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Shadow Banking Credit Intermediation: Determinants of Default Risks in Securitization and Collateralization

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The growth in shadow banking system over the past few years is acknowledged as the key risk to Malaysia's financial stability. This is because that it is associated with growth in the household debts extended by the shadow banks. In line with initiatives by the Bank Negara Malaysia (the Central Bank of Malaysia) to enhance surveillance on the activities of the shadow banks in Malaysia, this study attempts to examine the determinants of default risks of shadow banks restricting to focus on their two main activities, securitization and collateralization. The results provide empirical evidences that future methodology to examine the systemic risks in the shadow banking system may need to account for additional explanatory variables that measure collateralized assets that are being intermediated.

Keywords: household debts, shadow banks, securitization, collateralization

Introduction

The growth in shadow banking system is partly attributed to filling the gap left by traditional banks whose balance sheets lately are increasingly being scrutinized by regulators. As such, the traditional banks have deleveraged their balance sheets, or when they become temporarily impaired, as Ghosh, Gonzalez del Mazo, and Otker-Robe (2012) of the World Bank wrote, non-banks have filled in their shoes. The latter lends to borrowers who could not obtain borrowing from the traditional regulated banks.

The Central Bank of Malaysia (Bank Negara Malaysia) defines the shadow banking system as a system of credit intermediation involving entities and activities outside its regulatory parameter. This definition encompasses non-bank financial institutions, leasing companies, factoring companies, national mortgage corporations, building societies, and major non-bank credit providers. There seems to be a niche spot for them in the financial system. Thus, their importance in credit intermediation has grown over the past few years. It is acknowledged that the key risk to the Malaysia's financial stability is associated with the growth in household debts extended by the shadow banks. The Financial Stability and Payment Systems Report 2013 of the Bank Negara Malaysia (2013a) reported, for the first time, that prudential measures are extended to include the activities of the shadow banks. This is because that they provide personal financing with a share of 60% (57% in 2012), accounting for the largest total personal financing to households. Table 1 below shows the figures in the household sector: new approvals of personal financing.

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Table 1

Household Sector: New Approvals of Personal Financing

Credit provider	Number of borrowers		Amount (RM million)	
	1st half of 2013	2nd half of 2013	1st half of 2013	2nd half of 2013
Banks	304,967	270,024	9,303	7,652
Non-bank financial institutions	286,215	213,318	20,422	6,508

Note. Source: Bank Negara Malaysia (2013a, p. 21).

The figures in Table 1 show the current size of the credit intermediation of the shadow banks as a percentage of total assets in the financial system is estimated at over-half of the total household debts. In view of their significant role in complimenting the role of traditional banks, the Bank Negara Malaysia is currently looking to gauge and monitor the growth of the shadow banking activities and monitor the risks they pose to the financial industry as a whole.

In addition, in the household balance sheet, the composition of the household debts grew annually by 12.75% from 57% of the gross domestic product (GDP) in 2002 to 86.85% of the GDP at the end of 2013 (Bank Negara Malaysia, 2013b). Further, within the figures in 2013, close to 45% are loans for properties, an increase from 30% in 2002. Previously, in 2011 and 2012, the loans for properties of the household debts were 40% and 41%, respectively. Figure 1 below shows the household debts as a percentage of the GDP.

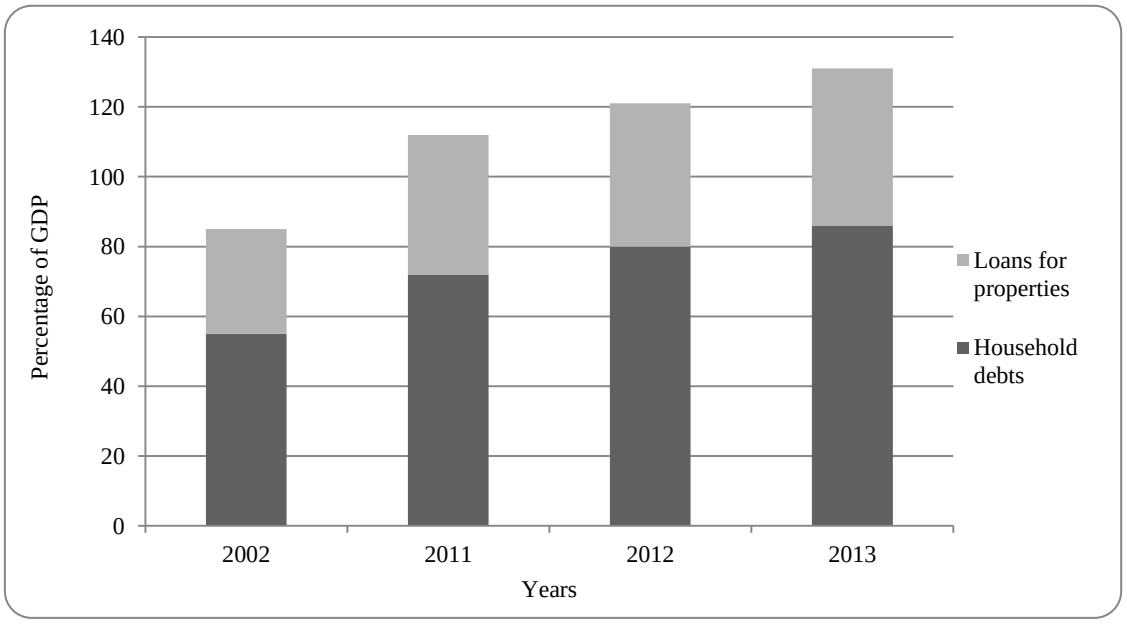

Figure 1. Household debts as a percentage of the GDP. Source: Bank Negara Malaysia (2013b, p. 70).

There is a need to examine the determinants of default risks in securitization and collateralization activities of the shadow banks. This is in line with the initiatives by the Bank Negara Malaysia to enhance surveillance on their activities, as their main customers are mainly from middle- and lower-income groups. Generally, they are at higher risks of defaulting on their loans. It prevents the household balance sheets from becoming a source of systemic risks. In this regard, the Bank Negara Malaysia is currently working with the Financial Stability Board (FSB) Regional Consultative Group for Asia and is expected to come out with a report in October 2014 on profile, issues, challenges, and risks of the shadow banks in Malaysia.

This study attempts to examine the determinants of default risks of the shadow banks restricting to focus on their two main activities: securitization and collateralization. This study is structured as follows. The next section is the literature review. In Section 3, we present the methodology used in this paper, and Section 4 presents the results and discussion. Finally, Section 5 concludes this study.

Literature Review

The relationship between a well-functioning financial intermediation—the process of channeling savings or funds into productive investment in the economy—has been well documented. Banks played important roles in channeling funds from savers to investors for their investing activities (Rajan & Zingales, 1998; Levine, 1998; 2004). According to Adrian and Ashcraft (2012), the term "shadow banking" was coined by McCulley (2007) at the Federal Reserve Economic Symposium in 2007. However, Claessens, Pozsar, Ratnovski, and Singh (2012) observed that Rajan (2005) had discussed some of the vulnerabilities of what constitute the term, without actually using it, at a conference in Kansas City two years earlier. The first articles on shadow banking system were published in 2008 by Pozsar (2008) and Adrian and Shin (2009).

In a broad definition, "shadow banks" intertwine and interconnect with core regulated banks in intermediating funds among savers, investors, and borrowers. Instead of trading claims such as bonds and equity (typical activities), shadow banks create and distribute financial assets. Adrian and Ashcraft (2012) hold the view that in the shadow banking system, "the intermediation chain always starts with origination and ends with wholesale funding, and each shadow bank appears only once in the process" (p. 16). Further, the authors added that shadow banks are without any direct and explicit access to any financial backstops. And, Zabala and Josse (2014) identified that the key players in the shadow banking system are investment banks. In a study of Claessens et al. (2012), the authors categorized activities of shadow banks to be outside a regulated banking system. Even though their activities are outside a regulated banking system, they pose similar financial risks just as the traditional banks. Moreover, Ghosh et al. (2012) explained that significance activities of shadow banks in emerging economies may pose greater systemic risks. The activities of shadow banks are a source of systemic risks to a banking system at large because in the intermediation process, they ignore aggregate risks arising from credit, maturity, and liquidity transformation. Because their activities intertwine and interconnect with the operations of a regulated and core banking system, they create a source of systemic risks for the financial system as a whole. After all, the global financial crisis in 2008 originates in the shadow banking system. A key difference between bank-based intermediation and securitization in a regulated banking system versus that of the shadow banking is that banks transform risks in a single balance sheet. In the shadow banking system, the risks are supported by a chain of multiple balance sheets and through various sources of capital and puts.

The two main intermediation functions in the shadow banking system are securitization and collateral intermediation (CI). The first function is securitization, when the shadow banks originate, re-pack, and re-sell pools of credit; and henceforth, in the process they transfer credit, maturity, and liquidity risks. But to hold securitized debts rather than to transfer risks to the rest of the financial system would be to negate the benefits of securitization, as Shin's (2009) study suggests. Moreover, Watkins (2011) expanded that financial innovation technique of "originate to distribute" in the shadow banking system will remain a

critically important part of the financial system. This process increases the velocity of money circulating through the economy by creating money-like instruments. The process increases productivity, Watkins (2011) defended.

The second function in the shadow banking system is CI, when the shadow banks intensively re-use scare collaterals to support as large as possible, volume or chains of transactions. The stock of collateral and its velocity, that is, the intensity that it is used, both lead to a source of systemic risks in the financial system. Ghosh et al. (2012) explained that this practice amplifies pro-cyclicality in the financial system. The authors explained that in securities financing transactions, it is the assets of shadow banks rather than deposit sources that are usually used as collaterals to raise more funds, which can then be used to buy more assets. In turn, they can be used as collaterals to raise additional funds. The process amplifies pro-cyclicality of the financial system, as a consequence.

Whilst previous studies provide answers to inadequate assessment of tail risks, Adrian and Ashcraft (2012) observed that because of information opacity, no study has attempted to measure the impact from the two activities in the shadow banking system, securitization and collateralization, on quality of assets of shadow banks.

Methodology

The methodology to measure the systemic risks in the shadow banking activities posed to the financial system as a whole has not yet been well understood. There is no specific systemic risk determinant that may explain the interconnectedness of the shadow banking activities. The methodology is still a work in progress. Further, because the study on shadow banks is yet to catch up fully with the issues and is further hindered by data challenges (because unregulated shadow banks are not subject to statistical reporting), this study is restricted to focus on measuring the default risks of the shadow banks from the two main activities, i.e., deposits of securitized debts (DSD) and CI. This is the same approach to measure the default risks in the shadow banking activities as proposed in a recent report published by the FSB on measurement of assets held by non-banks and shadow banking activities. In the report, "the Global Shadow Banking Monitoring Report 2013" dated November 14, 2013, the FSB narrows down the broad shadow banking estimates by filtering out the non-banks activities that have no direct relation to credit intermediation. These activities are related to self-securitization; henceforth, the securities remain on the bank's balance sheet, with no third party involvement in credit transformation or activities that have already been prudentially consolidated into a banking group for an existing prudential regulatory purpose.

Theoretical Framework

Because of this categorization, the activities to be included in the measurement of the default risks in the shadow banking activities are confined in this study to: "deposits and placements at other financial institutions", "investment securities", and "derivative financial instruments". This category excludes other activities such as, "loans, advances, and financing", "property assets", "plant, property, and equipments", "investment in subsidiaries", and "investment in associates". The two approaches of the FSB are shown in Figure 2.

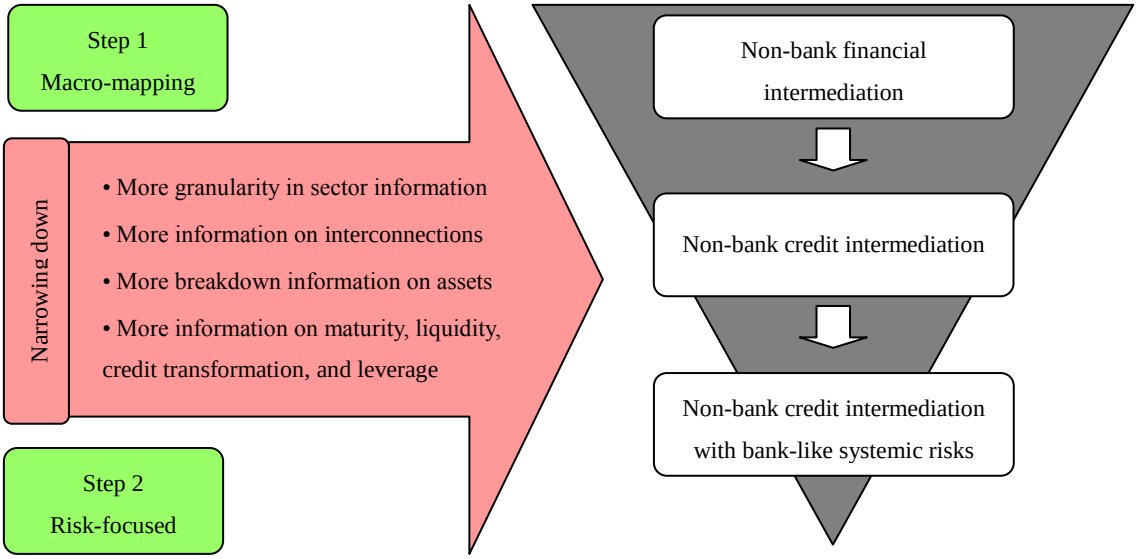

Figure 2. The two approaches of the FSB to mapping default risks in shadow banking. Source: FSB (2013, p. 6).

Based on the two approaches to measure the default risks in the shadow banking system as proposed in the report, a theoretical framework to measure the default risks of the shadow banks is as follows:

$$NPL_{it} = DSD_{it} + CI_{it}$$

where:

NPL_{it} (Non-performing loans): Risks of default to shadow bankers from their transformation activities;

DSD_{it} (Deposits of securitized debts): Securitization by unbundling and repacking, creating assets from debt obligations, and in the process transferring risks (credit, maturity, and liquidity). In this category, the main accounts are "deposits and placements at other financial institutions", and "amount due for guarantees" for a guarantee corporation, such as the Credit Guarantee Corporation (CGC) of Malaysia;

CI_{it} (Collateral intermediation): The efficient use of scare collateral to support a large volume of transactions, whose main accounts are "investment securities" and "derivative financial instruments".

The Ordinary Least Squares (OLS) model regression equation is as follows:

$$\log NPL_{it} = \beta_0 + \log \beta_1 DSD_{it} + \log \beta_2 CI_{it} + \varepsilon_{it}$$

Data

This study tested data on all shadow banks in Malaysia. The list of the shadow banks is shown in Table 2. The banks are analyzed until 2013 and their figures are reported in RM'000. There are three categories of the banks: (1) development financial institutions; (2) other development financial institutions; and (3) non-bank financial providers.

Whilst in other countries, the activities of their shadow banks may be either lightly regulated or not regulated at all, Mohd Farid (2013) of the Bank Negara defended that most of the shadow banks in Malaysia are subjected to some form of oversight by various authorities. Further, the author revealed that although it is beneficial for the authorities to monitor the shadow banking industry from a macro prudential perspective, it may not be necessarily helpful if the authorities are unable to focus on specific activities or components in the shadow banking system that are likely to emit and transmit the systemic risks to the financial system.

Table 2

Shadow Banks in Malaysia

Development financial institution	Other development financial institution	Non-bank financial provider
Bank Pembangunan Malaysia Berhad 2008-2012*	MIDF 2010-2012*	Malaysian Building Society Berhad (MBSB) 2002-2013*
SME Bank Berhad 2009-2012*	Corporate Guarantee Corporation Berhad 2005-2012*	RCE Capital Group Berhad 2003-2013*
Export-Import Bank Berhad (EXIM) 2008-2012*	Lembaga Tabung Haji 2011-2012* (excluded from analysis)	AEON Credit Berhad 2010-2013*
Bank Kerjasama Rakyat Malaysia Berhad 2007-2012*	Sabah Development Bank 2009-2012*	Court Mammoth Berhad (excluded from analysis)
Bank Simpanan Nasional Berhad 2005-2012*	Sabah Credit Corporation 2005-2012*	
Agrobank Berhad 2006-2011*	Borneo Development Corporation (Sabah) (excluded from analysis)	
	Borneo Development Corporation (Sarawak) (excluded from analysis)	

Notes. Source: Bank Negara Malaysia. *: The years when figures are available and thus are included in the analysis.

Results and Discussion

The descriptive statistics and the results of regression equations from using Stata are tabulated in Table 3. And the logged descriptive statistics are tabulated in Table 4.

Table 3

Descriptive Statistics

Variable		Mean	Std. dev.	Min.	Max.	Observation
DSD	Overall	421,776.1	741,767.6	0	3,515,000	*N* = 88
	Between		662,004.6	0	2,371,584	*n* = 15
	Within		408,556.1	-807,577.6	2,535,453	*T*-bar = 5.86667
CI	Overall	1,874,129	3,485,194	0	1.80e+07	*N* = 88
	Between		3,070,616	0	1.01e+07	*n* = 15
	Within		1,580,836	-1,995,008	9,746,250	*T*-bar = 5.86667
NPL	Overall	1,036,384	1,519,006	0	5,412,194	*N* = 88
	Between		1,173,141	13	4,418,987	*n* = 15
	Within		426,977.6	-1,450,071	2,029,591	*T*-bar = 5.86667

The above results indicate that NPL varied more between the shadow banks ("between" standard deviation = 1,173,141) than within the shadow banks ("within" standard deviation = 426,977.6).

Further, DSD varied more between the shadow banks ("between" standard deviation = 662,004.6) than within the shadow banks ("within" standard deviation = 408,556.1). The same is for CI where it varied more between the shadow banks ("between" standard deviation = 3,070,616) than within the shadow banks ("within" standard deviation = 1,580,836).

The results show that the two variables seem to be significant to determine the NPL of the shadow banks as the calculated *R*-squared that assesses the goodness of fit is 0.5205 (see Table 5); however, between the two variables, DSD is less significant (its calculated $P > [t] = 0.866$) than CI (see Table 6). In other words, the variable CI is more significant, because the calculated $P > [t] = 0.000$.

The fixed effect: least square dummy variable (LSDV) estimation method with a dummy dropped is shown in Table 7.

Table 4

Logged Descriptive Statistics

Variable		Mean	Std. dev.	Min.	Max.	Observation
log*DSD*	Overall	11.71714	2.04215	7.072422	15.07255	*N* = 73
	Between		1.668733	8.716264	14.66066	*n* = 15
	Within		1.329115	8.252453	15.2384	*T*-bar = 5.86667
log*CI*	Overall	11.89324	2.998396	6.481577	16.7069	*N* = 79
	Between		2.781722	7.75698	16.04866	*n* = 14
	Within		1.210706	7.6533	16.32916	*T*-bar = 5.64286
log*NPL*	Overall	12.01723	2.868567	2.484907	15.50416	*N* = 87
	Between		3.259571	2.561982	15.27097	*n* = 15
	Within		0.8769774	8.104577	13.88296	*T*-bar = 5.8

Table 5

Pooled OLS Estimators for the NPL Equation

Source	Sum of squares	Degree of freedom	Mean square
Model	196.629795	2	98.3148977
Residual	181.139325	62	2.92160202
Total	377.76912	64	5.90264251
Number of observations = 65			
F (2, 6) = 33.65			
Prob. > *F* = 0.0000			
R-squared = 0.5205			
Adjusted *R*-squared = 0.5050			
Root mean square error = 1.7093			

Table 6

Fixed Effects: LSDV

Variable	Coef.	Std. error	*t*	*P* > [*t*]	[95% conf. interval]	
log*NPL*	5.115712	1.175091	4.35	0.000	2.772647	7.458778
log*DSD*	0.0211497	0.1249193	0.17	0.866	-0.2285603	0.2708597
log*CI*	0.5795617	0.0880145	6.58	0.000	0.4036232	0.7555001
_cons	4.776332	1.231005	3.88	0.000	2.315587	7.237077

The results compute each of the shadow banks different from the other shadow banks. The results show that deviation of shadow bank No. 3 (EXIM Bank) from shadow bank No. 1 (Bank Pembangunan Malaysia Berhad) is -0.838153 (see Table 7). Further, deviation of shadow bank No. 14 (MBSB) is 1.02549 from Bank Pembangunan Malaysia Berhad, shadow bank No. 1.

Meantime, the fixed effects (within) estimation uses variations within each individual shadow bank. The parameter estimates of regressors of the "within" estimation are identical to those in the LSDV in Table 7, thus, the coefficient of log*DSD* is also equal to 0.0838638, and the coefficient of log*CI* is also equal to 0.000223 (see Table 8).

The results of the fixed effects (within) estimation are listed in Table 8. The results indicate the fixed effects estimation better explains the differences "between" the shadow banks (*R*-square between = 0.0711) than differences "within" the shadow banks.

Table 7

Fixed Effect: LSDV: Dummies

Source	Sum of squares	Degree of freedom	Mean square
Model	334.489756	14	23.8921254
Residual	43.2793648	50	0.865587296
Total	377.76912	64	5.90264251

Number of observations = 65
F (14, 50) = 27.60
Prob. > *F* = 0.0000
R-squared = 0.8854
Adjusted *R*-squared = 0.8534
Root mean square error = 0.93037

	Coef.	Std. error	*t*	*P* > [*t*]	[95% conf.	interval]
log*NPL*	5.115712	1.175091	4.35	0.000	2.772647	7.458778
log*DSD*	0.0838638	0.1023786	0.82	0.417	-0.1217696	0.2894972
log*CI*	0.000223	0.1816524	0.00	0.999	-0.3646365	0.3650825
2 (SME Bank)	-0.7526825	0.674497	-1.12	0.270	-2.10745	0.6020846
3 (EXIM Bank)	-0.838153	0.7503618	-1.12	0.269	-2.345299	0.6689931
4 (Bank Rakyat)	-1.368613	0.6154143	-0.22	0.825	-1.372957	1.099235
5 (BSN)	-0.8919834	0.6252837	-1.40	0.166	-2.167988	0.3840214
6 (Agrobank)	-1.487365	0.5967732	-2.49	0.016	-2.686019	-0.2887107
7 (MIDF)	-3.837627	0.9880317	-3.88	0.000	-5.822147	-1.853107
8 (CGC)	-1.62869	0.9401924	-1.73	0.089	-3.5171122	0.2597418
10 (Sabah Development Bank)	-2.325027	0.8699781	-2.67	0.010	-4.072429	-0.5776243
11 (Sabah Credit Corporation)	-6.190557	1.205778	-5.13	0.000	-8.612434	-3.76868
14 (MBSB)	1.02549	1.08936	0.94	0.351	-1.162554	3.213534
15 (RCE Capital)	-5.631419	0.9010572	-6.25	0.000	-7.441246	-3.821593
16 (AEON Credit)	-3.186761	1.384927	-2.30	0.026	-5.968468	-0.4050535
_cons	13.25764	2.256892	5.87	0.000	8.724542	17.79075

Notes. No. 1 (Bank Pembangunan) is not computed in LSDV. No. 9 (Lembaga Tabung Haji), No. 12 (Borneo Dev Sabah), No. 13 (Borneo Dev Sarawak), and No. 17 (Court Mammonth) are excluded.

Table 8

Fixed Effects (Within) Estimation

Fixed effects (within) regression

Group variable	*R*-square			Corr. (*u_i*, *Xb*)	No. of obs.	No. of groups	Obs. per group min.	Avg.	Max.	*F* (2, 50)	Prob. > *F*
	Within	Between	Overall								
Shadow banks	0.0185	0.0711	0.1867	0.3950	65	13	1	5.0	8	0.47	0.6265

	Coef.	Std. error	*t*	*P* > [*t*]	[95% conf.	interval]
log*NPL*	5.115712	1.175091	4.35	0.000	2.772647	7.458778
log*DSD*	0.0838638	0.1023786	0.82	0.417	-0.1217696	0.2894972
log*CI*	0.000223	0.1816524	0.00	0.999	-0.3646365	0.3650825
_cons	10.91713	1.824185	5.98	0.000	7.25315	14.58112
sigma_u	2.1755601					
sigma_e	0.93036944					
rho	0.84539355 (fraction of variance due to *u_i*)					

Notes. *F*-test that all *u_i* = 0. *F* (12, 50) = 13.27. Prob. > *F* = 0.0000.

Table 9

Random Effects

Random effects Generalized Least Squares (GLS) regression											
Group variable	*R*-square			Corr. (u_i, X)	No. of obs.	No. of groups	Obs. per group min.	Avg.	Max.	Wald chi2 (2)	Prob. > chi2
	Within	Between	Overall								
Shadow banks	0.0057	0.5477	0.5204	0 (assumed)	65	13	1	5.0	8	7.58	0.0226

	Coef.	Std. error	*z*	*P* > [*z*]	[95% conf. interval]	
log*NPL*	5.115712	1.175091	4.35	0.000	2.772647	7.458778
log*DSD*	0.0041184	0.0965966	0.04	0.966	-0.1852075	0.1934443
log*CI*	0.3146591	0.1314317	2.39	0.017	0.0570578	0.5722604
_cons	8.397248	1.501919	5.59	0.000	5.45354	11.34096
sigma_u	1.5294395					
sigma_e	0.93036944					
rho	0.72990679 (fraction of variance due to u_i)					

The Wald chi2 (2) = 7.58 indicates the overall significance of the two variables ("DSD" and "CI") in explaining the NPL of the shadow banks (see Table 9). By comparing the different estimates above on the NPL of the shadow banks, the following question arises: Which is more preferred from among the pooled OLS, fixed effects or random effects? The results of the Breusch and Pagan Lagrangian multiplier test for random effects are as follows in Table 10.

Table 10

Estimated Results: $lnpl(bank,t) = Xb + u(bank) + e(bank,t)$

	Var.	Sd = sqrt (Var.)
lnpl	5.902643	2.429535
e	0.8655873	0.9303694
u	2.339185	1.52944
Test: Var. (*u*) = 0		
chibar2 (01) = 82.90		
Prob. > chibar2 = 0.0000		

The null hypothesis is that variance across the shadow banks is zero, that is, there is no significant difference across the shadow banks. However, here we reject the null hypothesis and conclude that the random effects model is a more appropriate model.

Based on the above results, the two explanatory variables, "DSD" and "CI", are determinants of default risks in shadow banking activities. Apart from this, the positive coefficients of the variables against the NPL provide suggestive evidence that the higher the DSD and collaterals intermediated in financial transactions, the higher the levels of NPL.

Further, the above results indicate that the random effects model is more preferred than the fixed effects model as the former explains variations "within" and "between" the shadow banks. And, the variations are mainly attributed to the "between-banks variations", rather than the "within-banks variations" (or "time-series variations"). This is because that the *R*-squared "between" = 0.5477, which is higher than *R*-squared "within" = 0.0057 (see Table 9).

More importantly, future methodology to measure the systemic risks in the shadow banking industry may need to account for additional explanatory variables particularly that measure collateralized assets being intermediated. This is because that the results show that between the two variables, the DSD is less significant than the CI.

This argument is further supported by the fact that:

(1) First, because of the diverse nature of financial services in the shadow banking industry, henceforth the total assets represent stability of the whole industry that is being examined. This is in the same vein with a previous study on bad debt provisions of financial institutions in China by Shan and Xu (2012) who also examined total assets and used it as the denominator;

(2) Second, it is because of the fact that shadow banks in the shadow banking industry accumulate assets that are sensitive to tail events when they take advantage of mispriced tail risk, whereby it is referred to as "neglected risk"; and in this respect, market participants are biased against the rational assessment of tail risk. Adrian (2014) referred to Gennaioli, Shleifer, and Vishny (2012) that this behavioral theory is rooted in the psychological study. Also, Rajan (2005) earlier had questioned whether financial innovations had made the world riskier;

(3) Third, because in the shadow banking system, it is the assets, rather than the deposit sources, that are used (as collaterals) to raise more funds that in turn can then be used as collaterals to raise additional funds. Henceforth, this practice amplifies pro-cyclicality in the shadow banking financial system as explained by Ghosh et al. (2012).

Conclusion

This study attempts to examine the determinants of default risks of shadow banks restricted to focus on their two main activities: securitization and collateralization. The results provide empirical evidence that future methodology to examine the systemic risks in the shadow banking system has not yet been well understood to explain the interconnectedness of the activities, but it may need to account for additional explanatory variables that measure collateralized assets being intermediated. This study itself also suggests that a further line of work in terms of a better survey of data is needed to capture systemic risks in the shadow banking system.

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