FINANCING-TO-VALUE (FTV) POLICY AND ITS IMPACT ON RESIDENTIAL PROPERTY PRICES IN INDONESIA

Imam Wahyudi Indrawan[1], Maya Puspa Rahman[2], and Nurfatihah Ahmad Senusi[3]

[1] International Islamic University Malaysia, Malaysia, indrawan.imam@live.iium.edu.my.
[2] International Islamic University Malaysia, Malaysia, mayapuspa@iium.edu.my.
[3] International Islamic University Malaysia, Malaysia, nurfatihahsenusi@gmail.com

ABSTRACT

Financing-to-value (FTV) policy is a macroprudential policy currently used by the central banks to maintain the stability of financial systems and prevent systemic risks. In Indonesia this is particularly the case in relation to financing of the property sector by Islamic financial institutions. This paper aims to analyse the impact of FTV policy on the residential property price index (RPPI) in Indonesia using a panel data analysis method. Indonesia is chosen in this study as it is one of the countries implementing FTV policy in its Islamic banking system. There are three important findings to be drawn from the study. First, FTV policy ratios significantly affect RPPI. Second, equal increases in all FTV policy ratios will lead to lower RPPI, and vice versa. This means that by applying lower down-payment requirements, there is an effective decrease in demand for residential property as indicated by lower levels of RPPI. Moreover, as macroprudential regulator, Bank Indonesia should pay attention to house financing through *murabahah* and *istisna'* (HOUSE_CMI) contracts as well as apartment financing through *musharaka mutanaqisah* (MMQ) and *ijarah muntahiyah bittamlik* (IMBT) lease with ownership option (APARTMENT_MI) contracts, because the imposition of FTV policy to these financing facilities tends to be counter-productive to FTV policy aims . This is an indication of the inability of FTV policy to direct property markets towards Bank Indonesia's objectives. Third, the success of FTV policy is subject to other policies, particularly monetary policy, that may hinder achievement of the intended objectives of FTV policy.

I. INTRODUCTION
1.1. Background

Both monetary policy and microprudential banking regulations were found to be inefficient in obstructing the expansion of systemic risk during the global financial crisis of 2008. According to a growing consensus, macroprudential policy should act in a complementary role to the existing policy frameworks of central banks or supervisory authorities in order to minimize the systemic risk that might occur (Bank of England, 2009; Caruana, 2010b; European Central Bank, 2010; International Monetary Fund, 2010; Swiss National Bank, 2010). It is undeniable that the starting point of the financial crisis was housing market developments in the United States in which creditors extensively lent to borrowers of poor creditworthiness. Lenders anticipated rising housing prices and expected that the overheated housing market would return to a more sustainable level. During the downturn in the housing market cycle, a large number of borrowers defaulted on their loans and banks were faced with a situation in which the repossessed dwellings and land resulting were worth less on the market than the amount loaned. In addition, banks have since faced liquidity issues and it has been more difficult to give and obtain home loans since the sub-prime lending bubble burst (also known as a 'credit crunch'). The crisis spread to other asset markets and other countries through the securitization of bank loans and the development of mortgage- and asset-backed securities.

As a result of the crisis, maximum loan-to-value (LTV) ratios (also referred to as 'LTV policy') for mortgages are being assessed or have been implemented by some countries, namely Hungary, Norway, Sweden and the UK as a macroprudential instrument intended to fill a policy gap (Wong, Fong, Choi, & Li, 2010). Although LTV policy is considered important in improving systemic risk levels related to credit–property price spirals, there is still a lack of empirical evidence for some key issues, reflecting the scarcity of information about the impact of the measures that have become popular with many regulators since the crisis. Moreover, the literature still provides insufficient guidance on the optimal targets of this macroprudential tool (Wong et al., 2010). Even the econometric analysis of such measures is limited. Studies by Lament and Stein (1999) and Almeida et al. (2006) show that economic activity is more sensitive to change in house prices if LTV is higher. In the case of Hong Kong, the financial sector's losses due to the Asian crisis were limited since LTVs were low and there is some important determinant of loan default found to be involved. Cross-country evidence presented by Wong et al. (2010) indicates that at the aggregate level, low LTVs can minimize loan delinquencies in response to economic downturns and crashes in property prices. Some empirical studies show that the effectiveness of LTV may restrict the use of macroprudential tools due to the use of mandatory limits on these loan-eligibility criteria. This is particularly the case when applied in an actively managed manner in response to cyclical movements in property markets with short histories, and only a few countries, such as Korea, Hong Kong, Singapore, and Malaysia, have implemented such frameworks (Igan & Kang, 2011). The implications of LTV policy should be taken into consideration in encouraging potential speculators to use effective tools in order to ameliorate booms in property markets and prevent associated risks.

Indonesia as an emerging economy in the Asian Pacific that, along with other countries in the region, has experience of sudden volatility and bubbles in property markets as well as the imposition of LTV policy. In Indonesia, LTV policy was initiated by Bank Indonesia in 2012 in response to a spiking trend in housing prices resulting from loose regulation of home financing. Indonesia's LTV policy is unique because it is imposed on both the conventional and Islamic home financing that are features of the country's dual banking system. Initially, LTV policy was imposed only for large residential properties (> 70m^2), because it is the high price movements of this type of property which tend to produce housing bubbles. Thus, LTV policy was imposed to tighten demand for property through the self-financing ('down-payment') requirement, which in turn was intended to stabilize property prices (Bank Indonesia, 2012b).

Since then, some adjustments and changes to LTV policy have been made by Bank Indonesia to respond to economic conditions, such as loosening LTV policy ratios to boost the economy and tighten them to prevent a housing bubble. Some studies have tried to evaluate LTV policy ratios in Indonesia, such as the study by Ascarya, Rahmawati, and Karim (2016) that compared the impact of LTV policy ratios in conventional and Islamic banks to non-performing loans/financing in the respective banks.

Other than this , little attention has been given to FTV policy specifically in terms of Islamic banks and its impact on residential property prices in Indonesia. This issue is important given that: i) the aim of such policy is to control the residential property market in which price is a signal for market participants about market conditions; and ii) the role of Islamic banks in macroprudential policy, in particular in FTV policy, is as important as that of their conventional counterparts. This paper tries to fill this knowledge gap by looking into the impact on RPPI of the FTV policy ratios for Islamic banks regulated by Bank Indonesia. Attention is given in this paper to the Islamic banks, since most studies to date have looked at the impact of the Islamic banking system on economic growth and little attention has been given to the interaction between the Islamic banking industry and the residential property industry.

1.2. Objective

The objective of this study is to analyse the impact of FTV policy ratios on RPPI in Indonesia using panel data analysis. RPPI is chosen as the measure of the effects of FTV policy ratios because it reflects both housing market supply and demand and its analysis will therefore show how FTV policy ratios affect, or even direct, property markets, and in particular the residential property sector. In turn, it will show how FTV policy ratios imposed by Bank Indonesia fulfil the FTV policy objective of preventing housing bubbles that may lead to financial crises. To achieve this objective, a key question is proposed: what is the impact of FTV policy ratios on the residential property index in Indonesia?

This study contributes to the body of knowledge by analysing the impact of FTV policy imposed by Bank Indonesia on the country's RPPI .

II. LITERATURE REVIEW
2.1. Background Theory
2.1.1. Determinants of the Property Price Index

The housing sector is important because its performance has significant impacts on the performance of the economy as a whole. The property industry can also be considered a main target of government fiscal and monetary policy, aimed towards achieving low inflation, low unemployment and balanced growth (Apergis, 2003). In addition, strong downward price stickiness can be seen in housing prices in general, since house owners tend to have high reservation prices and/or to resist selling their properties below a certain price, especially during recessions. However, during economic booms, price inertia may affect the behaviour of housing prices since house owners have optimistic expectations which facilitate the formation of housing bubbles (Adams & Füss, 2010). The determinants of house price indices are many and diverse, both theoretical and empirical, and can be highly uneven. Many studies in the past have found that there is a strong correlation between housing prices and fundamental macroeconomic factors. Nevertheless, those studies are limited in reliability because they are unable to accommodate the full set of interactions with the rest of the economy. The increasing complexity of the models used may also increase the possibility of serious misspecifications (Baffoe-Bonnie, 1998).

There are numerous different views associated with the influence of inflation on the housing sector (Kearl, 1979; Hendershott, 1980; Feldstein, 1992; Poterba, 1992). Feldstein (1992) showed that higher levels of inflation decrease the incentive to invest in property which eventually will decrease housing demand . On the other hand, Kearl (1979) claimed that inflation causes nominal housing payments to increase and that this leads to housing demand decreasing. Other economic variables – employment and income growth, inflation of real construction costs, and changes in real after-tax interest rates – can describe and explain the differences in national and regional housing prices, and thus the construction of new homes (Baffoe-Bonnie, 1998).

In the United Kingdom, a study by Stern (1992) mentioned that disposable income is the most dominant variable in the United Kingdom housing market. Jud and Winkler (2002), and Case and Shiller (1990) found that real changes in income, construction costs, interest rates and population growth are considered significant variables that may influence housing price appreciation in the United States. A study by Abelson, Joyeux, Milunovich, and Chung (2005) deduced that unemployment rate, mortgage rate, equity prices and housing stock are negatively related to Australian house prices, whereas disposable income and Consumer Price Index (CPI) are positively related in the long run. In addition, a study by Stubbs (2005) also revealed that interest rate is the main concern for property investors in Australia, as it is the dominant factor determining housing prices.

Other studies have found that higher employment growth improves building activity whereas lower rates will cause a decline in property-market activity (Smith & Tesarek, 1991; Sternlieb & Hughes, 1977). In general, employment growth helps to produce real estate cycles (Baffoe-Bonnie, 1998). Furthermore, Hartzell et al. (1993) claimed that not all regional employment features play a significant role in the investor decisions that determine housing prices. A study by Giussani et

al. (1992) discovered that there is a significant impact on housing prices of GNP changes related to employment growth.

Macroeconomic shocks, for instance unanticipated changes in money supply, industrial production or interest rates, affect house prices with lags which depend on the speed of the propagation mechanisms in play. The speed of propagation is regulated by the efficiency of the institutional framework, such as planning regulations, the pace of administrative processes, credit supply, transaction costs and/or the nature of the mortgage market. For example, if changes in interest rates move rapidly into changes in mortgage-market interest rates then an increase in money supply will influence the housing market more rapidly than if mortgage rates are fixed and/or the mortgage market is generally ineffective (Adams & Füss, 2010).

Different countries provide different credit supply for housing financing supported by a variety of property valuation methods. If the valuation method fully reacts to changes in property prices and if the LTV ratio allowed is high, then the increment in house prices will increase the credit supply, and vice versa. As the credit supply increases, interest rate changes will be more important since more firms and households are depending on debt financing. In contrast, low transaction costs may encourage more transactions, and therefore a quick response in house prices may follow a macroeconomic shock. Equally important, housing supply inelasticity will have a stronger influence on price reactions than supply reactions (Adams & Füss, 2010).

2.1.2. Loan-To-Value (LTV) Policy
In Islamic financial institutions, FTV policy can be equated with LTV policy in their conventional counterparts. In Hong Kong, LTV policy has played an important role in safeguarding banking stability since 1991. The existence of this policy reflects some special features of the Hong Kong financial system (Wong et al., 2010). Research has found that bank lending in Hong Kong is mainly influenced by property price movements, such that systemic risk is highly connected with developments in the property market. LTV was introduced as an instrument to strengthen the banking system's resilience to asset price volatilities and to minimize the risk of bank credit becoming a cycle amplifier, rather than using management of asset price cycles or market activities or targeting asset prices (Wong et al., 2010).

2.1.3. FTV Policy in Indonesia
FTV policy is part of the macroprudential policy applied to the Islamic banking industry in Indonesia. This policy was first introduced by Bank Indonesia in March 2012, applying to conventional residential property credit in the form of LTV regulation applying maximum limits for banks in giving credit or financing to customers buying property based on the value of the property forming the underlying asset. Later on, Bank Indonesia also imposed LTV ratios for Islamic residential property financing with different ratios for different types of property financing contracts. As a result, LTV policy for Islamic property financing is also known as financing-to-value (FTV) policy.

The first LTV policy, imposed in March 2012, targeted large properties ($> 70m^2$ in area) being funded through conventional credit facilities only and imposed a maximum LTV ratio of 70% (Bank Indonesia, 2012a). In November of the same year, Bank Indonesia issued circulars stating that Islamic banks were also subject to FTV policy, with different types of financing contracts having different FTV ratios. For property financing with *murabahah* (margin sale) and *istisna'* (construction) contracts, the FTV ratio matched the conventional credit LTV ratio of 70%, while for property financing with *musharaka mutanaqisah* or MMQ (diminishing partnership) and *ijarah muntahiyah bittamlik* or IMBT (lease with ownership option) contracts, FTV ratio of 80% was applied (Bank Indonesia, 2012b). Since that time, LTV/FTV policy ratios in Indonesia have continued to be divided into two types: CMI ratio, comprising conventional credit and *murabahah* and *istisna'* financing, and MI ratio, comprising Islamic MMQ and IMBT financing contracts.

On September 24, 2013, Bank Indonesia changed its LTV policy by introducing LTV/FTV ratios for medium ($22–70m^2$) and small ($< 22m^2$) properties. At this time, Bank Indonesia also differentiated LTV/FTV ratios for different categories of credit/financing facilities, namely first, second and third facilities. This differentiation is not based on a customer's ownership of property but on the number of property credit/financing facilities currently taken by the customer. Furthermore, Bank Indonesia also differentiated the definition of residential property between permanent houses and apartments, although the LTV/FTV ratios for these two types of property remained the same (Bank Indonesia, 2013).

Another change was made in June 2015, removing LTV/FTV ratio limits on first-time property credit/financing facilities for small and medium-sized properties as well as increasing the other LTV/FTV ratios to boost the property sector with the objective of generating economic growth. Small permanent houses were totally removed from LTV/FTV requirements to help the government in achieving its target of universal housing access for Indonesian citizens (Bank Indonesia, 2015). The most recent change was made on August 26, 2016 to increase maximum LTV/FTV ratios for medium and large properties to boost growth in the property sector (Bank Indonesia, 2016). A summary of FTV policy in Indonesia is provided in Table 1, showing FTV policy ratios imposed by Bank Indonesia between their inception on November 27, 2012 up to the most recent change on August 26, 2016, and representing each date of enactment of new FTV policy ratio regulations. FTV stands for financing-to-value ratio, the ratio of financing for housing divided by house price. An FTV of 100 means banks can offer house/apartment financing up to 100% of house/apartment value without restrictions being imposed by Bank Indonesia.

Table 1.
Timeline of FTV Policy in Indonesia

Property size	Date of FTV policy	FTV ratio (%)											
		Permanent house						Apartment unit					
		Murabahah and *istisna'*			MMQ and IMBT			*Murabahah* and *istisna'*			MMQ and IMBT		
		1	2	3	1	2	3	1	2	3	1	2	3
Small (<22m²)	November 27, 2012	100	100	100	100	100	100	100	100	100	100	100	100
	September 24, 2013	100	70	60	100	80	70	100	70	60	100	80	70
	June 18, 2015	100	100	100	100	100	100	100	80	70	100	80	70
	August 26, 2016	100	100	100	100	100	100	100	85	80	100	85	80
Medium (22-70m²)	November 27, 2012	100	100	100	100	100	100	100	100	100	100	100	100
	September 24, 2013	80	70	60	90	80	70	80	70	60	90	80	70
	June 18, 2015	100	80	70	100	80	70	100	80	70	100	80	70
	August 26, 2016	100	85	80	100	90	85	100	85	80	100	85	80
Large (>70m2)	November 27, 2012	70	70	70	80	80	80	70	70	70	80	80	80
	September 24, 2013	70	60	50	80	70	60	70	60	50	80	70	60
	June 18. 2015	80	70	60	85	75	65	80	70	60	85	75	65
	August 26. 2016	85	80	75	90	85	80	85	80	75	90	85	80

Source: Various regulations and circulars from Bank Indonesia, edited.

2.2. Previous Studies

Wong et al.'s (2010) analysis suggests that even though there is strong evidence that tightening LTV limits in general would reduce household leverage, there are mixed indications that tightening LTV limits will have significant dampening effects on property-market activities across economies. The authors also mention that the effect of LTV policy on systemic risk is transmitted predominantly through impacts on the household sector rather than on property-market activities. In addition, there are also studies related to the effect of LTV policy on credit growth. In these studies, various theoretical approaches give results showing that LTV policy can minimize excess credit, but empirical evidence does not seem to strongly support these results. Based on the empirical evidence, the results are rather mixed. According to theoretical approaches, studies with LTV policy or equivalents in their models have found that macroprudential instruments are effective in preventing excessive credit growth (Wong, Tsang, & Kong, 2014).

Both Mendicino (2012) and Christensen (2011) found that countercyclical LTV ratios in response to credit growth can smooth the credit cycle. A study by Funke and Paetz (2012) revealed that by applying a dynamic stochastic general

equilibrium (DSGE) modelling framework with a nonlinear LTV policy rule that reacts when property price growth goes beyond a certain threshold to the examination of Hong Kong's LTV policy, their simulation proves that LTV policy can reduce the level of household debt.

A study by Wong et al. (2014) also discovered signs of a limited direct policy effect on the property market. If LTV policy has a significant impact on the property market this would be mostly via the demand for properties, and if that is the case, the demand for mortgage loans which is supposedly derived from the demand for properties should be significantly sensitive to LTV ratios. However, based on their estimations, they find low responsiveness of the demand for mortgage loans to LTV ratios, suggesting there is a limited impact of LTV policy on the property market. This finding may implicitly suggest that LTV policy may be less effective in stabilizing the property market.

In Brazil, in xxxx the Central Bank of Brazil (CBB) increased to 150% the risk weight applied to new car loans with long maturities and high LTV ratios in order to improve the standard of origination of car loans (Afanasieff, Carvalho, Castro, De Coelho , & Gregório, 2015). The features of newly originated car loans in terms of LTV and maturity improved after the implementation of these measures . Furthermore, the measure has successfully signalled to banks the need to retain sound origination standards, since these standards did not worsen even after the measure was withdrawn in 2011 (Afanasieff et al., 2015). Macroprudential tools that target the quality of credit origination can have a powerful effect, since it has been proven that there is an effective signalling channel between the CBB and the financial institutions. After the implementation of LTV limits, banks started to revise their lending practices and to damp down the lending excesses that had been taking place, even after the measure was relaxed (Afanasieff et al., 2015).

Successful LTV policy depends on the policy design implemented by the central bank. Good design of LTV policy will generate lower lending rates to the private sector in the long run, meaning LTV policy achieves its goal of curbing credit growth but with less instability than resulting from immediate contraction (Basto, Gomes, & Lima, 2018).

III. METHOD
3.1. Data
As this study utilizes a panel data analysis method it comprises two sets of observed data. The first is cross-sectional data for the types of housing/apartment, as classified by Bank Indonesia, i.e. large ($> 70m^2$), medium ($22m^2$–$70m^2$), and small ($< 22m^2$), with the 'small' category as the base fixed effect in the fixed effect model. Second, the time series comprises quarterly data from the first quarter of 2007 to the fourth quarter of 2017.

As presented in Table 2, this study addresses one dependent variable and several independent variables.

Table 2.
Description of Variables

Variable	Code	Status	Description
Residential property price index	RPPI	Dependent variable	Index that indicates the general movement of residential property prices in some cities in Indonesia.
Number of cities surveyed	NO_CITIES	Independent variable	Number of cities surveyed by Bank Indonesia to obtain RPPI data.
Real gross domestic product	GDP	Independent variable	Amount of goods and services produced in an economy as proxy of market size. Measured in constant 2010 Indonesian rupiah.
Consumer price index	CPI	Independent variable	Domestic price of a basket of consumer goods as proxy of price level in the economy. Measured with 2012 as base year (CPI 2012 = 100).
Real interest rate	RIR	Independent variable	Product of subtraction of the Jakarta Interbank Offered Rate (JIBOR) from inflation (YoY) at a particular quarter.
Home financing	HOMEFIN	Independent variable	Total outstanding amount of home financing from Islamic commercial banks in Indonesia. Measured in billions of Indonesian rupiah.
Financing-to-value policy ratios	FTV	Independent variable	The 12 possible ratios available in Bank Indonesia's policy.

For the FTV variable, not all ratios are used. The description and coding of the used ratios are presented in Table 3.

Table 3.
Codes for FTV Ratios in the Regression Model

Type of Residential Property	Type of Contract	First Financing Facility	Second Financing Facility	Third Financing Facility
House	*Murabahah* and *istisna'* (CMI)	Not used	FTV_HOUSE_CMI_2	FTV_HOUSE_CMI_3
	MMQ and IMBT (MI)	Not used	FTV_HOUSE_MI_2	FTV_HOUSE_MI_3
Apartment	*Murabahah* and *Istisna'* (CMI)	Not used	FTV_APARTMENT_CMI_2	FTV_APARTMENT _CMI_3
	MMQ and IMBT (MI)	Not used	FTV_APARTMENT _MI_2	FTV_APARTMENT _MI_3

Because the FTV ratios for the first property financing facility present a collinearity problem, only the ratios applied to second and third property financing facilities are used for data analysis in this study. If no FTV policy is imposed, meaning that banks can freely provide home financing at any value relative to

house price, FTV policy ratios are set at 100 to indicate no restrictions applied by Bank Indonesia.

Data for the above variables are taken from the Bank Indonesia website (http://bi.go.id/) for RPPI, CPI, RIR and FTV ratios, and from Statistics Indonesia (Badan Pusat Statistik or BPS) (http://bps.go.id/) for GDP data.

3.2. Model Development

Panel data analysis is used to analyse the relationships between variables. This method is chosen because it enables researchers to analyse cross-sectional and/or time-series effects of the study. Furthermore, three independent variables – GDP, CPI, and HOMEFIN – as well as the dependent variable (RPPI) are transformed into natural log (LN) form in order to reveal the effect of percentage change in any independent variable in relation to the dependent variable. In panel data analysis there are two possible models that can be used in this study:

a. Pooled Ordinary Least Squares (Pooled OLS) Model

This model will be used if there are no cross-section (property size) effects within the model (Park, 2011, p. 7). In this study, two pooled OLS model equations are conducted separately, mathematically expressed as:

$$
\begin{aligned}
LN\_RPPI_{it} = {} & \alpha_0 + \alpha_1.NO\_CITIES_{it} + \alpha_2.LN\_GDP_{it} + \alpha_3.LN\_CPI_{it} + \alpha_4.RIR_{it} \\
& + \alpha_5.LN\_HOMEFIN_{it} + \alpha_6.FTV\_HOUSE\_CMI\_2_{it} \\
& + \alpha_7.FTV\_HOUSE\_MI\_2_{it} + \alpha_8.FTV\_APARTMENT\_CMI\_2_{it} \\
& + \alpha_9.FTV\_APARTMENT\_MI\_2_{it} + \mu_{it} \dots
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
LN\_RPPI_{it} = {} & \beta_0 + \beta_1.NO\_CITIES_{it} + \beta_2.LN\_GDP_{it} + \beta_3.LN\_CPI_{it} + \beta_4.RIR_{it} \\
& + \beta_5.LN\_HOMEFIN_{it} + \beta_6.FTV\_HOUSE\_CMI\_3_{it} \\
& + \beta_7.FTV\_HOUSE\_MI\_3_{it} + \beta_8.FTV\_APARTMENT\_CMI\_3_{it} \\
& + \beta_9.FTV\_APARTMENT\_MI\_3_{it} + v_{it} \dots
\end{aligned}
\tag{2}
$$

The difference between the two equations is in the FTV policy ratios used. In the first model equation, identified as FTV_2, FTV policy ratios for second financing facilities are used as independent variables. Meanwhile, in the second model equation, identified as FTV_3, FTV policy ratios for third financing facilities are used as independent variables. This separation is conducted because of the collinearity problem that appears when all FTV ratios are inserted simultaneously into one model equation.

b. Fixed Effects Model (FEM)

This model allows different constants for each cross section to represent time-invariant effects and can examine the effects within intercepts (Asteriou & Hall, 2007, p. 346 ; Park, 2011, p. 8). There are two fixed effect model equations in this study, the FTV_2 equation and the FTV_3 equation, mathematically expressed as:

$$
\begin{aligned}
LN\_RPPI_{it} = (\alpha_0 + \lambda_i) &+ \alpha_1.NO\_CITIES_{it} + \alpha_2.LN\_GDP_{it} + \alpha_3.LN\_CPI_{it} \\
&+ \alpha_4.RIR_{it} + \alpha_5.LN\_HOMEFIN_{it} + \alpha_6.FTV\_HOUSE\_CMI\_2_{it} \\
&+ \alpha_7.FTV\_HOUSE\_MI\_2_{it} + \alpha_8.FTV\_APARTMENT\_CMI\_2_{it} \\
&+ \alpha_9.FTV\_APARTMENT\_MI\_2_{it} + \mu_{it} \dots
\end{aligned} \tag{3}
$$

$$
\begin{aligned}
LN\_RPPI_{it} = (\beta_0 + \theta_i) &+ \beta_1.NO\_CITIES_{it} + \beta_2.LN\_GDP_{it} + \beta_3.LN\_CPI_{it} \\
&+ \beta_4.RIR_{it} + \beta_5.LN\_HOMEFIN_{it} + \beta_6.FTV\_HOUSE\_CMI\_3_{it} \\
&+ \beta_7.FTV\_HOUSE\_MI\_3_{it} + \beta_8.FTV\_APARTMENT\_CMI\_3_{it} \\
&+ \beta_9.FTV\_APARTMENT\_MI\_3_{it} + v_{it} \dots
\end{aligned} \tag{4}
$$

There is another model that can be used for panel data analysis, namely the random effects model (REM). However, REM is not used here because the number of cross sections is smaller than the number of parameters, reflecting the infeasibility of the Swamy and Arora (1972) method to estimate REM when the number of cross sections is smaller than the number of parameters (Mohammadi, 2012).

The meaning of notations within the models are as follows:

LN_RPPI　　　: Natural log of RPPI
LN_GDP　　　: Natural log of real GDP
LN_CPI　　　: Natural log of CPI
RIR　　　　　: Real interest rate
LN_HOMEFIN : Natural log of outstanding amount of home financing
$\alpha0$　　　　　　: Intercept representing fixed effect for small residential properties (area < 22m2)
$\beta0$　　　　　　: Intercept representing fixed effect for small residential property (area < 22m2)
DMEDIUM　　: Dummy for fixed effect of medium property
DLARGE　　　: Dummy for fixed effect of large property
uit & vit　　　: Error terms
λi & θi　　　　: Fixed effects

All data analysis in this study is conducted using EViews 9 software.

3.3. Method
3.3.1. Diagnostic Tests

Since only pooled OLS and fixed effect models are possible methods for this study, and in order to determine the best of the two possible models within the panel data analysis method applied, redundant fixed effects or Chow testing is used to determine whether the fixed effect model produces significant differences to the pooled OLS model or not. The hypotheses of this test are shown below:

$H_0: \lambda_1 = \lambda_2 = \lambda_3 = 0; \theta_1 = \theta_2 = \theta_3 = 0 \rightarrow$ *all λ_i and θ_i = 0 → pooled OLS is better*
$H_a:$ *at least one λ_i and/or $\theta_i \neq 0 \rightarrow$ FEM is better*

The test statistics for the redundant fixed effects test follows F-distribution (Park, 2011, p. 12), and all diagnostic tests and significance tests in this study use 5% level of confidence (α).

3.3.2. Panel Data

Panel data or longitudinal data is data in which several units or cross sections are observed over several different time periods. The advantages of using panel data include: i) informative data; ii) more variability; iii) the variables have less collinearity; iv) more degrees of freedom; and v) greater efficiency. This study utilizes long panel data with many periods but few cross sections (Cameron & Trivedi, 2010).

In panel data analysis, either cross-section effects or time effects or both are examined in order to deal with heterogeneity problems, and these effects may be fixed or random. In an FEM, the effect is examined by looking at whether the intercepts vary among cross sections or time periods. Meanwhile, an REM investigates differences in error variance components among cross sections or time periods (Park, 2011).

Panel data analysis has several advantages, such as i) better inference of model parameters, since panel data usually has more degrees of freedom and more data availability than cross-sectional and time-series data; and ii) greater capacity to capture complexity in human behaviour. However, panel data analysis also has drawbacks, including i) it is more costly for data collection because cross-sectional units must be observed for different periods of time consistently; ii) lack of ability to capture dynamic impacts in short time-series parts of the panel data analysis; and iii) the possibility of the existence of omitted variables, because any omitted variables are assumed to be incorporated into cross-sectional or time-series effects. However, omitted variables may become a problem when cross-sectional dependence occurs (Hsiao, 2007) .

IV. RESULTS AND DISCUSSION
4.1. Results
4.1.1 Diagnostic Test Results
In the two separate models (FTV_2 and FTV_3), redundant fixed effects testing is conducted to determine whether a pooled OLS or a fixed effect model is more suitable. A summary of the test results for the F TV_2 equation is shown in Table 4.

Table 4.
Results of Redundant Fixed Effects Test for FTV_2 Equation

Effects test	Statistic	d.f.	Prob.
Cross section F	38.017311	-2.120	0
Cross section Chi-square	64.78554	2	0

Source: Eviews 9 Output, edited

It can be seen that the F-statistic has p-value of 0.000, and as this is less than 0.05 (α) the null hypothesis can be rejected and thus the FEM is better for analysing the FTV_2 equation. Meanwhile, the results of the redundant fixed effects test for the FTV_3 equation is shown in Table 5:

Table 5.
Results of Redundant Fixed Effects Test for FTV_3 Equation

Effects test	Statistic	d.f.	Prob.
Cross section F	37.292147	-2.120	0
Cross section Chi-square	63.80533	2	0

Source: Eviews 9 Output, edited

Table 5 shows that the F-statistic has p-value of 0.000, and as this is less than 0.05 (α) the null hypothesis can be rejected. In other words, the FEM is better for analysing the FTV_3 equation.

4.1.2. Main Model Results

Since the FEM is used for both equations, it can be expressed as a least squares dummy variable (LSDV) equation. LSDV expression is utilized to check for the significance of fixed effects. Firstly, the goodness of fit and overall significance results of the FTV_2 and FTV_3 models are shown in Table 6.

Table 6.
Goodness of Fit and Overall Significance of the Models

Equation	Goodness of Fit (adjusted R-squared)	Overall Significance (F-statistics)
FTV_2	0.575	15.431 (p-value = 0.000)
FTV_3	0.565	16.463 (p-value = 0.000)

Source: Eviews 9 Output, edited

Table 6 shows that both models have high goodness of fit, as shown by adjusted R-squared values for both models of greater than 0.5. Both models are also significant overall, as indicated by both F-statistics (0.000 for both) being lower than 0.05 (α). These results mean that both models are robust. The panel data results for FTV_2 and FTV_3 equations are summarized in Table 7.

Table 7.
Summary of Panel Data Results

Dependent Variable	RPPI			
	FTV_2 Model		FTV_3 Model	
	Coefficient	t-statistic (P-value)	Coefficient	t-statistic (P-value)
NO_CITIES	-0.038318	-2.098916 (0.0379)*	-0.039885	-2.225103 (0.0279)*
LN_GDP	-0.149909	-0.500014 (0.618)	-0.084724	-0.286921 (0.7747)
LN_CPI	-0.845102	-1.805371 (0.0735)	-0.958145	-2.074471 (0.0402)*
RIR	-0.007618	-2.117502 (0.0363)*	-0.008468	-2.384678 (0.0187)*
LN_HOMEFIN	0.357218	1.930336 (0.0559)	0.368916	2.034236 (0.0441)*
FTV_APARTMENT_CMI_2	0.027832	4.5435586 (0.0000)*	-	-
FTV_APARTMENT_MI_2	-0.033145	-5.194047 (0.0000)*	-	-
FTV_HOUSE_CMI_2	-0.024543	-3.998115 (0.0001)*	-	-
FTV_HOUSE_MI_2	0.02563	4.060664 (0.0001)*	-	-
FTV_APARTMENT_CMI_3	-	-	0.02982	4.940458 (0.0000)*
FTV_APARTMENT_MI_3	-	-	-0.0339	-5.420705 (0.0000)*
FTV_HOUSE_CMI_3	-	-	-0.026152	-4.328206 (0.0000)*
FTV_HOUSE_MI_3	-	-	0.026813	4.331753 (0.0000)*
DUMMY_MEDIUM	0.058998	3.898413 (0.0002)*	0.057597	3.884745 (0.0002)*
DUMMY_LARGE	-0.05841	-3.781138 (0.0002)*	-0.0546	-3.650001 (0.0004)*
C (DUMMY_SMALL)	7.468777	2.367411 (0.0195)*	6.840666	2.202095 (0.0296)*

Source: Eviews 9 Output, edited. *: Significant at α = 5%

The findings in Table 7 shows that the FTV_2 and FTV_3 models deliver quite similar results. By maintaining other variables as constant, the macroeconomic variables of GDP and CPI as well as the variable HOMEFIN are non-significant to RPPI in FTV_2, p-values for both equations being greater than 0.05 (α). Meanwhile, in the FTV_3 equation, CPI and HOMEFIN are found to be significant. Other independent variables are consistently significant in both models. FTV ratios for house financing impact in the opposite direction to RPPI. While increments of FTV ratios for *murabahah* and *istisna'* house financing (HOUSE_CMI) for both second and third financing facilities tend to decrease RPPI, higher MMQ and IMBT FTV

ratios (HOUSE_MI) tend to increase RPPI for both the second and third financing facilities.

On the other hand, opposite results appear for FTV ratios applied to apartment financing. Increments of FTV ratios for apartment *murabahah* and *istisna'* financing (APARTMENT_CMI) for both second and third financing facilities tend to increase RPPI while in contrast higher MMQ and IMBT FTV ratios (APARTMENT_MI) tend to generate lower RPPI levels for both second and third financing facilities.

With regard to the fixed effects of property size, given equal conditions, medium residential property prices, either houses or apartments, tend to grow more quickly than other types of residential property, as shown by the DUMMY_MEDIUM variable, followed by small residential properties (C) and, lastly, large residential properties (DUMMY_LARGE).

4.2. Analysis

The results reveal that when all FTV policy ratios for both apartment and housing financing either in second or third financing facilities increase by equal rates, the net result is a lower level of RPPI. This means that by loosening FTV policy in Indonesia there is an effective decrease in demand for residential property as indicated by a lower level of RPPI. In contrast, if FTV policy ratios are decreased by Bank Indonesia, which means tighter FTV policy, the net result is a higher level of RPPI that indicates higher demand for residential property. In other words, FTV policy imposed by Bank Indonesia cannot achieve its objectives of controlling housing bubbles through tighter FTV policy ratios or boosting the economy by loosening the ratios. Instead, the results are the opposite of the objectives.

The finding of this study is in line with studies by Wong et al. (2010) and Wong et al. (2014), both of which found that LTV policy has limited impact on the property market. This suggests that FTV as a macroprudential policy has limitations in directing demand for property through limiting the accessibility of financing for property purchase. In the case of Indonesia as observed in this study, Bank Indonesia as macroprudential regulator should pay attention to house financing via *murabahah* and *istisna'* contracts (HOUSE_CMI) contracts as well as apartment financing via MMQ and IMBT (APARTMENT_MI) contracts, because imposition of FTV policy on these financing facilities tends to be counter-productive to FTV policy.

Another important consideration from this study's findings is that the impact of FTV policy change also depends on the effectiveness of monetary policy as indicated by RIR. Based on the results of the panel-data regression, increases in RIR, which may be caused by rises in JIBOR in the interbank money market and/or reductions in inflation, tend to reduce RPPI. If Bank Indonesia, in its role as macroprudential regulator, loosens its FTV policy to boost the economy through the property sector the opposite effect may result if at the same time, in its role as monetary policy maker, it also raises interest rates, usually in response to external macroeconomic shocks. It is therefore evident that synergy between macroprudential policy and monetary policy is important to achieve Bank Indonesia's ultimate goal of stabilizing the property sector, and particularly the RPPI.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

This paper is intended to show how FTV policy ratios imposed by Bank Indonesia affect the RPPI. This study found that most macroeconomic variables as well as outstanding home financing are insignificant to RPPI, while all FTV policy ratios imposed by Bank Indonesia significantly affect RPPI, although with each ratio having opposite effect.

Typically, increments of FTV ratios for house purchase through *murabahah* and *istisna'* financing have a tendency to decrease residential property prices, but higher MMQ and IMBT FTV ratios for house financing will increase residential property prices. On the other hand, FTV ratios on apartment financing with *murabahah* and *istisna'* financing will lead to higher residential property prices, but higher MMQ and IMBT FTV ratios reduce residential property prices.

5.2. Recommendations

There are some policy implications that can be drawn from this study's findings. In general, increase in FTV policy ratios, meaning lower down-payment requirement for customers and looser FTV policy, will generate lower RPPI, indicating lower demand for residential property. This is counter-productive to Bank Indonesia's intention to boost the property sector when loosening FTV policy ratios and to restrain the sector when tighter FTV policy is imposed. Moreover, Bank Indonesia should take into account imposition of FTV policy ratios on house financing through *murabahah* and *istisna'* (HOUSE_CMI) contracts as well as apartment financing through MMQ and IMBT (APARTMENT_MI) contracts because there is an indication of opposite effects of FTV policy on these types of property financing, causing FTV policy results to be in opposition to policy intentions.

Also, synergy with other policies, particularly monetary policy, is important because any sudden change in interest rates by Bank Indonesia may offset the impact of FTV policy. Bank Indonesia should also give more attention to small and medium-sized properties because these tend to have higher price index levels than large properties, given *ceteris paribus* conditions. Proper attention and regulation will help Bank Indonesia to prevent property bubbles that may affect the lower-middle income group.

Given the opposite direction of property price indices to those intended by FTV policy makers in several of the schemes in place, Islamic banks as the practitioners of FTV policy must be cautious when Bank Indonesia announces new FTV policy ratios. In order to prevent bubbles in property financing by Islamic banks, it is better for the Islamic banks to provide financing for houses through MMQ and IMBT schemes while utilizing *murabahah* and *istisna'* schemes for apartment financing.

This study extends the body of knowledge by providing empirical analysis of the impact of FTV ratios as part of macroprudential policy on the direction of property markets as indicated by RPPI. Also, this study reveals interaction between FTV policy as part of macroprudential policy and monetary policy represented by RIR.

Further research may analyse the impact of FTV policy on other indicators of the property market in Indonesia, such as the commercial property price index. Another potential field of study is analysis of policy interaction between macroprudential policy and other policies, particularly fiscal policy, which is not covered in this study, either for Indonesian specifically or across countries. Future studies may also utilize dynamic panel model analysis or other methods in order to obtain further insights into the impact of FTV policy in both the long and short run, such that the empirical results can be more comprehensive and provide better inputs for policymakers. Also, a potential area for future study would be comparison of the effectiveness of Islamic FTV and conventional LTV as macroprudential policy tools.

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APPENDIX A
Eviews Output on LTV_2 Model Equation

Dependent variable: LN_RPPI
Method: Panel least squares
Date: 06/25/18; Time: 13:19
Sample: 2007Q1 2017Q4
Periods included: 44
Cross sections included: 3
Total panel (balanced) observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO_CITIES	-0.043184	0.017657	-2.445717	0.0159
LN_GDP	-0.160293	0.288699	-0.555226	0.5798
LN_CPI	-0.662821	0.448772	-1.476965	0.1423
RIR	-0.008596	0.003503	-2.454001	0.0156
LN_HOMEFIN	0.271718	0.180181	1.508024	0.1342
FTV_APARTMENT_CMI_2	0.022832	0.006154	3.709969	0.0003
FTV_APARTMENT_MI_2	-0.021097	0.006125	-3.444220	0.0008
FTV_HOUSE_CMI_2	-0.022324	0.006260	-3.565860	0.0005
FTV_HOUSE_MI_2	0.022156	0.006170	3.591091	0.0005
DUMMY_MEDIUM	0.060331	0.014690	4.106906	0.0001
DUMMY_LARGE	-0.063106	0.014933	-4.225859	0.0000
C	7.495784	3.068486	2.442829	0.0160

R-squared	0.610577	Mean dependent variable		4.976288
Adjusted R-squared	0.574880	S.D. dependent variable		0.094920
S.E. of regression	0.061889	Akaike info. criterion		-2.640443
Sum squared residual.	0.459629	Schwarz criterion		-2.378370
Log likelihood	186.2692	Hannan-Quinn criterion.		-2.533948
F-statistic	17.10437	Durbin-Watson statistic		0.447965
Prob (F-statistic)	0.000000			

APPENDIX B
Eviews Output on LTV_3 Model Equation

Dependent variable: LN_RPPI
Method: Panel least squares
Date: 06/25/18; Time: 13:19
Sample: 2007Q1 2017Q4
Periods included: 44
Cross sections included: 3
Total panel (balanced) observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NO_CITIES	-0.040840	0.017817	-2.292157	0.0236
LN_GDP	-0.204537	0.290950	-0.702997	0.4834
LN_CPI	-0.597547	0.453246	-1.318372	0.1899
RIR	-0.008098	0.003527	-2.295975	0.0234
LN_HOMEFIN	0.267512	0.182379	1.466788	0.1450
FTV_APARTMENT_CMI_3	0.021689	0.006291	3.447670	0.0008
FTV_APARTMENT_MI_3	-0.019915	0.006270	-3.176047	0.0019
FTV_HOUSE_CMI_3	-0.021272	0.006414	-3.316733	0.0012
FTV_HOUSE_MI_3	0.021115	0.006307	3.348157	0.0011
DUMMY_MEDIUM	0.060580	0.014848	4.080000	0.0001
DUMMY_LARGE	-0.063723	0.015183	-4.197115	0.0001
C	7.854667	3.097926	2.535459	0.0125
R-squared	0.601840	Mean dependent variable		4.976288
Adjusted R-squared	0.565342	S.D. dependent variable		0.094920
S.E. of regression	0.062579	Akaike info. criterion		-2.618255
Sum squared residual	0.469941	Schwarz criterion		-2.356182
Log likelihood	184.8048	Hannan-Quinn criterion		-2.511760
F-statistic	16.48965	Durbin-Watson statistic		0.433070
Prob (F-statistic)	0.000000			