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Non-core Liabilities and Monetary Policy Transmission in Indonesia during the Post-2007 Global Financial Crisis

CAMA Working Paper 78/2017
December 2017

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Abstract

The policy importance of non-core liabilities has risen to prominence in recent years with the studies of Shin and Shin (2010), Hahm, et al., (2010) and Hahm, et al., (2013) highlighting it as a useful indicator of financial procyclicality and vulnerability. In this paper, we look at non-core liabilities in relation to its role in the transmission of monetary policy, particularly by examining how the interest rate channel of monetary policy is affected by non-deposit liabilities. We analyse this issue in the context of an emerging economy experience of Indonesia, which in recent years, has seen an increased reliance of its banking sector on non-core funding. Our investigation employs available bank-level data on non-core liabilities and lending rates in Indonesia over the period October 2011 to July 2016. We find that including non-core liabilities in the estimation has an effect, relative to the baseline, of stronger overall and immediate pass-through, albeit with a more sluggish adjustment towards correction of disequilibrium in the next period. The overall effect is that non-core liabilities make the duration lengthier for the monetary policy rate to transmit to bank lending rates in Indonesia.

Keywords

non-core liabilities, lending rates, policy rates, interest rate channel, monetary policy transmission, dynamic panel

JEL Classification

C33, E43, E52, G21

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ISSN 2206-0332

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By

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Abstract

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Acknowledgments: We would like to thank Paul Mizen as well as participants of the SEACEN Signature Course on Macroeconomic and Monetary Policy Management held in Bali, Indonesia, in July 2017 and the SEACEN Intermediate Course on Analytics of Macroeconomic and Monetary Policy Management held in Manila, Philippines in October 2017, for which the earlier results of this study were presented.

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I. Introduction

In response to the recent crisis, central banks of advanced economies implemented accommodative unconventional monetary policies, which saw their short-term policy rates cut to near zero levels. The favourable global monetary conditions engendered by such policies spilled over to emerging economies in the form of surges in capital inflows. According to Bank of International Settlements (BIS) data, the lower funding cost increased global bank lending to Asian emerging economies from 100 percent of the region's GDP in the first quarter of 2007 to 140 percent by the second quarter of 2017.[1] Moreover, the easy global financial conditions have contributed to a shift in funding of the domestic banks of these Asian economies from domestic to external sources (Ananchotikul and Seneviratne, 2015; Azis and Shin, 2015). Specifically, domestic banks may raise funding through "non-core" liabilities as opposed to "core" liabilities (IMF, 2017). If we classify retail deposits as the core liabilities of the banking sector, then non-core liabilities are the rest of the components of bank funding (Shin and Shin, 2010).

The literature has earlier emphasised the importance of non-core liabilities to bank funding. Previous studies have mainly treated non-core liabilities from a financial stability perspective, particularly as an indicator of financial procyclicality and vulnerability (Shin and Shin, 2010; Hahm, et al., 2010; Hahm, et al., 2013). For this paper, we analyse non-core liabilities in terms of its role in the transmission of monetary policy. Specifically, our aim is to examine how the interest rate channel of monetary policy is affected by such non-deposit liabilities. As argued by Mohanty and Rishabh (2016), banks that have a more mixed liability structure comprising not just of deposits, may experience a sluggish change in their average funding cost in responding to a change in the central bank's policy rate. In other words, the reliance on non-

[1] See Bank for International Settlements (BIS) statistics on Global Liquidity.

core funding by banks may actually delay the transmission of the monetary policy rate to bank lending rates. We believe that addressing this issue is of major policy importance. Understanding the process of interest rate transmission is essential for any central bank or monetary authority, in particular, for an inflation targeter for which the interest rate channel is often the most important monetary policy transmission channel.

The key questions that we focus on in this paper are as follows: how is the monetary policy stance of Indonesia's central bank, Bank Indonesia, transmitted to the lending rate of Indonesian banks? How do the non-core liabilities of Indonesian banks affect the transmission of monetary policy in Indonesia? Did the non-core liabilities of banks delay the interest rate pass-through of monetary policy in Indonesia? To address these questions, we work with a balanced panel of commercial banks in Indonesia. We were able to obtain the monthly balance sheets of domestic and foreign banks operating in Indonesia as well as the lending rates of the individual banks. The balance sheets of the individual banks were available for the period October 2011 to July 2016, which then allowed us to construct the non-core liabilities of the individual banks for the said period. This time frame coincides with the period that central banks of advanced economies undertook quantitative easing policies. The non-core funding of the Indonesian banking sector was about 30 percent of the total liabilities of the Indonesian banking sector by mid-2016 - considered as relatively high for an emerging economy.

To the best of our knowledge, our study is the only paper so far that connects the impact of non-core liabilities on the interest rate channel of monetary policy transmission in an emerging economy context. A related study, though with a slightly different focus compared to our paper, is by Illes et al., (2015) which investigates the relationship between lending rates, bank funding costs and policy rates in the euro area over the period 2003-2014. Since the period covered by Illes et al., (2015) include the pre-crisis phase, their finding of a structural break in the relationship between policy rates and lending rates during the crisis led them to show that during the post-crisis period, a measure of banks' effective funding costs can better capture the observed divergence in bank lending rates as opposed to policy rates in the euro area. On the other hand, our study focuses on the post-crisis period and examines how the non-core funding of banks alters the basic relationship between the monetary policy rate and bank lending rates for the interest rate channel of monetary policy transmission. In another related study, Jain-Chandra and Unsal (2012) find that large capital inflows weaken the link between changes in the policy rates and bank lending rates for a panel of Asian economies. The difference between this and our study is that ours affords more granularity in the estimation since it includes a panel of individual banks' lending rates and balance sheet data for a relatively large emerging Asian economy. A related study by Annachotikul and Seneviratne (2015) finds that, using bank-level data for nine Asian economies during 2000-2013, global financial conditions, in addition to other factors, affect the response of domestic credit to changes in domestic monetary policy. The Annachotikul and Seneviratne (2015) study, however, belongs to a growing separate strand of literature on the credit-channel perspective of monetary policy transmission, while also deemed as very important, is different to our study which pertains to the interest rate channel.

In our empirical estimation, we employ the latest technique on dynamic panel estimation. Accounting for parameter heterogeneity, potential cross-sectional dependence and the dynamic set-up with the presence of a lagged dependent variable, we adopt the Chudik and Pesaran (2015) dynamic "common correlated effects" (CCE) estimator. The CCE estimator essentially employs the cross-section averages of all variables in the model to capture the unobservables as well as omitted elements in the cointegration relationship (Eberhardt and Presbitero, 2015). Finally, in line with previous studies (e.g., Sander and

Kleimeir, 2004; Gambacorta, 2008; Kitamura et al., 2015; Annachotikul and Seneviratne, 2015; Holton and d'Acri, 2015) that employ bank-level panel data to examine the monetary policy transmission mechanism, we also include as control variables, bank-related variables on size, liquidity, an index of competition in the Indonesian banking system as well as aggregate domestic and external macroeconomic variables -- domestic output and inflation, VIX and credit-default swaps (CDS) rates.

We find that including non-core liabilities in the estimation has an effect, relative to the baseline, of stronger overall and immediate pass-through, albeit with a more sluggish adjustment towards correction of disequilibrium in the next period. The overall effect of non-core liabilities is that it takes longer for the monetary policy rate to be transmitted to bank lending rates in Indonesia. The paper is structured as follows. The next section presents some stylized trends on capital account openness in Indonesia and non-core funding of Indonesian banks. The third section discusses the method employed in the paper, while the fourth section presents the data and empirical results. The fifth section concludes the study.

II. Some Stylized Trends

It was in the aftermath of the 1997-98 Asian financial crisis that reform measures were quickly and steadily implemented in Indonesia. For instance, the Bank Indonesia Act of 1999 was a major change in the conduct of monetary policy, especially pertaining to the provision of central bank independence. Implicitly, the Act mandates that the central bank implement monetary policy based on interest rates, which replaces the previous monetary targeting framework. In July 2005, the central bank adopted a full-fledged inflation targeting framework, making the inflation target the overriding objective and nominal anchor of monetary policy. Under this framework, the BI rate became the policy rate for conveying the monetary policy stance to the market. The monthly meetings of the Board of Governors decide on the policy rate and this is announced to the public. The policy rate is expected to influence the overnight interbank money market rate. Monetary operations such as through open market operations and the standing facility, are often employed to anchor the movement of the overnight interbank money market rate around the BI rate (Nurliana et al., 2016). In its effort to improve monetary policy rate transmission, Bank Indonesia replaced the BI rate with the 7-day reverse repo rate as its policy instrument in August 2016.

One can argue that the important role the policy rate has been accorded under the Indonesian inflation targeting framework is underpinned by two major forces, namely, the gradual development of the Indonesian financial market, including the introduction of financial market instruments that are sensitive to interest rates, and the integration of the country's domestic financial market into international financial markets (Nurliana et al., 2016). Since the mid-1990s, the Indonesian economy has relaxed its restrictions on the movement of international capital flows, as captured by the new index of capital controls constructed by Fernandez et al., (2016) (Figure 1).

One consequence of the increased openness to foreign capital flows has been the steady increase in non-deposit liabilities of the Indonesian banking system. These flows enter the banking sector as restrictions on capital inflows are relaxed (Azis and Shin, 2015). In addition to retail deposits, the Indonesian banking system has, in recent years, tapped alternative sources of funding, i.e., wholesale funding, to support credit growth. In Figure 2, measured as a share of the total liabilities of the Indonesia banking system, it can be seen that such non-core liabilities which accounted for a little more than a quarter at end of 2011, gradually rose to a third of the total liabilities by mid-2016.

The gradual rise in non-core funding of the Indonesian banking system in recent years was also reinforced by the favourable global financial conditions brought on by the accommodative unconventional monetary policy stance pursued by central banks of major advanced economies. Based on the global liquidity data published by BIS (total claims on private non-financial sector as a proportion of GDP), the non-core funding of the Indonesian banking system rose in tandem with global liquidity (Figure 2), which suggests that there is a correlation between Indonesian banks' non-core funding with global liquidity. Whether the non-core funding of the Indonesian banking system has affected the pass-through of Indonesian policy rates to lending rates is the central empirical issue that we examine in subsequent sections.

III. Empirical Methodology

In order to analyse the effect of non-core liabilities on the relationship between bank lending rates and the monetary policy rate, we use an error-correction model (ECM). The starting point of the analysis is the error-correction representation expressed as follows:

$$\Delta brate_{it} = \alpha_j \Delta plrate_{t-1} + \gamma_j bratei_{,t-1} - \beta_j plrate_{t-1} + \phi_j \Delta X_{t-1} + \psi_j \Delta Z_{i,t-1} + \varepsilon_{it} \quad (1)$$

where brate is lending rates for each bank i, plrate is the monetary policy rate. ΔX is a vector of changes in a number of important domestic and external macroeconomic variables for Indonesia, namely, VIX (CBOE Volatility Index), domestic output (proxied by the industrial production), domestic inflation and credit-default swap (CDS) rates. ΔZ is a vector of changes in bank-related variables such as size, liquidity and an index of competition in the Indonesian banking system. The measure of these variables is detailed in Table 1. In all cases, the right-hand side variables are included at a lag (t – 1) to mitigate endogeneity concerns. In addition, in all cases, the coefficients of all the right-hand side variables have subscripts j to denote that these parameters are allowed to differ across banks. This accounts for observed heterogeneity which marks as one central feature of our empirical set-up.

Furthermore, the above equation yields four crucial information regarding the relationship between the monetary policy rate and the lending rates set by Indonesian banks, which then accords the advantage of the use of the error-correction framework. First, the immediate effect of bank lending rates in Indonesia to a change in the monetary policy rate is given by the coefficient α_j. Given that we are conducting the estimations using monthly data, the coefficient gives the immediate effect in the same month. Second, the coefficient γ_j assesses how fast an Indonesian bank adjusts its lending rate when its level is not in sync with its equilibrium relationship with the monetary policy rate. It is the percentage of the error that is corrected in the next period. This coefficient should be negative and significant if a cointegrating relationship exists between bank lending rates and the monetary policy rate. Third, the overall relationship between bank lending rates and the monetary policy rate is given by $\theta_j = -\beta_j/\gamma_j$. If pass-through is complete and banks pass on all changes in the policy rate, this ratio will equal 1. Finally, the average number of months, after the adjustment in the first month, it takes to reach the total pass-through to bank lending rates is given as $(\theta_j - \alpha_j)/(-\gamma_j)$.

As we are interested in the effect of non-core liabilities of Indonesian banks on the pass-through of the monetary policy rate to bank lending rates, we extend equation (1) by including interactions of the non-core liabilities with changes in the monetary policy rate and with the levels of the monetary policy rate and bank lending rates as follows:

$$\Delta brate_{it} = \alpha_j \Delta plrate_{t-1} + \alpha_j^* \Delta plrate_{t-1} \times ncore_{i,t-1} + \gamma_j bratei_{,t-1} - \gamma_j^* brate_{i,t-1} \times ncore_{i,t-1} - \beta_j plrate_{t-1} + \beta_j^* plrate_{t-1} \times ncore_{i,t-1} + \pi_j \Delta X_{t-1} + \psi_j \Delta Z_{i,t-1} + \varepsilon_{it} \qquad (2)$$

In this equation, ncore is the ratio of non-core liabilities to total liabilities of Indonesian banks. Similar to the other variables, ncore is included at a lag (t – 1) to mitigate endogeneity concerns. Following Gambacorta (2008), ncore is normalized with respect to the average across all banks, in each period of time, so that the coefficients of α_j*, γ_j*, and β_j* are directly interpretable as average effects. The effect of non-core liabilities of Indonesian banks on the pass-through of the monetary policy rate to bank lending rates can now be expressed as:

Overall pass through:

$$\theta_j^* = -\frac{\beta_j + \beta_j^* \times \overline{ncore}_{i,t-1}}{\gamma_j + \gamma_j^* \times \overline{ncore}_{i,t-1}} \tag{2a}$$

Immediate pass through:

$$\alpha_j + \alpha_j^* \times \overline{ncore}_{i,t-1} \tag{2b}$$

Adjustment:

$$\gamma_j + \gamma_j^* \times \overline{ncore}_{i,t-1} \tag{2c}$$

where $\overline{ncore}_{i,t-1}$ is the mean of the non-core liabilities of Indonesian banks. Finally, similar to equation (1), in equation (2) we also account for observed heterogeneity by allowing the coefficients of all the right-hand side variables to differ across banks (denoted by the subscript j). There is one more crucial econometric issue, however, that we must take into account in our empirical set-up, and this concerns the issue of the dependence of the unobservables (ε_{it}) across our sample of Indonesian banks. Accounting for what is known as cross-sectional dependence requires a simple augmentation of our error correction model in order to eventually identify all our parameters of interest. One can resort to the common correlated effects (CCE) estimator of Pesaran (2006), which serves as an improvement to the earlier standard Mean Group (MG) estimator of Pesaran and Smith (1995). The CCE estimator employs cross-section averages of all the variables in the model to capture unobservables as well as omitted elements of the cointegration relationship (Eberhardt and Presbitero, 2015). Due to the dynamic setup with the presence of a lagged dependent variable in equation (3), in addition to the cross-section averages of all variables in the model, we follow the suggestion of Chudik and Pesaran (2015) of including further lags of cross-section averages of the changes in the variables. Our final estimation equation is as follows:

$$\begin{aligned}\Delta brate_{it} &= \alpha_j \Delta plrate_{t-1} + \alpha_j^* \Delta plrate_{t-1} \times ncore_{i,t-1} + \gamma_j bratei_{,t-1} \\ &- \gamma_j^* brate_{i,t-1} \times ncore_{i,t-1} - \beta_j plrate_{t-1} + \beta_j^* plrate_{t-1} \times ncore_{i,t-1} + \pi_j \Delta X_{t-1} + \\ &\psi_j \Delta Z_{i,t-1} + \alpha_{j1} \overline{\Delta plrate}_{t-1} + \alpha_{j2} \overline{\Delta plrate}_{t-1} \times \overline{ncore}_{t-1} + \gamma_{j1} \overline{brate}_{t-1} + \\ &\gamma_{j2} \overline{brate}_{t-1} \times \overline{ncore}_{t-1} + \delta_j \overline{\Delta brate}_t + \phi_{j1} \overline{\Delta X}_{t-1} + \psi_{j1} \overline{\Delta Z}_{t-1} + \\ &\delta_{j1} \left(\overline{\Delta brate}_t\right)_{t-p} + \alpha_{j3} (\overline{\Delta plrate}_{t-1})_{t-p} + \\ &\alpha_{j4} (\overline{\Delta plrate}_{t-1} \times \overline{ncore}_{t-1})_{t-p} + \pi_{j2} (\overline{\Delta X}_{t-1})_{t-p} \\ &+ \psi_{j2} (\overline{\Delta Z}_{t-1})_{t-p} + \varepsilon_{it} \qquad (3)\end{aligned}$$

where p = 2 and 3 lags. Bars on top of a variable denote a cross-section average of the variable. Equation (3) represents the Chudik and Pesaran (2015) dynamic CCE Mean Group estimator. Finally, the inclusion of the cross-section averages as well as the lags of the macroeconomic (ΔX) and bank-related (ΔX) control variables in equation (3) may help identify the unobserved common factors following Pesaran, Smith and Yamagata (2013).

IV. Data and Empirical Results

4.1 Data

The dataset includes a balance panel of 15 banks of which 6 banks are domestic banks and the rest are foreign banks that operate branches or subsidiaries in Indonesia. Our empirical investigation uses monthly data from October 2011 to July 2016. This period encompasses several episodes of Quantitative Easing (QE) policies undertaken by major advanced economies, such as the US, UK, Eurozone and Japan, which then saw a number of emerging economies, including Indonesia, experience a significant increase in capital inflows. Furthermore, the end of the sample period is immediately prior to Bank Indonesia's replacing of its policy interest rate from the BI rate to the 7-day reserve repo rate.

Since we are interested in the effect of non-core liabilities on the interest rate transmission of the monetary policy rate to bank lending rates, we focus on the individual bank lending rate data.[2] The monetary policy rate data for Indonesia was obtained from the CEIC. Data for the non-core liabilities, measured as the difference between the total liabilities and the total savings, time and demand deposits of individual banks, were also obtained from the CEIC. Following previous studies, bank-related and macroeconomic variables are also considered in this study. All the data used to construct the bank-related variables, such as size, liquidity and an index of competition in the Indonesian banking system, were obtained from the CEIC. The measure of these variables is detailed in Table 1. Data for the macroeconomic variables on output (proxied by the industrial production) and inflation were obtained from the International Monetary Fund-International Financial Statistics (IMF-IFS). The VIX data was

[2] The lending rates are sourced from the Bloomberg database of the individual banks.

obtained from the Chicago Board Options Exchange (CBOE) website[3], while the CDS data for Indonesia was obtained from the Bloomberg database.

4.2 Empirical Results

The interest rate pass-through calculated from the estimations are summarised in Tables 2 and 3.[4] Table 2 summarises our baseline regression results. The results reported in this table come from the estimations of equation (3) above, except that the interactions of the non-core liabilities with changes in the monetary policy rate and with the levels of the monetary policy rate and bank lending rates are excluded from the estimations. Table 3, on the other hand, summarises our main regression results, which come from the estimations of equation (3). Columns (1) to (3) of both tables report the results of the interest rate pass-through calculations for which only the bank-related variables are included in the specification. Columns (4) to (6) of both tables summarise the results where only the macroeconomic control variables are included, while the last three columns of both tables report the results of the interest rate pass-through calculations where all control variables are included. Finally, each column of results in both tables refers to a particular specification of the dynamic CCE Mean Group estimator of Chudik and Pesaran (2015) where the number of additional lags of cross-section averages of the changes in variables are indicated in the heading of each column of both tables.

We first analyse the estimates of the interest rate pass-through from our baseline regression presented in Table 2. Starting with the results for overall pass-through, we can see that all the estimates are highly significant, regardless of which control variables are included in the specification. For instance, the estimate reported in column 1 of Table 2 suggests that if the policy rate in

[3] http://www.cboe.com/products/vix-index-volatility/vix-options-and-futures
[4] Full estimation results are available on request.

Indonesia is cut by 100 basis points, loan rates offered by commercial banks in Indonesia would decrease by 46 basis points.[5] The estimates of the overall pass-through range from 0.37 to 0.66. With respect to the estimates of the immediate pass-through, we can see that majority of the estimates are highly significant. For example, the immediate pass-through estimate reported in column 2 of Table 2, suggests that if the policy rate in Indonesia falls by 100 basis points, loan rates offered by banks in Indonesia would drop by 24 basis points in the same month. Excluding the insignificant estimates of the immediate pass-through, the estimates range from 0.20 to 0.34. Finally, the estimates of the speed of adjustment for the baseline regressions in Table 2 are all highly significant. For instance, when there is a disequilibrium in the relationship between the policy and bank lending rates, 46 percent of this disequilibrium will be corrected in the next period (column 1 of Table 2). The estimates of the speed of adjustment range from -0.55 to -0.45. At this juncture, it must be emphasised, as seen from Table 2, that the coefficients of the speed of adjustment are all negative and highly significant at different specifications, showing that a cointegrating relationship exists between bank lending rates and the monetary policy rate.

Earlier, it is shown that we can obtain the average number of months, after the adjustment in the first month, it takes to reach the total pass-through to bank lending rates, viz., the overall pass-through - immediate pass through/(-speed of adjustment). From these set of baseline estimates in Table 2, we can see that the duration of transmission to reach total pass-through from the monetary policy rate to bank lending rates is between 0.31 to 0.83 month.[6] By including the adjustment that occurs in the first month, it is between 1.31 to 1.83 months.

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[5] It is noted that the standard errors for overall pass-through are calculated using the delta method, which involves an approximation of the estimate using its derivative with respect to each coefficient and the variance-covariance matrix of the model.

[6] We did not obtain the duration in transmission when one of the interest rate pass-through coefficients is insignificant. This is the case with columns (1) and (7) in Table 2.

Finally, the diagnostic tests of the baseline regressions highlight that the use of cross-section averages eliminates residual cross-section dependence according to formal Cross-section Dependence (CD) tests following Pesaran (2004).[7]

The main regression results in Table 3 includes the interactions of the non-core liabilities with changes in the monetary policy rate and with the levels of the monetary policy rate and bank lending rates. The effect of including non-core liabilities in the specification, relative to the baseline regression, is that of a longer duration for the monetary policy rate to transmit to bank lending rates. In what follows, we then distil the information from our respective pass-through coefficients in Table 3 for how this finding is derived. First, while all highly significant regardless of controls included in the specification, the estimates of the overall pass-through in the main regressions are higher than those reported in the baseline regressions. The estimates range from 0.86 to slightly higher than 1 at 1.13. Second, similar to our baseline regression results, the majority of the estimates of the immediate pass-through are highly significant and almost all[8] of the estimates are slightly higher than those obtained from the baseline regressions. Again, excluding the insignificant estimates, the immediate pass-through estimates reported in Table 3 range from 0.15 to 0.41.

Finally, in terms of the speed of adjustment, while the majority of the estimates are significant, most of the estimates exhibit more sluggishness (this is the case when the macroeconomic control variables or all the control variables are included in the specification). The estimates reported in Table 3 range from -0.54 to -0.28. It should be re-emphasised that the coefficients of the speed of adjustment are all negative and the majority are highly significant at different specifications in Table 3, suggesting a cointegrating relationship between bank lending rates and the monetary policy rate.

[7] The exceptions to this result are columns 3 and 6 of Table 2.
[8] The lone exception is column (4) in Table 3 compared to the same column in Table 2.

The above analysis indicate that including non-core liabilities in the specification has the effect, relative to the baseline regression, of stronger overall and immediate pass-through, albeit with a more sluggish adjustment on the correction of disequilibrium in the next period. The combination of these results implies that after the adjustment in the first month, it takes longer for the policy rate to transmit to bank lending rates.[9] In other words, non-core liabilities have an effect of delaying the changes in the monetary policy rate to bank lending rates. According to Table 3, this is in the range of between 1.1 to 2.6 months, on average.[10] Thus, when the adjustment that occurs in the first month is included, the transmission duration is between 2.1 to 3.6 months, markedly longer than the 1.3 to 1.8 months reported in Table 2. Therefore, according to our estimates, the reliance on alternative or non-core sources to fund bank balance sheets delay the monetary policy transmission to bank lending rates by as much as two times. Finally, the diagnostic tests of the main regressions also indicate that the use of cross-section averages eliminates residual cross-section dependence according to Pesaran's (2004) Cross-section Dependence (CD) tests.

V. Policy Implications and Conclusion

In this section, we provide a policy snapshot and context for our main results. Bank Indonesia expected a benign inflation environment in 2016. As an inflation targeting central bank, it took aggressive monetary policy easing measures by cutting its policy rate four times during the first six months of 2016 to address what it believed a widening of the negative output gap. The observed

[9] When recalling again the formulae to obtain the average number of months to reach the overall pass-through, i.e., overall pass through – immediate pass through/(-speed of adjustment), the results make reasonable sense. The combination of a higher gap in the numerator and a smaller denominator in the formulae leads to, on average, a longer duration of the transmission of monetary policy rates to bank lending rates.

[10] Just as in the baseline regression results presented in Table 2, we did not obtain the duration in transmission when one of the interest rate pass through coefficients are insignificant. This is the case with columns (1) and (7) in Table 3.

pass-through of the policy rate cuts, however, was weak. Following the first 25 basis points cut in January 2016 of the BI rate, the average lending rate of commercial banks dropped by 15 basis points by end of March 2016 (see Appendix Figure 1). By end of July 2016, the BI rate had fallen by 100 basis points from December 2015, while the average lending rate of commercial banks had only dropped by less than 50 basis points. Given that it is reasonable to expect that bank lending rates should fall by the same amount as the policy rate, such instance of a divergence between bank lending rates and the policy rate is a major policy issue for any central bank, more so for an inflation targeting economy like Indonesia.

The empirical studies produced in the past two decades have emphasised the important role that macroeconomic factors and bank-related characteristics can play in the interest rate channel of monetary policy transmission. In the specific context of Indonesia, for instance, Siregar, et al., (2016) claim that the illiquid interbank market in Indonesia was partly responsible for explaining the weaker monetary policy transmission in Indonesia when compared to its neighbours, such as Malaysia and Thailand during the post-2007 global financial crisis.

Depending on the available data, controlling for some of these macroeconomic factors and bank-related characteristics, our study contributes further to the understanding of the interest rate channel of monetary policy transmission by examining the role of alternative sources of bank funding, i.e., non-deposit liabilities, to the overall monetary policy transmission mechanism in Indonesia. As we saw earlier, the non-core funding of the Indonesian banking system rose in tandem with global liquidity. Our empirical estimations show that the increasing reliance of the Indonesian banking system on non-core funding, which are mainly sourced from outside of the Indonesian banking system, has led to a delay in the transmission of the monetary policy rate in Indonesia. This result provides some explanation to the weakness in the transmission of the policy rate cut undertaken in 2016. On a broader level, our finding then provides a justification to the decision by Bank Indonesia to replace the BI rate with the 7-day reserve repo rate as its monetary policy instrument in August 2016, with the expectation that the repo-rate would be more able to efficiently influence commercial bank interest rates, particularly the lending rate.

Because of this delay, it then means that the central bank requires larger changes in its monetary policy instruments to achieve the equivalent preferred change in aggregate demand. But apart from this important policy implication in our results, our findings also have important implications for the usage of other policy instruments. Given the continuing integration of the country's financial system into the international capital market, external developments and factors will increasingly drive domestic interest rates. Due to such circumstances, macroprudential and capital flow management (CFM) measures must always be ready to be deployed to achieve the desired macroeconomic stabilisation of the economy. For instance, to help manage strong demand in the domestic bond market and the accompanying risks, Indonesia imposed a minimum holding period on bond acquisition by all investors, including foreign investors in July 2010. Further, a cap of 30% of capital on the daily balance of commercial banks' external debt was also introduced in January 2011 to limit domestic banks' exposures to external borrowing.

This approach of combining conventional monetary policy with macroprudential policy and CFM measures in Indonesia is often considered a form of a policy mix under a flexible inflation targeting regime. To achieve the desired macroeconomic outcomes in Indonesia in the current environment of low global interest rate and a benign inflationary pressure, CFM and macroprudential policies must continue to support and complement conventional interest rate policy adjustments in Indonesia.

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Table 1
Definition of Variables

brate	Bank interest rates on loans
plrate	Monetary policy rate
X (Macro variables)	VIX volatility index Industrial production Inflation Credit default swap (CDS) rate
Z (Bank-related variables)	Size (ratio of total assets of a bank to total assets of the banking system) Liquidity (ratio of holdings of securities, cash and loans of a bank to total bank assets) Index of Competition – Herfindahl-Hirschman Index $(\sum_{i=1}^{n} \frac{Loan\ operations_{it}}{Total\ Loan\ Operations_{it}})$

Table 2
Baseline regression results

	CMG	CMG 2nd lag	CMG 3rd lag	CMG	CMG 2nd lag	CMG 3rd lag	CMG	CMG 2nd lag	CMG 3rd lag
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Overall pass-through (ϕ)	0.458	0.597	0.660	0.369	0.427	0.640	0.432	0.514	0.630
	[0.154]**	[0.228]**	[0.253]**	[0.177]**	[0.214]**	[0.219]**	[0.189]**	[0.249]**	[0.273]**
Immediate pass-through (τ)	0.175	0.241	0.248	0.210	0.200	0.306	0.120	0.248	0.338
	[0.151]	[0.120]**	[0.099]**	[0.106]**	[0.078]**	[0.109]***	[0.114]	[0.092]**	[0.143]**
Speed of adjustment (ψ)	-0.460	-0.448	-0.498	-0.520	-0.519	-0.546	-0.492	-0.479	-0.512
	[0.088]***	[0.088]***	[0.083]***	[0.087]***	[0.080]***	[0.070]***	[0.084]***	[0.085]***	[0.070]***
Bank-related variables	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Macroeconomic variables	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Average number of months		0.79	0.83	0.31	0.44	0.61		0.56	0.57
CD test	0.47	0.22	0.01	0.62	0.18	0.03	0.88	0.71	0.11
Observations	784	770	756	840	825	810	784	770	756

Notes: (i) Baseline regression results refers to the estimation of equation (3) in the text, which excludes the interactions of the non-core liabilities with changes in the monetary policy rate and with the levels of the monetary policy rate and bank lending rates. The estimation is based on an error correction model with the change in average bank lending rates as dependent variable;

(ii) The robust mean of coefficients across banks are reported;

(iii) The CMG estimator with the number of lags indicated is implemented using additional lags of the cross-section averages (CSAs);

(iv) average number of months is computed as (ϕ – τ)/(-ψ);

(v) CD test reports the Pesaran (2004) test, which under the null of cross-section independence is distributed standard normal.

** Significant at 5% level. *** Significant at 1% level.

Source: Authors' calculations.

Table 3
Main regression results

	CMG	CMG 2nd lag	CMG 3rd lag	CMG	CMG 2nd lag	CMG 3rd lag	CMG	CMG 2nd lag	CMG 3rd lag
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Overall pass-through (ϕ)	1.077	0.920	0.944	0.855	0.879	0.949	1.131	0.982	1.02
	[0.441]**	[0.378]**	[0.228]***	[0.360]**	[0.244]***	[0.280]***	[0.404]**	[0.276]***	[0.254]***
Immediate pass-through (τ)	0.086	0.331	0.347	0.151	0.290	0.326	0.080	0.276	0.405
	[0.094]	[0.119]**	[0.137]**	[0.056]***	[0.093]***	[0.093]***	[0.079]	[0.118]**	[0.156]**
Speed of adjustment (ψ)	-0.262	-0.491	-0.544	-0.275	-0.441	-0.431	-0.228	-0.356	-0.452
	[0.147]	[0.216]**	[0.161]**	[0.129]**	[0.177]**	[0.125]***	[0.177]	[0.161]**	[0.195]**
Bank-related variables	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Macroeconomic variables	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Average number of months		1.20	1.10	2.56	1.34	1.45		1.98	1.36
CD test	0.21	0.60	0.35	0.45	0.61	0.73	0.16	0.29	0.59
Observations	770	756	742	825	810	795	784	784	770

Notes: (i) Main regression results refers to the estimation of equation (3) in the text and is based on an error correction model with the change in average bank lending rates as dependent variable;

(ii) The robust mean of coefficients across banks are reported;

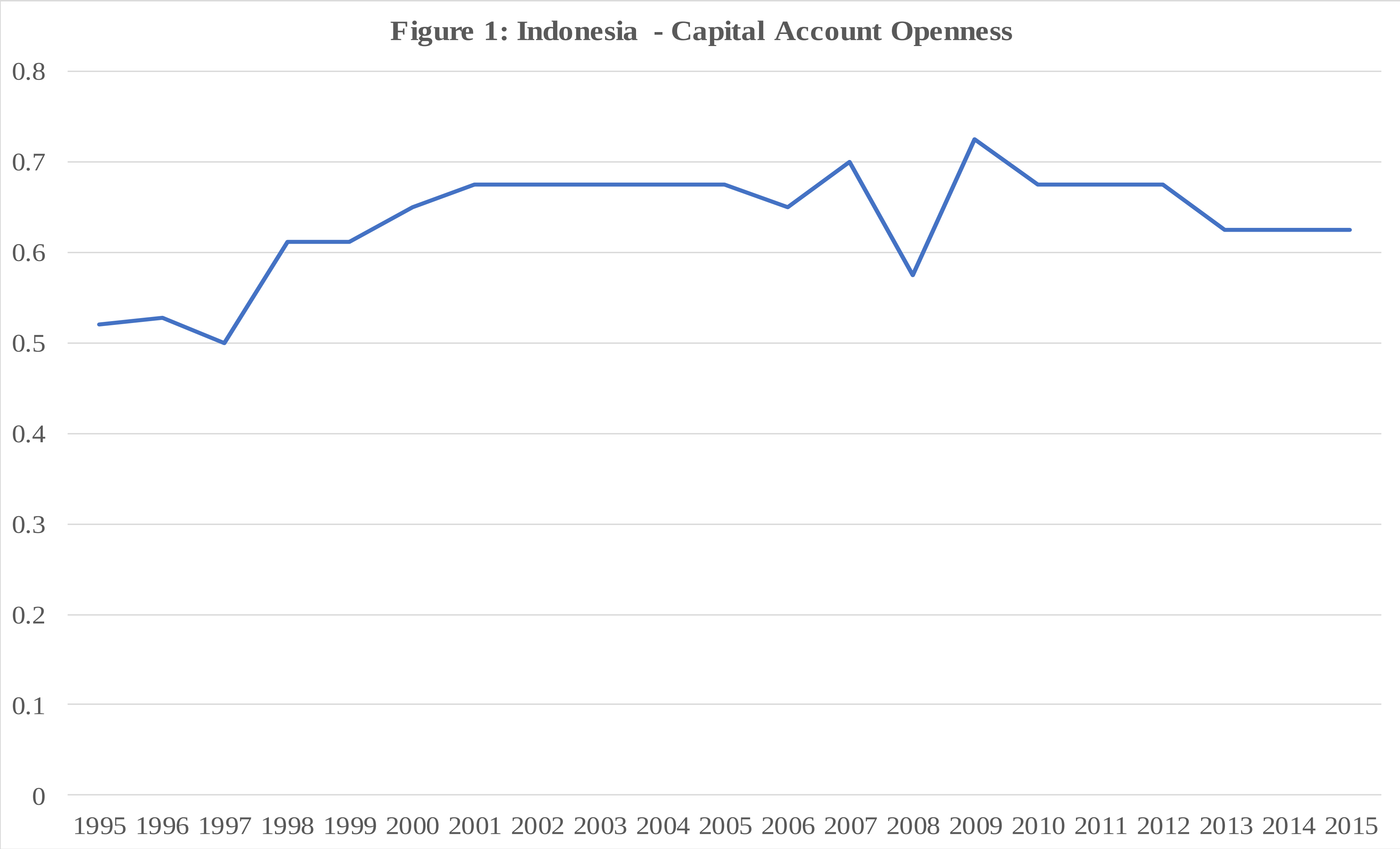
(iii) The CMG estimator with the number of lags indicated is implemented using additional lags of the cross-section averages (CSAs);

(iv) average number of months is computed as $(\phi - \tau)/(-\psi)$;

(v) CD test reports the Pesaran (2004) test, which under the null of cross-section independence is distributed standard normal.

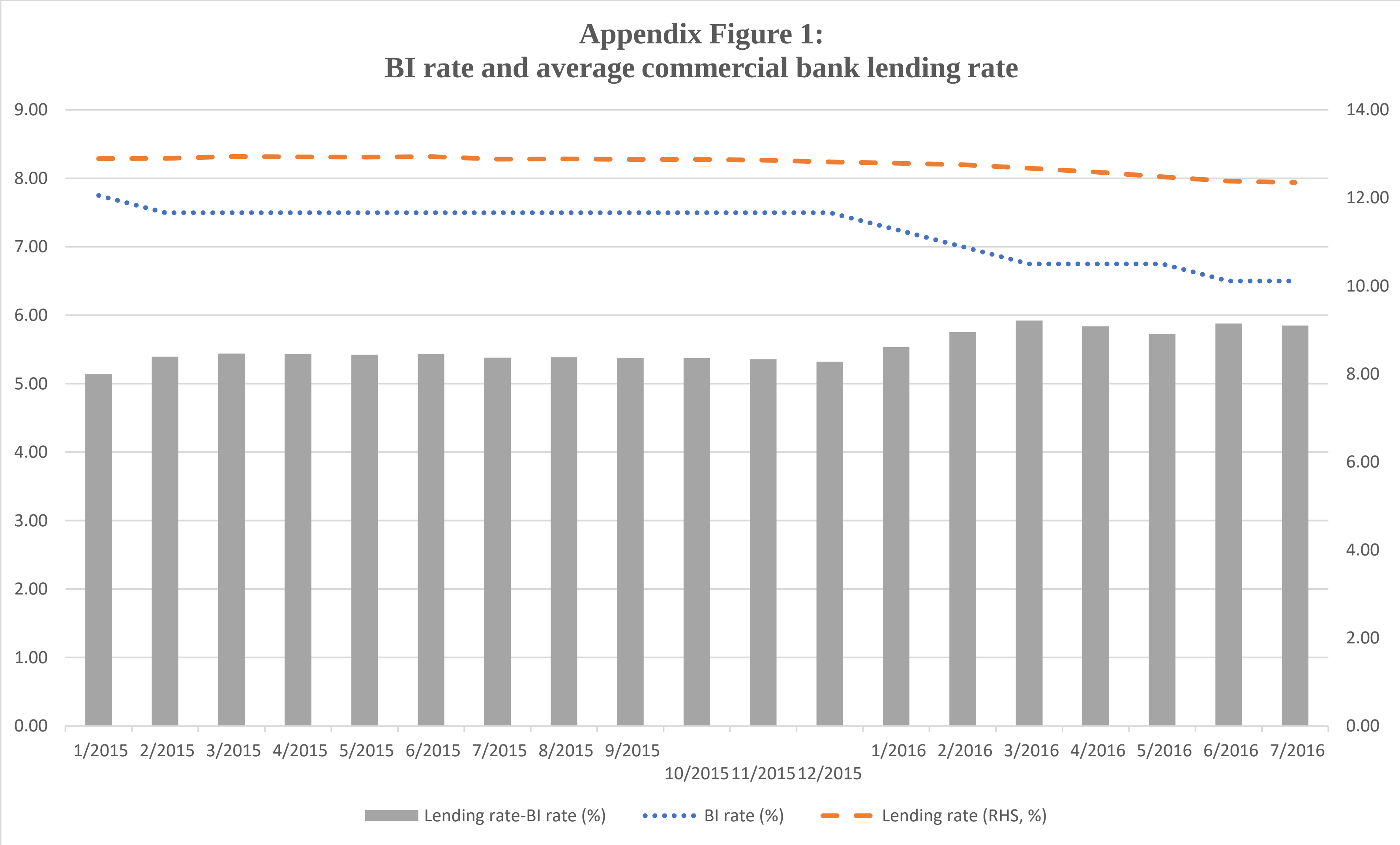
** Significant at 5% level. *** Significant at 1% level.

Source: Authors' calculations.



Source: Authors' calculations. Source of basic data: Fernandez et al., (2016)

Source: Authors' calculations. Source of basic data: BIS and CEIC.



Source: Authors' calculations. Source of basic data: Bloomberg.