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CAPITAL FLOWS, MACRO PRUDENTIAL POLICY, AND PROPERTY SECTOR

Indonesian Case in the Aftermath of Asian Crisis

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Abstract: *Capital flows to emerging economies in the world have increased significantly since the 2000s. After the 2008 global financial crisis, the monetary easing in advanced economies and some expectation on their exits have been giving a great influence on capital inflows towards emerging markets including Indonesia. Capital inflows could have significant effect to asset prices, including property prices.The global financial crisis also rising the importance of macroprudential policies. The paper has the objective to test the impact of capital flows to property market and also the effect of macroprudential policies represented by Loan To Value (LTV) regulation to property market in Indonesia. Simple regression analysis using quarterly data (2002-2014) showed the co-movement between property prices and capital flows. But in complete models, capital flows tend to be not significantly influence property prices. The regression using quarterly data (2002-2014) still not succeed in capturing the impact of LTV regulation to property prices, but LTV has significant impact to credit growth in property sector. LTV could moderate the credit growth in period of observation (2006-2014).*

Keywords: *capital flows, property prices, financial cycle, macroprudential*

JEL Classification: *E32, E44, F32*

1. INTRODUCTION

According to standard macroeconomic theory, free capital mobility is beneficial to all countries, as it leads to an efficient allocation of resources that raises standard of living and productivity. In practice, however, as now appears to be well recognized, large capital inflows can also create substantial challenges for policy makers. It was proven in the case of East Asian Miracle. In the period of East Asian Miracle, capital account and financial market liberalization has been contributed to heavy capital inflows. A heavy capital inflow has been intermediated through the banking system,

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and also has boosting the asset price, especially in property sector. Property price can create financial cycle as property markets reversed and there were deterioration of financial and corporate balance sheet because of economic shocks, for example exchange rate shocks in 1997-1998 in a case of Indonesia.

A surge in capital inflows could intensify moral hazard and adverse selection in banking system. Bernanke and Gertler (1995), Miskhin (1996), Krugman (1998), as well as Allen and Gale (2000) stated that moral hazard is arises from weak financial regulation and the explicit or implicit guarantees, which encourage bank to take on riskier loan without adjusting their cost of fund.

Capital flows to emerging economies in the world have increased significantly since the 2000s. After the 2008 global financial crisis, the monetary (quantitative) easing in advanced economies (US, Europe, Japan) and some expectation on their exits have been giving a great influence on capital inflows towards emerging markets (including Indonesia) and also capital outflows from them. In some cases, capital flows have become significantly high relative to the size of domestic capital markets with a potentially large direct impact on their asset prices.

Many countries used macroprudential policies in response to the surge of capital flows and boom bust cycle in property/housing/construction sector. Claessens (2014) notes that Macroprudential policies use caps on loan to value ratios, limits on credit growth and other balance sheets restrictions, (countercyclical) capital and reserve requirements and surcharges, and Pigouvian levie. Those have become part of the policy paradigm in emerging markets as well as advanced countries. Some countries, especially emerging markets, have used these tools and analyses suggest that some can reduce procyclicality and crisis risks.

This research has the objective to measure the impact of capital flows to property prices and property market in Indonesia, as well as macroprudential policy. Property market condition will be represented by property price and credit growth of construction/property sector.

2. LITERATURE REVIEW

Collyns and Senhadji (2002) discuss . that property market plays a central role in credit cycles because increases in real estate prices tend to boost bank ‘s willingness to lend. In globally integrated financial market, large capital inflows can exacerbate these cycles. It could create the possibility of severe financial crisis when a surge in capital inflows combined

with lack of regulation in financial sector. They also found that there are strong relationship between bank lending and asset price inflation, especially in real estate market.

Tillmann (2012) explores the responses of property prices to an inflow of foreign capital in ASEAN economies using panel VAR. He found that capital inflow shocks have significant effect on the appreciation of house price and equity prices. He also address cross country differences in ASEAN economies in terms of response of house prices to shocks due to differences in monetary policy response to capital inflow. Relatively similar study also conducted by Kim and Yang (2011). They use a panel VAR model to analyze the effects of capital inflow shocks on assets price in Asian economies. Different with Tilmann, they find that capital inflow shocks explain only a small fraction of asset price fluctuations. But the cautious interpretation should be noted, because of the weakness of ad-hoc ordering they used.

Bianci, Cespedes, Rebucci (2015) explain an empirical evidence on the nexus between global liquidity, house price, and macroeconomy. They describe stylized fact that real house prices in emerging economies grew slower and are more volatile and less persistent than in advanced economies over the past twenty years. They also done an event study that find a strong association between capital inflows and episodes of real house prices booms in emerging markets, without finding a similar pattern of connection in advanced economies.

The third method they used in VAR analysis, which find that the effects of a global liquidity shock are significant only in the case of emerging markets. This empirical evidence is consistent with the idea that the nexus between house price and capital flows is tighter in emerging markets, possibly because borrowing and collateral constraints that are relaxed by capital inflows are much more prevalent in emerging economies than in advanced economies. They conclude that while global imbalances would have played a smaller role in explaining house price boom in developed economies in the period previous to the economic recession, the increase in global liquidity in response to it can be playing an important role in explaining recent house price dynamics in emerging markets.

The result of Bianci, Cespedes, Rebucci (2015) is in line with Caballero and Krishnamurthy (2006). They provided theoretical insights on the connection between capital inflows and asset bubbles in emerging market economies. They argued that emerging market economies present a fruitful macroeconomic environment for the emergence of "bubbles dynamics", since

a shortage of stores of value, i.e. dynamic inefficiency, caused by the "financial repression" in their financial systems tends to create a space for bubbles on unproductive assets to arise.

Lee, et. al. (2015) explore three type of macroprudential policies in 10 economies in Asia and also asses the impact of policies to financial stability indicators (credit growth, leverage growth, and housing price inflation). Three type of macroprudential policies they explore are credit-related, liquidity related, and capital related. The general finding is macroprudential policy can indeed promote financial stability in Asia. The specific finding is the evidence from the 10 economies suggest that credit-related macroprudential policy can effectively dampen credit expansion and housing price inflation, while liquidity related macroprudential policy tools moderate leverage growth and housing inflation.

3. THEORETICAL CONCEPT, EMPIRICAL SPECIFICATION AND HYPOTHESIS

Fundamental value of housing according to Glindro, *et,al*. (2008) was determined by economic condition and institutional arrangements (Equation 1).

$$P_{it}^* = f(X_{it}) \quad (1)$$

P_{it} = log of real fundamental value of house price in country i at time t

X_{it} = a vector of macroeconomic and institutional variables that determine house price fundamentals

$$X_{it} = f(\text{demand side, supply side, other assets}) \quad (2)$$

Demand side including real GDP, population, real mortgage rate and mortgage credit to GDP ratio Supply side consisting land supply index and real construction cost Other type of assets consists of equity prices and exchange rates.

He (2014) considering the effect of macro prudential policies on housing market risk in the case of Hongkong. The results of his empirical work suggest that caps on LTV ratios have been effective in constraining household leverage, but do not appear to have sustained effects on housing price. Macroprudential policies according to He (2014) is used to guarantee that banks and their customers have sufficient cushions on their balance sheets to survive volatilities in property prices. These policies do not aim at

targeting property prices but may help to dampen the amplitude of property price cycles.

Wong, et. al. (2013) in He (2014) quantify the macroprudential policy impact on borrowers leverage and credit growth and also describe the direct and indirect effect as He (2012) did. The direct effect of LTV policy improves the resilience because mortagagor would have a larger equity buffer at origination, contribution to a lower likelihood of negative equity and thus lower default risk. The indirect effect primarily avoids bank underwriting excessively fresh mortgage loans which are generally subject to higher default risks due to a relative low portion of equity.

Theoretically, the policy impact on housing market activities can be revealed indirectly from the estimated impact of LTV ratios on credit demand. Chan and Yuen (2014) construct a vector autoregresssion (VAR) model to evaluate the short run impact of macroprudential measures on housing prices,transaction volume, and outstanding mortgage loans. They used also the control variables including economic and financial factors with inclue stock price index, unemployment rate and mortgage interest rate.

Based on theoretical study and empirical study conducted beforw, we try to develop following equation with property price index as dependent variable.

$$\text{Log(PPI)} = \beta_0 + \beta_1 \text{ CF} + \beta_2 \text{ Log (GDP)} + \beta_3 \text{ Dummy LTV} + \varepsilon \qquad (3)$$

where

PPI = property price index

CF = capital flows in millions USD

GDP = GDP in billions of rupiah and at constant price

Dummy LTV

= Dummy for the implementation on Loan to Value (LTV) regulation,

0 = 2002Q1-2012Q1

ε = error term for Equation (3).

The hypothesis for each variable used in Model 1 are as follows (1) capital flows has positive and significant impact to property price index (2) National income represented by GDP positive and significant impact to property price index (3). The implementation of LTV regulation has negative

and significant impact to property price index, with the assumption that the LTV in contractive direction. The three hypotheses will be tested in regression equation.

We also run the Model 2 for testing the impact of capital flows to credit of property sector. The model is as follow.

$$\text{Log (CREDIT)} = \gamma_o + \gamma_1 \text{ CF} + \gamma_2 \text{ Log (MPI)} + \gamma_3 \text{ Dummy LTV} + \upsilon \quad (4)$$

where

Credit = Credit for construction/property sector in Millions Rupiah

CF = capital flows millions USD

MPI = Manufacture Production Index

Dummy LTV = Dummy for the implementation on Loan to Value (LTV) regulation, 0=2006M1-2012M3

υ = error term for Equation (4)

The hypothesis for each variable used in Model 2 are as follows (1) capital flows has positive and significant impact to credit in property sector (2) Aggregate economic activity represented by Manufature Production Index has positive and significant impact to credit in property sector (3). The implementation of LTV regulation has negative and significant impact to credit in property sector, again with the assumption that the LTV in contractive direction

In both model we will run simulation that try to capture lag effect on the impact of independent variable to dependent variable.

4. DATA AND METHODOLOGY

We use Indonesia data after Asian crisis starting from 2002. In the first model we use quarterly data from 2002Q1 to 2014Q4. For second model, we use monthly data from 2006 to 2014. We employ the data sources from International Financial Statistics, CEIC database, Central Bank of Indonesia Statistics, and Indonesia Statistics Agency We (BPS).

This research using Engle Granger Cointegration Methods to capture long run relationship between property price and its explanatory variables, as well credit growth. Engle Granger found the possibility of stationerity of linier combination between I(1) variables. Than we will have stationary equiblibrium relationship.

Equation (3) and Equation (4) are long run cointegrating equation assuming stationerity in residual estimates following Engel Granger cointegration test. After we verified that the stationerity of error estimates cannot be rejected we can go to next step for estimating error correction model. After cointegration proved, we can run error correction model in order to get short term behavior of relationship between property price and regressors (CF, GDP, LTV) and get error correction term. Error correction term for Equation (3) is respresented in Equation (5) and for Equation (4) represented in Equation (6).

$$\varepsilon = \text{Log(PPI)} - \beta_0 - \beta_1 \text{CF} - \beta_2 \text{Log (GDP)} - \beta_3 \text{Dummy LTV} \quad (5)$$

$$\upsilon = \text{Log (CREDIT)} - \gamma_o - \gamma_1 \text{CF} - \gamma_2 \text{Log (MPI)} - \gamma_3 \text{Dummy LTV} \quad (6)$$

5. STYLIZED FACT

If we plot property price index and capital flows using quarterly data (Figure 1) we see the long run co-movement. It is clearer when we take the trend of capital flows (CF_trend). Property price tend to move together with capital flows. Long run co-movement between property price and CF confirmed in first regression result (Annex). But the problem with first regression result is low DW possibly from high autocorrelation problem.

Figure 1: Property Price Index and Capital Flows

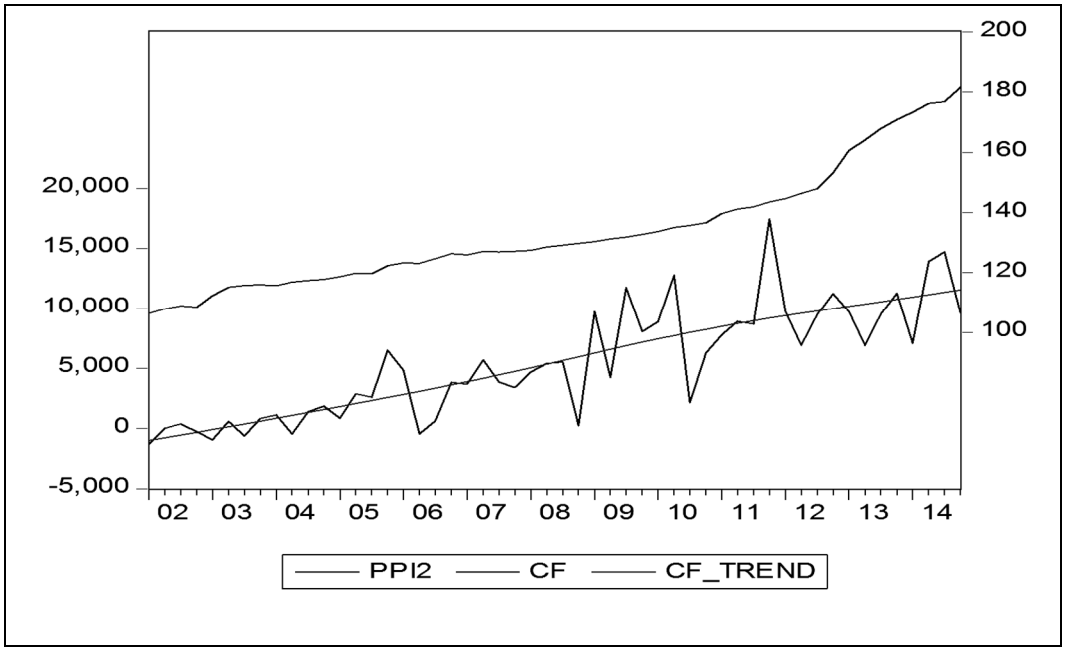
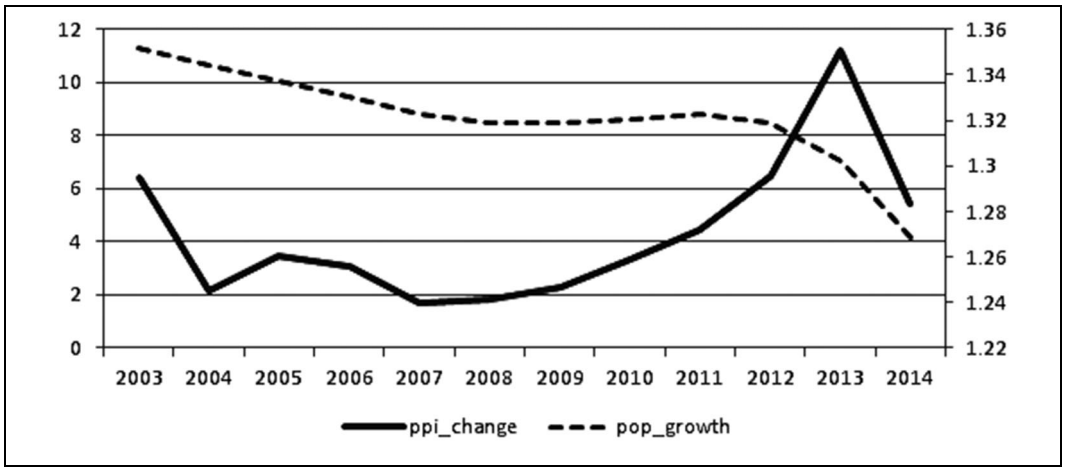


Figure 2: Population Growth and Property Prices



Source: Bank Indonesia Statistics, BPS statistics

Property price index (PPI) growth is in the range of moderate growth in the period 2003-2008, around 5-10 percent. PPI growth is negative in 2009, following the subprime mortgage crisis. After recovery in 2010, it reaches the peak rate in 2013 for all range of observation. After reach the peak period it starts to decline following the tapering off policy from US Federal Reserve. Different with volatile PPI, population growth has smoother trend with declining tendency. The graph shows that the relationship between property price changes has not been strongly correlated with the population growth, even the conclusion should be explored further. The initial presumption is the purchasing power of the consumer is dominant in explaining the property price change than aggregate population growth.

5.1 Indonesia Property Market Current Condition

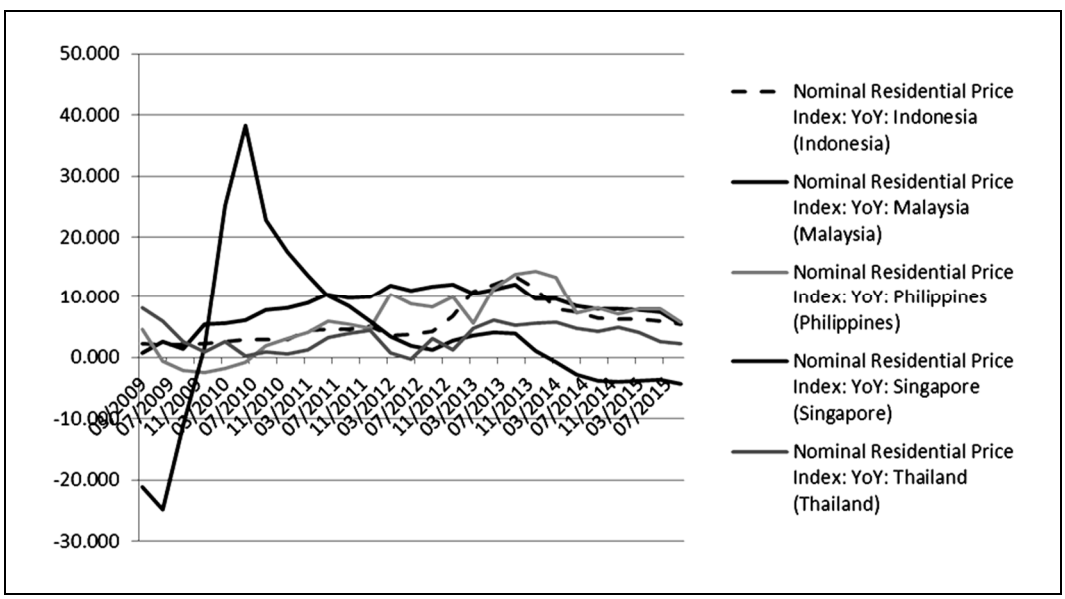
According to the S & P's report (2015), Indonesia's property sector is still at "a high-growth stage" on the back of the country's rising household income, expanding middle income class, and growing population which led to roughly 15 million units of housing shortage. S&P illustrated the property development is most active in Jakarta, the capital city, home to the majority of the middle-class population resides.

S & P also noted that property market dominated by the major players. Some years ago, many developers in the archipelago nation focused on landed housing, using land reserves acquired when land costs were low. The trend has changed now, that developers are increasingly building high-rise apartments to boost volume and maximize the value of their land banks.

Deceleration trend of Indonesian property market was happened since 2013, following Fed tapering off According to Global Property Guide (2015), from 2008 to 2011, the Indonesian property market saw very weak real growth (if any) relative to its neighboring Asian countries. Property prices rose by 2.56% in 2008. In 2009, Property prices increased only by 2.3% in 2009. After the recovery from global crisis in 2007-2009, property prices rose to 2.91% in 2010. Property prices rose in the period of buoyant capital inflow in 2011 to 5.05%. There was tremendous pent-up housing demand in Indonesia, which has the world's fourth-largest population-252.8 million people (2014). Factors hampering the development of Indonesia's housing market according to Global Property Guide (2015) are high mortgage interest rates, foreign ownership restrictions, high costs of building materials, high tax rates, and government red tape.

The increase in property price of Indonesia was moderate compare to other ASEAN-5 members. The gap was highest in 2010 when Singapore has growth of property prices approaching 39%. Since 2013, the growth of property price in ASEAN was relatively converge. The deceleration of property price growth also happened in other ASEAN member besides Indonesia, the most extreme happened in Singapore who has negative growth.

Figure 3: Residential Property Price Change in ASEAN-5 2009-2015 (yoy in %)



Source: CEIC database

6. EMPIRICAL RESULT AND DISCUSSION

6.1 Statistics Pattern

In order to have a detailed pattern on each variable used in this research we calculate a basic descriptive statistics, namely mean, maximum, minimum, standard deviation, and variation coefficient.

Table 1.
Descriptive Statistics for Model 1 (Quarterly Data)

Statistics	*PPI*	*GDP*	*CF*	*R*
Mean	133.80	531,540.00	5,451.00	16.20
Maximum	181.60	745,151.40	17,641.70	20.19
Minimum	106.40	368,650.40	-1,285.00	13.05
Std.deviation	19.60	113,015.30	4,665.10	2.17
Variation Coef	0.15	0.21	0.86	0.13

From the descriptive statistics using quarterly data (Table 1), we could see that Capital Flows (CF) is the most volatile variable, which shown by the highest coefficient variation of capital flows. Maximum number of Property Price Index (PPI) 181.60 was happened in 2012Q4, and the lowest index was in 2002Q1. Maximum value of capital flow was happened in 2011Q4 and the minimum in 2002Q1. The maximum number of credit interest rate (R) was happened in 2002Q4 and the minimum number was happened in 2013Q3.

Table 2.
Descriptive Statistics for Model 2 (Monthly Data)

Statistics	*Credit*	*MPI*	*CF*	*R*
Mean	71,011.86	141.15	0.60	15.21
Maximum	149,384.00	184.89	3.16	17.88
Minimum	26,294.00	108.75	-4.06	13.03
Stdev	31,705.80	19.74	1.14	1.57
Coefficient variation	0.45	0.14	1.90	0.10

In the monthly data, the highest volatility is again on capital flows variable and the lowest is for interest rate variable. The maximum of capital flows (net) was happened in 2011M4 and minimum number (or the the highest capital outflow) was in 2013M6. The highest interest rate was 17.88% was happened in 2006M9. For credit variable, the highest construction credit in millions rupiah was occurred in 2014M11 and the lowest was in 2006M1. The highest MPI was in 2014M9 and the lowest in 2006M2.

6.2 Correlation Analysis

Before going into regression results, this part presents a correlation analysis for quarterly and monthly data. For quarterly data, the highest correlation is between GDP and PPI (0.861). The second highest is between GDP and CF (0.828). The correlation of PPI with CF is 0.659. Outside PPI as dependent variable, the highest correlation is between GDP and R, R and CF (in negative direction), GDP and CF (in positive direction) could be the potential for multicollinearity problem.

Table 3.
Correlation Analysis for Model 1 (Quarterly Data)

Correlation	*CF*	*PPI*	*LTV*	*GDP*	*R*
CF	1.000	0.659	0.514	0.828	– 0.773
PPI	0.659	1.000	0.696	0.861	– 0.853
LTV	0.513	0.696	1.000	0.769	– 0.673
GDP	0.828	0.861	0.769	1.000	– 0.932
R	-0.773	-0.853	– 0.673	– 0.932	1.000

Table 4.
Correlation Analysis for Model 2 (Monthly Data)

Correlation	*CF*	*CREDIT*	*LTV*	*MPI*	*R*
CF	1.000	0.075	0.080	0.092	– 0.080
LTV	0.080	0.854	1.000	0.877	– 0.767
MPI	0.092	0.965	0.877	1.000	– 0.920
CREDIT	0.075	1.000	0.854	0.965	– 0.877
R	-0.080	– 0.877	– 0.767	– 0.920	1.000

For monthly data, the highest positive correlation is between credit and MPI (0.965). The highest negative correlation is between MPI and R (-0.92). Outside CREDIT as dependent variable, the highest correlation between MPI and R, R and LTV (in negative direction) could be potential for rising the problem of multicollinearity. One important to highlight also about low correlation between CREDIT and CF in monthly data. The weak correlation shows the possibility of weak impact of CF to property price, because property market in Indonesia really depend on credit as source of financing.

6.3 Unit Root Test

Standard and widely known of unit root test is Augmented Dickey Fuller (ADF)test. ADF test is the extension of Dickey-Fuller test by augmenting the

lagged values of dependent variable in DF test, which usually symbolized by ΔY_t. Unit root test using ADF test show the variables are non-stationary in level (and stationary in first difference for all variables, except for GDP. The unit root test has the null hypothesis that the variable has unit root. All test equations were tested using the method of least square including intercept but no trend. The optimal lag in ADF equations are selected using Schwarz information criterion.

Table 5.
Results of Unit Root Test for Model 1 (Quarterly Data)

Variable	*Augmented Dickey Fuller test*	
	Level	*First difference*
PPI	4.061	– 3.883***
CF	– 1.879	– 8.672***
GDP	1.381	– 1.533
R	– 2.052	– 4.076***
GDP_growth″)	– 2.854*	– 7.630***
PPI_growth″)	– 0.0039	– 6.764***

Notes: All variables are in original unit form / not in logarithmic form except for symbol ') in growth

*** = significant at 1%
** = significant at 5%
* = significant at 10%

Table 6.
Results of Unit Root Test for Model 2 (Monthly Data)

Variable	*Augmented Dickey Fuller test*	
	Level	*First difference*
CREDIT	0.791	-7.050***
CF	-1.879	-10.186***
MPI	0.194	-11.768***
R	-0.676	-9.673***
MPI_GROWTH")	-2.530	-8.290***
CR_GROWTH")	-1.637	-9.869***

Notes: All variables are in original unit form / not in logarithmic form except for symbol ') in growth

*** = significant at 1%
** = significant at 5%
* = significant at 10%

6.4 Regression Result Analysis

Table 7.
Regression Result for Model 1 (Quarterly Data)

Dependent variabel	*Log(PPI)*	
Adj R_2	0.953	
DW stat	1.649	
N	50	
Independent variable	Coefficient	t
C	-0.058	-0.030
CF(-1)	1.87E-06	1.571
LTV	0.024	0.792
Log(GDP(-1))	0.382	2.637**
AR(1)	0.898	15.668***

*** = significant at 1%
** = significant at 5%
* = significant at 10%

From the regression above we can find the significance of GDP to Property Price Index (PPI). Capital flows and LTV regulation has not significantly affected the property price index. The result is similar to He (2014) who found the insignificance of macro prudential policy to property price. The noise to property price index sometimes becomes the cause of this insignificance. The model 1 is using quarterly data, with the limited sample (50 samples) so the regression still cannot capture the impact of capital flows and LTV to Property Prices. However the probability value for CF is 12% near the 10% critical value, so we could say CF has marginally significant effect to PPI.

Besides Property Price Index as indicator for property market, we use credit as dependent variable and using monthly data to have extended sample. The result is summarized in Table 8.

Table 8.
Regression Result for Model 2 (Monthly Data)

Dependent variable	*Log(Credit)*	
Adj R^2	0.919	
DW stat	0.810	
N	95	
Independent variable	Coefficient	t
C	-5.517	-6.086***
CF(-1)	-0.007	-0.629
LTV	-0.084	-1.586
Log(MPI(-1))	3.368	18.074***

*** = significant at 1%
** = significant at 5%
* = significant at 10%

The result of monthly data regression shows that the indicator of economic activity represented by growth Manufacture Production Index (MPI) has significant impact to credit growth in property sector. Again CF and LTV has not significant impact to credit in 10% significance level. However, LTV has increased in terms of t statistic. In quarterly regression LTV t stat is 0.7 (not significant at all, with probability value 43%). In monthly regression the t stat become marginally significant with probability value 11.6%. So, we can conclude that LTV impact could be more captured in monthly data regression and for credit of property sector instead of property prices. In monthly regression with credit as dependent variable LTV has marginally significant and with negative direction as the hypothesis predict.

We do sensitivity analysis by dropping GDP and MPI, with the reason of potential multicollinearity problem between GDP and CF . The result of alternative regression without GDP has found the significant effect of CF and LTV to property price in quarterly regression. The dominance of GDP as an explanatory variable has diminished the significance of CF and LTV to property price, along with the problem of sample limitation. (Note: we exclude the interest rate because we already test that it has high degree of collinearity problems with other independent variables).

6.5 Macroprudential Policy through Loan To Value Regulation : Indonesia Case

First Phase of LTV

Contraction and General: The LTV rule was first introduced in Indonesia in 2012 to apply to houses and apartments with an area of more than 70 square meters (sqm). In the first phase of LTV rule, it was not differentiated between the purchase of first house or second house etc. After the enactment of the LTV policy in 2012, the growth rate of residential property loans decelerated to 17.8 percent yoy by June 2013, from the peak rate 44,5% in July 2012.

Second Phase of LTV

Contraction and Variation: Even though the deceleration credit growth has happened, the government and Central Bank of Indonesia still felt the need to slowdown the credit growth of property, so they distinguished the LTV ratio for particular types of property. The enhancements included the imposition of lower LTV on purchases of second and further homes or

apartments, which was not regulated in the previous LTV rule in 2012. Policy LTV-1 only regulated of houses / flats with Type> 70, while policies LTV-2dding regulation of credit facility houses / flats ownership both for not only the type of> 70, but also of houses / flats with Type <70 and house shop or home office.

According to the updated LTV rule, the maximum loan for residential property credit and apartment property credit type 70 and above or with a building area greater than 70 sqm was 70 percent, 60 percent for second homes and 50 percent for third homes. This action was prompted by the fact that these types of property are more likely to be used as investment and speculation not comes from fundamental value. BI explained that the maximum LTV regulation was also needed to suppress property credit growth, which was not compensated by its fundamentals. LTV-2 Policy have made slowdown in growth Index Property and Residential Price (IHPR) for all types of buildings. Policy LTV-1, which only set of houses / flats Type> 70 have less impact on slowing IHPR. It is indicated by the sharp increase of IHPR until mid-2013 in the y-o-y and q-t-q. However, the level of IHPR growth after the implementation of LTV policy was still higher compared with the period before the application of the LTV-1 (or prior years 2012).

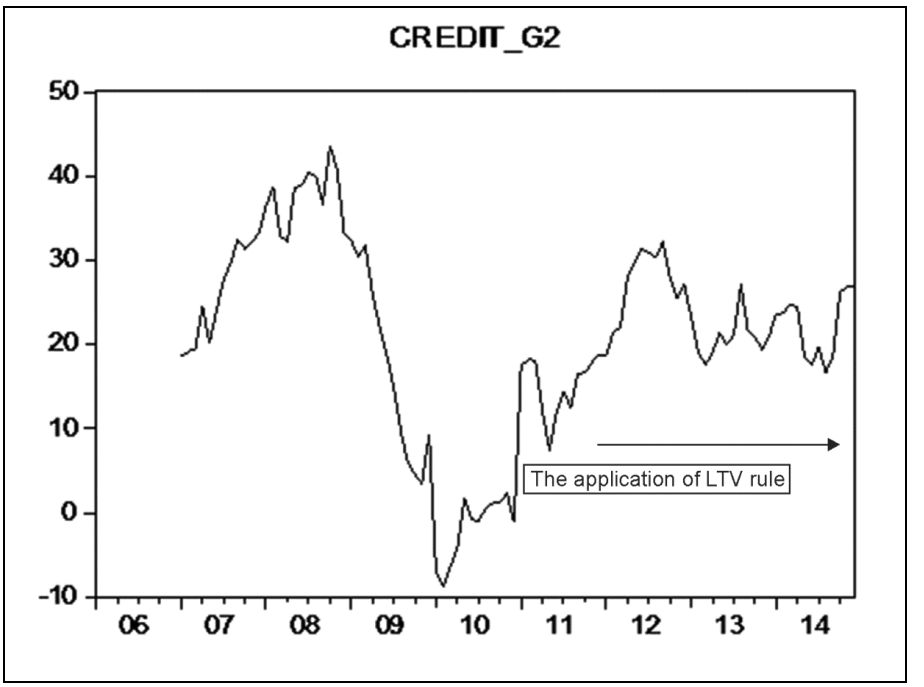
Property/construction credit growth is considered to threaten the banking industry's role in credit disbursement. BI wants property loans to grow in a healthier way. Another factor behind the central bank's move to tighten rules on LTV is the high proportion of loan-holders who take out more than one loan. According to Bank Indonesia data, in 2013 around 31,300 people had more than one mortgages, constituting a loans portfolio of Rp 22.9 trillion, or 10 percent of total mortgages. In this new rule, BI also prohibited financing ownership of second and extra homes that are still under construction (*indent housing*). These tightened rules in 2013 further suppressed the growth of property loans. (Paraminta, 2015).

Third Phase of LTV: Relaxation

Bank Indonesia was relaxing the LTV rule in 2015. The reason behind relaxation is the importance of loans/credit for property and motor vehicles in terms of the national economy. The central bank believes that the LTV revision could boost national bank loan growth, which experiencing deep deceleration following the moderation of Indonesian economic growth since

US Tapering off. Greater LTV means lower down- payment requirements for buyers. The purchases of second and third homes need 30 percent and 40 percent down payments, correspondingly, whereas before the down payment requirements were set higher at 40 percent and 50 percent. But the paper is not assessing the impact of this new rule because the scope of our analysis finished in 2014 before this new rule was launched. In other words this paper focusing on contraction phase of LTV rule.

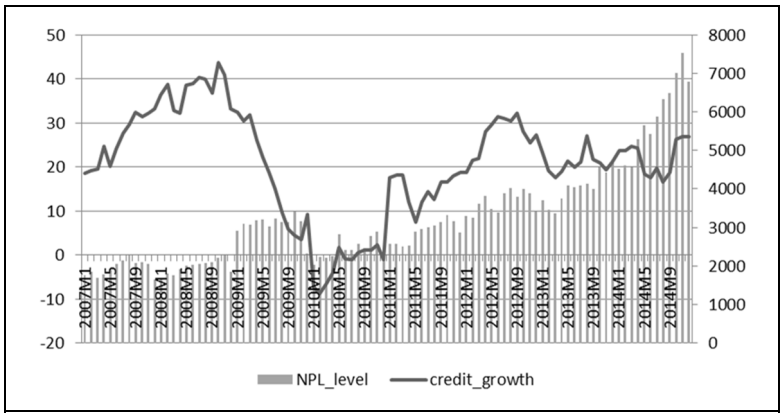
Figure 4 : Credit Growth of Construction/Property Sector



Source: Indonesian Banking Statistics, Central Bank of Indonesia

Credit growth for construction/property sector peaked in 2008M2 at the rate 38.7% and declined afterwards. The lowest point was at period 2010M2. After the lowest point, credit growth has been recovered again and has reached the second peak point di 2011M2. The third peak point of credit growth has reached in 2012M5. The application of LTV rule since 2012 (first phase) has decelerating credit growth even with moderate pace. In line with the moderation of economic growth and the implementation of LTV 2, mortgage growth slowed for all types of collateral, that is for the mortgage unit apartment or home with the type of <21, type 22 s / d 70 and Type> 70.

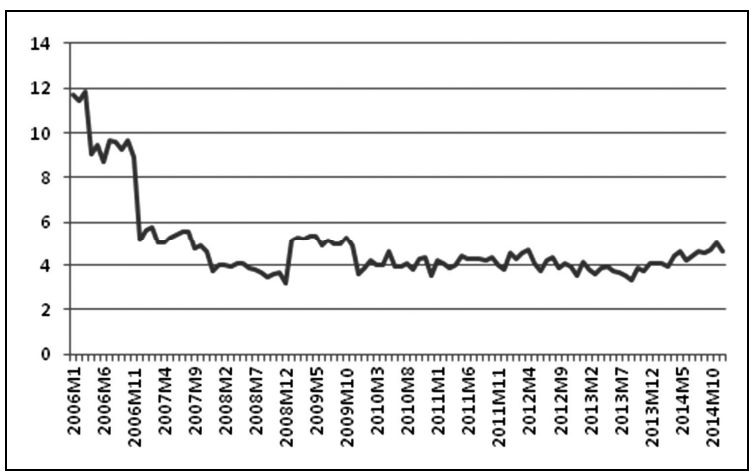
Figure 5: NPL in Billion Rupiah of Construction Sector



Source : Indonesian Banking Statistics, Central Bank of Indonesia

NPL Level in the observation period tend to increase. However if we zoom into shorter period, there were several episodes on NPL declining. For example in 2006M4, 2006M12, 2008M12, 2009M12, 2010M12. In terms of ratio, NPL has been declining in several periods, for example in 2006M11-2008M12, 2009M9, 2013M2.

Figure 6 : NPL Ratio of Construction Sector



Source : Indonesian Banking Statistics, Central Bank of Indonesia

The result is similar to He (2014), who found that macroprudential measures helped dampen mortgage loan growth and transaction volume but do not appear to have had a direct impact on housing prices as the estimated coefficient is not statistically significant. It is also in line with Lee, Ascuncion, and Kim (2015), who found that liquidity related macroprudential tightening

measures had no effect on dampening housing prices, but they had instaneous effect on credit expansion. Different condition they found in Singapore and Malaysia that macroprudential policies has brought substantial dampening effect on housing prices.

7. CONCLUSION AND FUTURE RESEARCH

The paper has the objective to test the impact of capital flows to property market and also the effect of macro prudential policies represented by Loan To Value (LTV) regulation to property market in Indonesia. From the quarterly data regression (2002Q1-2014Q4) we can find the significance of GDP to Property Price Index (PPI). Capital flows (CF) and LTV regulation has not significantly affected the property price index, even for CF has marginally significant effect to PPI. The noise to PPI sometimes becomes the cause of this insignificance and also the limitation of sample.

In monthly data regression (2006M1-2014M12) shows that the growth Manufacture Production Index (MPI) has significant impact to credit growth in property sector. Again CF and LTV has not significant impact to credit in 10% significance level. However, LTV has increased in terms of t statistic. In quarterly regression LTV t stat is 0.7 (not significant at all, with probability value 43%). In monthly regression the t stat become marginally significant with probability value 11.6%. So, we can conclude that LTV impact could be more captured in monthly data regression and for credit of property sector instead of property prices. In monthly regression with credit as dependent variable LTV has marginally significant and with negative direction as the hypothesis predict. Future research could elaborate the different type of housing to know exactly the impact of LTV policy as well as detailing the regional/urban pattern because the property market condition difference in each regional area in Indonesia.

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Annexure

Regression 1

Dependent Variable: LOG(PPI)

Method: Least Squares

Sample: 2002Q1 2014Q4

Included observations: 52

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	4.817326	0.020631	233.5024	0.0000
CF	1.38E-05	3.36E-06	4.102426	0.0002
LTV	0.150282	0.037998	3.955051	0.0002
R-squared	0.577015	Mean dependent var		4.924237
Adjusted R-squared	0.559751	S.D. dependent var		0.144637
S.E. of regression	0.095968	Akaike info criterion		-1.793637
Sum squared resid	0.451286	Schwarz criterion		-1.681065
Log likelihood	49.63455	Hannan-Quinn criter.		-1.750479
F-statistic	33.42174	Durbin-Watson stat		0.527959
Prob(F-statistic)	0.000000			

Null Hypothesis: RESID_11 has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.142862	0.1077
Test critical values:	1% level	-4.148465	
	5% level	-3.500495	
	10% level	-3.179617	
*MacKinnon (1996) one-sided p-values.			

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID_11)

Method: Least Squares

Sample (adjusted): 2002Q2 2014Q4

Included observations: 51 after adjustments

Contd…

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
RESID_11(-1)	-0.314571	0.100091	-3.142862	0.0029
C	-0.003430	0.018759	-0.182847	0.8557
@TREND(2002Q1)	0.000331	0.000632	0.524174	0.6026
R-squared	0.172495	Mean dependent var		0.005814
Adjusted R-squared	0.138015	S.D. dependent var		0.068780
S.E. of regression	0.063858	Akaike info criterion		-2.607293
Sum squared resid	0.195735	Schwarz criterion		-2.493657
Log likelihood	69.48598	Hannan-Quinn criter.		-2.563869
F-statistic	5.002830	Durbin-Watson stat		2.470227
Prob(F-statistic)	0.010629			

Regression 2

Dependent Variable: LOG(PPI)

Method: Least Squares

Sample (adjusted): 2002Q3 2014Q4

Included observations: 50 after adjustments

Convergence achieved after 12 iterations

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	-0.058094	1.925721	-0.030168	0.9761
CF(-1)	1.87E-06	1.19E-06	1.570973	0.1232
LTV	0.024191	0.030545	0.791969	0.4325
LOG(GDP(-1))	0.381635	0.144730	2.636870	0.0114
AR(1)	0.897775	0.057299	15.66819	0.0000
R-squared	0.957205	Mean dependent var		4.936506
Adjusted R-squared	0.953401	S.D. dependent var		0.133319
S.E. of regression	0.028779	Akaike info criterion		-4.163685
Sum squared resid	0.037271	Schwarz criterion		-3.972483
Log likelihood	109.0921	Hannan-Quinn criter.		-4.090874
F-statistic	251.6319	Durbin-Watson stat		1.648980
Prob(F-statistic)	0.000000			
Inverted AR Roots	90			

Null Hypothesis: RESID_PPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.955647	0.0000
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID_PPI)
Method: Least Squares
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
RESID_PPI(-1)	-0.890960	0.099486	-8.955647	0.0000
C	0.000477	0.003917	0.121700	0.9036
R-squared	0.625596	Mean dependent var		0.004371
Adjusted R-squared	0.617796	S.D. dependent var		0.044519
S.E. of regression	0.027523	Akaike info criterion		-4.308404
Sum squared resid	0.036361	Schwarz criterion		-4.231923
Log likelihood	109.7101	Hannan-Quinn criter.		-4.279279
F-statistic	80.20362	Durbin-Watson stat		1.898220
Prob(F-statistic)	0.000000			

Null Hypothesis: RESID_PPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.955647	0.0000
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Error Correction Equation
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID_PPI)
Method: Least Squares
Sample (adjusted): 2002Q3 2014Q4
Included observations: 50 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
RESID_PPI(-1)	-0.890960	0.099486	-8.955647	0.0000
C	0.000477	0.003917	0.121700	0.9036
R-squared	0.625596	Mean dependent var		0.004371
Adjusted R-squared	0.617796	S.D. dependent var		0.044519
S.E. of regression	0.027523	Akaike info criterion		-4.308404
Sum squared resid	0.036361	Schwarz criterion		-4.231923
Log likelihood	109.7101	Hannan-Quinn criter.		-4.279279
F-statistic	80.20362	Durbin-Watson stat		1.898220
Prob(F-statistic)	0.000000			

Regression 3 (Error Correction Equation for Model 2)

Dependent Variable: LOG(CREDIT)

Method: Least Squares

Sample (adjusted): 2006M02 2014M12

Included observations: 95 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	-5.516987	0.906462	-6.086288	0.0000
CF(-1)	-0.007397	0.011769	-0.628507	0.5312
LTV	-0.084243	0.053118	-1.585965	0.1162
LOG(MPI(-1))	3.367735	0.186327	18.07433	0.0000
R-squared	0.921653	Mean dependent var		11.12582
Adjusted R-squared	0.919070	S.D. dependent var		0.443341
S.E. of regression	0.126123	Akaike info criterion		-1.261929
Sum squared resid	1.447532	Schwarz criterion		-1.154398
Log likelihood	63.94165	Hannan-Quinn criter.		-1.218479
F-statistic	356.8320	Durbin-Watson stat		0.810508
Prob(F-statistic)	0.000000			

UNIT ROOT TEST

Null Hypothesis: RESID_CREDIT has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.946738	0.0006
Test critical values:	1% level	-4.072415	
	5% level	-3.464865	
	10% level	-3.158974	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID_CREDIT)
Method: Least Squares
Date: 02/29/16 Time: 11:51
Sample (adjusted): 2006M03 2014M12
Included observations: 83 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID_CREDIT(-1)	-0.468282	0.094665	-4.946738	0.0000
C	-0.029501	0.026484	-1.113927	0.2686
@TREND(2006M01)	0.000437	0.000383	1.139964	0.2577
R-squared	0.235617	Mean dependent var		-0.001446
Adjusted R-squared	0.216508	S.D. dependent var		0.112468
S.E. of regression	0.099551	Akaike info criterion		-1.740822
Sum squared resid	0.792829	Schwarz criterion		-1.653394
Log likelihood	75.24411	Hannan-Quinn criter.		-1.705698
F-statistic	12.32980	Durbin-Watson stat		1.910966
Prob(F-statistic)	0.000021			

Dependent Variable: D(LCREDIT)
Method: Least Squares
Sample (adjusted): 2006M03 2014M12
Included observations: 83 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	0.014302	0.005639	2.536504	0.0132
D(CF1)	-0.002362	0.002884	-0.818932	0.4153
D(LMPI)	0.028697	0.160742	0.178529	0.8588
LTV	0.004076	0.008823	0.461977	0.6454
RESID_CREDIT(-1)	-0.064201	0.041165	-1.559593	0.1229
R-squared	0.044620	Mean dependent var		0.016131
Adjusted R-squared	-0.004374	S.D. dependent var		0.039160
S.E. of regression	0.039245	Akaike info criterion		-3.579630
Sum squared resid	0.120134	Schwarz criterion		-3.433916
Log likelihood	153.5546	Hannan-Quinn criter.		-3.521090
F-statistic	0.910726	Durbin-Watson stat		1.606962
Prob(F-statistic)	0.462008			

Regression 4 (Error Correction Equation for Model 1

Dependent Variable: D(LOG(PPI))

Method: Least Squares

Sample (adjusted): 2002Q3 2014Q4

Included observations: 50 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	0.003396	0.005452	0.623004	0.5364
D(LGDP)	0.342038	0.187500	1.824203	0.0748
D(CF1)	1.65E-06	1.13E-06	1.459671	0.1513
LTV	0.012183	0.010208	1.193477	0.2389
RESID_PPI(-1)	-0.005243	0.108701	-0.048231	0.9617
R-squared	0.128830	Mean dependent var		0.011443
Adjusted R-squared	0.051393	S.D. dependent var		0.030188
S.E. of regression	0.029402	Akaike info criterion		-4.120892
Sum squared resid	0.038901	Schwarz criterion		-3.929689
Log likelihood	108.0223	Hannan-Quinn criter.		-4.048081
F-statistic	1.663667	Durbin-Watson stat		1.745090
Prob(F-statistic)	0.175079			