breusch-Godfrey Lagrange Multiplier) is a test to detect residual serial correlation. ARCH test to detect heteroscedasticity; with a p-value listed in [..]. in both models concluded there was no trouble free of serial correlation and heteroscedasticity.

Conventional Credit Procyclicality

Panel A shows the results of the estimation model Conventional short-term credit, which showed some interesting results among others, economic growth (IPI) is not accompanied by growth in credit in rural conventional bank. It was marked by a statistical test was not significant. This indicates that the nature of loan is not procyclical in the short term, then when the economic expansion is not necessarily followed by the increase in credit growth. But when viewed in the long term (panel B) will look much different results. In the long term of their loan has a positive relationship and very significant growth in output with very high coefficient is 1.98.

Economic growth in the short term is not responded directly to the increase in loans, their loan will increase in the long term. That is, the credit is in conventional rural banks are procyclical. With coefficient nearing two (1.98) indicates that the credit growth have greater amplitude. Behavior procyclicality of credit growth are high on the current economic expansion could be destabilized because it can bring financial systemic risk (Utari et al., 2012; Pramono et al., 2015).

These results are similar to research findings conducted by Craig et al. (2006) who attempted to analyze empirically factors driving procyclicality in 11 Asian countries. Empirically, GDP growth has very significant influence which seems to prompt credit procyclicality. Not only this finding is the same with the case in Korea as described Jeong (2009) that the credit is procyclical because it follows economic growth, but also the magnitude of the effect can be muted after implementation of the macroprudential policies, such as the Loan to Value (LTV) in Korea.

Then from the capital, show results in the short term that rising capital-to-assets in the BPR is responded differently by the credit. In previous lag, an increase in the capital side will lead to a rise in credit growth but also in the current period, the increase in capital to asset even lower the credit. But in the long run, capital to asset shows a positive relationship with the credit growth. This means that when there is an increase in capital to assets to raise credit in BPR, although the increase is not as large as the effect resulting from economic growth.

This could be possible due to the increase in capital to assets meaning that the bank has the capital the bank will extend credit to increase profits. However, it will cause problems when excessive lending (credit booms), because of great potential to trigger systemic risks.Therefore, there is a new policy to reduce the rate of credit from capital channel, called countercyclical capital buffer (CCB). This policy aims to increase the statutory capital which will raise the CAR so that the loan will be reduced when the credit booms. That is, the model found in this study has not been able to reduce the CCB policy procyclicality of credit.

The other aspect that is no less important is the effect of non-performing loans (NPL). In the estimation of this model, it was found that the effect of NPL was positive but not significantly affecting the growth of credit in the short term. This means that when there is an increase of NPLs in the short term, it will not affect the credit growth. In the long run, it is going on the contrary, negative coefficient values indicate that the NPL is very influential on the decline of loan growth. Certainly this is the case because when NPL rises, the credit risk will also

increase, responded by lowering bank credit.

In the aspect of credit risk, BPR showed prudence in the management of the risk of bad debts. Creig et al. (2006) emphasized that the high credit risk was capable of causing instability of the financial system. But there needs to be a thorough analysis in advance of a decline in credit quality, before lowering the credit. Therefore, when the decline in NPL increased credit because without recognizing deterioration in credit quality will weaken the banking sector.

Islamic Financing Procyclicality

In the model of financing in Islamic rural banks, showing the results is also very interesting, and in contrast to findings on conventional credit models. First, regarding the behavior of procyclicality of financing growth (lnFINcr) and economic growth (IPI). The estimation results indicate that in the short term there is no financing procyclicality behavior, meaning that when there is an increase in economic growth is not going to stimulate the increase of financing *(credit boom).*

The same thing happens in the long term. Statistically, it showed no significant effect between financing and economic growth. So, in the long term even BPRS is still relatively safe or will not cause instability of financial systems due to exesscive financing. This finding contrasts with the behavior of credit at BPR which is highly procyclical.

Furthermore, variable capital to assets in the Islamic rural banks also showed different results with conventional. From the estimation results show a negative relationship between the short-term growth capital financing aspects; both in the current period and the lag (-2). That is, the countercyclical capital buffer BPRS behaving towards

growth financing. This is in line with the policy of *countercyclical capital buffer* (CCB) whereby when there is an increase in capital requirements could effectively raise the CAR next to suppress the growth of financing,eventually there will be no excessive credit growth. In the long term, CAR also has a larger negative coefficienthence in the long term CAR is likely to reduce credit growth when it is greater than that in the short term.

This is in line with research conducted by Pramono et al. (2015) who found that the CCB was able to raise the policy; capital aspect has a negative correlation with the growth of credit. Furthermore, capital is also associated negatively with credit in all bank groups both from the classification based on BUKU and DSIB.

In the aspect of credit risk, credit risk management is not effectively applied in BPRS. This is indicated by the results of the model estimates that the non-performing financing (NPF) are positively related to loan growth. These results differ from BPR indicating the negative correlation between the two variables. In the short and the long term, NPF has significant effect in increasing the growth of financing. On the one hand, this is a positive thing when the considerable credit risk does not hamper the disbursement of financing, but on the other hand that will increase systemic risk when a high credit risk coupled with the growth of financing.

Through ARDL models, it can be explained that the BPR has procyclicality behavior larger than the BPRS; it is proved by such great influence of the economic growth on BPR credit growth while financing is not significantly affected by economic growth. Coupled with the positive relationship CAR to credit, which the CAR on BPRS showed the opposite result (negative) in

accordance with the policy of countercyclical capital buffer (CCB), which aims to reduce procyclicality's behavior when the economy is undergoing expansion. While credit risk, BPR seemed more cautious than the BPRS in managing this risk.

Frequency-based Filter Analysis

This study uses band-pass filters Christano-Fitzgerald (2003) to form a common cycle. Figure 4.1 is the result of filtering the data using frequency-based, which the results showed that the amplitude of credit cycles in BPR moved down in early 2009. This means that the credit penyaluaran BPR depressed by the global financial crisis in 2008, so the cycle is at its trough until June 2009. Some economists are already analyzed financial relationship crises that occur because of an increase in loans outstanding at the time of euphoria, as already widely described by Kindleberger (2005); Minsky (1970 & 2016).

These findings reinforce a study conducted by Aikman et al. (2010 & 2013) that the credit cycle is closely associated with financial crises, proved it also still have an impact on bank credit, in this case their loan. These results also enrich the literature that will need to add credit cycle and rural credit bank in the establishment of credit cycle in Indonesia.
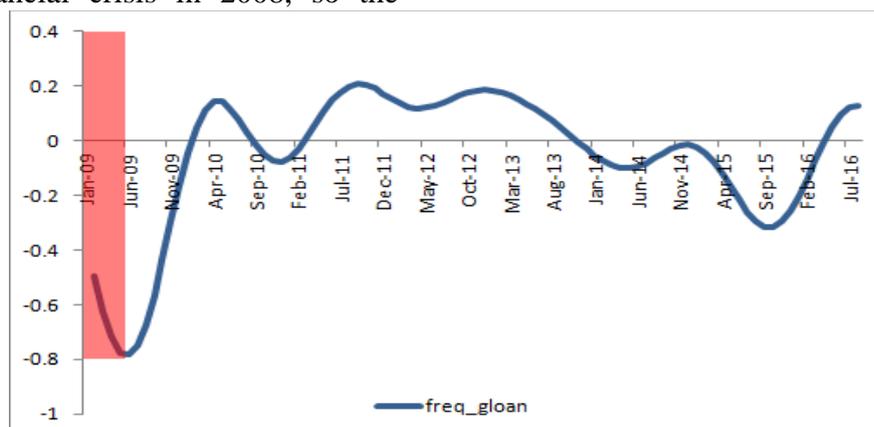

Figure 4.1 Credit Cycle

Unlike what happened in the BPRS, in the period of global financial crisis in 2009, the financing cycle amplitude shows the difference from the state of credit in BPR. This means that financing is more resilient to the financial crisis when compared to conventional credit. However, a decline in amplitude goes down sufficiently in August 2013 to June 2014. This shows that the BPRS is quite resilient to the global crisis of 2008, but depending on the condition of the real sector domestic economy. At the end of 2013, Indonesia's economy was in a state of sluggish; characterized by high inflation until 8.38% and volatility in food prices was increasing. This is due to the increase in fuel prices at that time. This state of everything, causing decreased purchasing power, as well as financing growth slows.
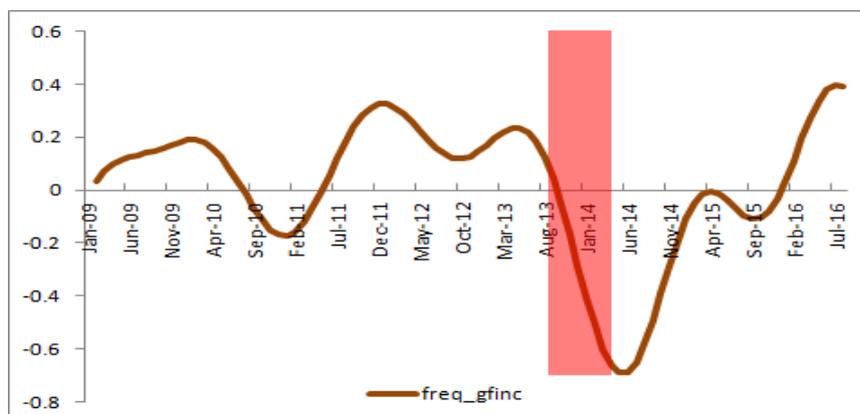
Figure 4.2 Financing Cycle

CONCLUSION

Through ARDL models, can be explained that the BPR has procyclicality behavior larger than the BPRS, it is proved by such great influence on the economic growth of BPRS credit growth while financing is not affected by economic growth. Coupled with the positive relationship CAR to credit, which the CAR on BPRS showed the opposite result (negative) in accordance with the policy of countercyclical capital buffer (CCB), which aims to reduce procyclicality's behavior when the economy is undergoing expansion. While credit risk, BPR seemed more cautious than the BPRS in managing this risk.

While the results of filtering using band-pass filter conclude that the conventional rural credit banks are more vulnerable to shocks caused by the global financial crisis. It is shown by the amplitude that decreases significantly moving from the peak to the trough. The opposite condition occurs in BPRS financing, where the financial crisis is still able to withstand shocks. However, financing BPRS is more sensitive to changes in economic conditions estate sector looks amplitude decreased in the period from the end of 2013 in which the domestic economy is in the doldrums with the condition that the drop in aggregate demand. The next researcher's suggestion is to consider other aspects that may affect the resilience of Rural Bank and Islamic Rural Bank to economic shocks. The non financial aspect can be an additional variable to see the performance of each Bank.

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Appendix

1. ARDL Model

a. CUSUM Test for Conventional model (left) and Islamic model (right)
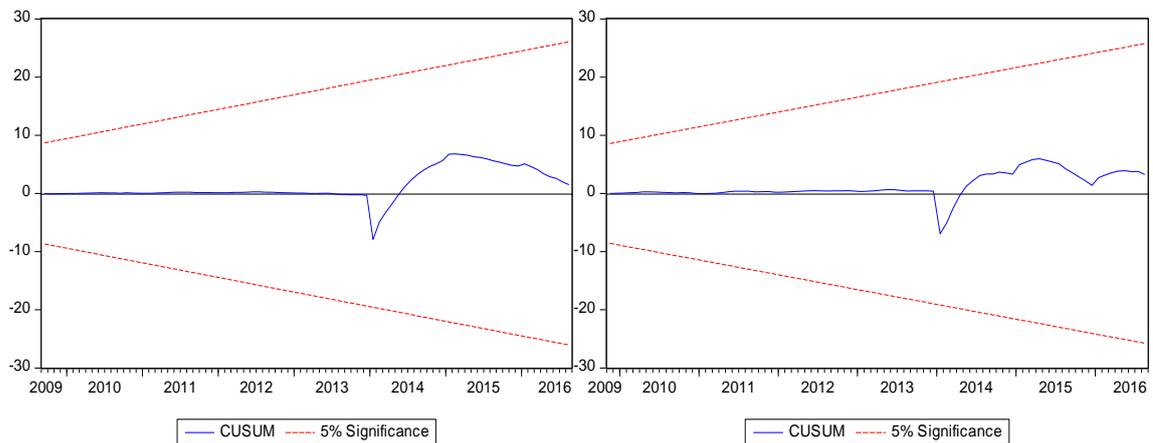
2. Frequency-Based Filter (Christiano and Fitzgerald)

a. Credit growth conventional (left) and Islamic (right)