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Determinants of Non-Performing Loan of Micro-Finance Sector in Cambodia

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I. Introduction

- As of the first quarter of 2016, the total number of licensed microfinances in Cambodia are 59 compared to only 35 at the end of 2012 (NBC).
- Outstanding loan by MFI sector as of the first quarter, 2016, was \$US 3.2 Billion, an significant increase of 43% compared to the same period last year. MFIs provide the capital for farmers and small businesses in which 51% of adults is using their service.
- With this rapid increase of number of MFIs and its loans, it is being discussed that the increasing number of MFIs have been leading to more risky loan provisions which pose concerns on the level of loan repayment rate.
- Although the amount of loan given out in Cambodia is still low when compared to the other countries, loan operation default should be taken care since this credit risk can pose system in the medium term.

II. Purpose of Study

- *Therefore, this study seeks to identify potential determinants including macro-indicators and MFI performance indicators on non-performing loans of MFI sector and propose some possible recommendations to better manage NPLs in the MFI sector.*
- This study fully employs econometric approaches to estimate and test for confirmation of the relationships among NPL and its determinants.
- Monthly time series data is used in this study. The observation is from Jan/2014 – Jun/2016

III. Literature Reviews

- Makri, Tsagkanos and Bellas (2014): case of Eurozone banking sector
- Nawai and Shariff (2010): empirical study on various determinants of NPL
- Similarly, Farhan et all (2012), Ahmad and Bashir (2013): case of Pakistan banking sector
- Ghosh (2015): case of USA
- Chaibi and Ftiti (2015): comparative study in the case of France and Germany
- Bhattarai (2014): Case of Nepali banking sector
- Akinlo and Emmanuel (2014): case of Nigerian banking sector
- Tanaskovic and Jandric (2015): case of CEEC and SEE countries
- Reinout and Alexander (2012): case of emerging economy countries (IMF working paper)
- Klein (2013): Case of Central, Eastern and South-Eastern Europe (CESEE) countries (IMF working paper)
- Espinoza and Prasad (2010): Case of Gulf Cooperative Council (GCC) countries (IMF working paper)

IV. Variable Specifications

1. Dependent variable:

- **Non-Performing Loan ratio (NPL):** Non-performing loan refers to the loan which was overdue to pay back for 90 days or more (NBC, 2009). The data is based on monthly NPL/total loan ratio.

2. Independent variables:

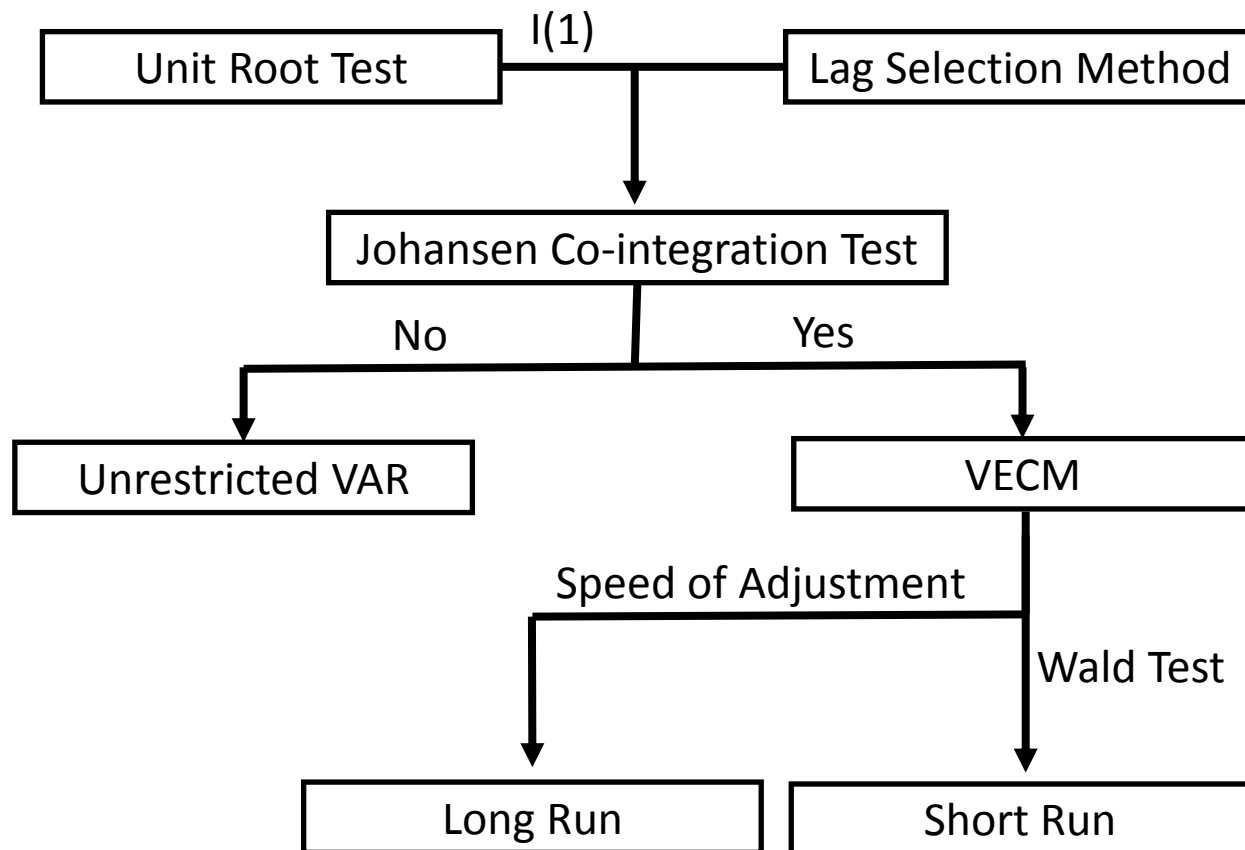
- **Gross Domestic Product growth rate (GDP):** Monthly changes of GDP growth rate, interpolated from annual data.
- **Inflation rate (IF):** Monthly percentage change of consumer price index.
- **Interest Rate (IR):** *Monthly borrowing interest rate of loan in US Dollar.*
- **Return on Asset (ROA):** *It is used to represent profitability ratios of MFIs. The data is the monthly average ratio of return on asset of aggregated MFIs (suggested by Makri, Tsagkanos and Bellas, 2014)*

3. Hypothesis

Independent Variables	Expected Sign
NPL	positive (+)
GDP	negative (-)
IF	positive/negative (+/-)
IR	positive (+)
ROA	negative (-)

V. Methodologies of the Research

1. Estimation Framework of the Research



2. Johansen Co-integration Based Model:

$$NPL_t = \alpha + \beta_1 NPL_{t-1} + \beta_2 GDP_t + \beta_3 ROA_t + \beta_4 IR_t + \beta_5 IF_t + u_t$$

There are two test we used to confirm the co-integration such as Trace Statistic test and Maximum Eigen Test.

The test of Johansen co-integration test required to be co-integrated at least 1 (at most None) co-integrated equation so that the model will be complied with the VECM requirement.

3. VECM model

It will be applied as following equation:

$$\Delta NPL_t = \sigma + \tau(aNPL_{t-1} + bGDP_{t-1} + cROA_{t-1} + dIR_{t-1} + eIF_{t-1}) + \delta_i \sum_{i=1}^k D(NPL_{t-i}) + \mu_i \sum_{i=1}^k D(GDP_{t-i}) + \rho_i \sum_{i=1}^k D(ROA_{t-i}) + \epsilon_i \sum_{i=1}^k D(IF_{t-i}) + \varphi_i \sum_{i=1}^k D(IR_{t-i}) + \mu_i$$

- a, b, c, d, and e are the normalized coefficients of the Johansen co-integration equation (long run coefficients).
- τ is the speed of adjustment which is used to confirm the long run relationship of the model. This coefficient is required to be stationary and negative in sign.
- $\delta, \mu, \rho, \epsilon$ and φ are short run coefficients generated by VECM and required to be confirmed by Wald Test.

VI. Estimation Results

1. Lag Selection Method

Table 4.3: Lag Length Selection Testing Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	520.3057	NA	7.12E-23	-36.80755	-36.56966	-36.73483
2	635.5917	<u>181.1636**</u>	<u>1.16e-25**</u>	-43.25655	<u>-41.82919**</u>	<u>-42.82019**</u>
3	662.2513	32.37237	1.25E-25	-43.37509**	-40.75826	-42.5751

Note: ** denoted the significant level of 5% level of each test criteria

- Based on the result of the test LR, FPE, SC and HQ of the lag 2 provided the test statistical value of 181.16, 1.16e-25, -41.83 and -42.82, respectively with significant probability of 5% level.
- Therefore, lag 2 will be selected for the estimate progress of the model in Johansen.

2. Unit Root Test

Variables	Level 0		Level 1	
	F-Statistic	Probability	F-Statistic	Probability
NPL (Delinquency Ratio)	-2.06980	0.5402	-6.20065***	0.0001
GDP Growth Rate	-2.31158	0.415	-5.48585***	0.0006
Return on Asset	-2.88104	0.1827	-5.52603***	0.0006
Micro Loan Interest Rate	-4.33919**	0.0123		
Inflation Rate	-0.59716	0.9716	-4.40627***	0.0083

Note: ** and *** denoted the level of significant at 5% and 1%, respectively.

Based on the result of the ADF test, all variables are stationary at the first level of integration except for interest rate of the loan. Therefore, Johansen co-integration test requirement will be complied.

3. Johansen Co-integration test

Result of Trace Test for Johansen Co-integration				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Probability
None *	0.76804	91.87106	60.06141	0.000
At most 1 *	0.654871	52.41895	40.17493	0.0019
At most 2	0.407067	23.69534	24.27596	0.0591
At most 3	0.233767	9.583127	12.3209	0.1378
At most 4	0.084845	2.393873	4.129906	0.1439

Note: * denotes rejection of the null hypothesis at the 5% level.

Result of Maximum Eigen Test of Johansen				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Probability
None *	0.76804	39.45211	30.43961	0.0029
At most 1 *	0.654871	28.72361	24.15921	0.0112
At most 2	0.407067	14.11222	17.7973	0.1647
At most 3	0.233767	7.189254	11.2248	0.2335
At most 4	0.084845	2.393873	4.129906	0.1439

Note: * denotes rejection of the null hypothesis at the 5% level.

4. Normalized Coefficients of the Johansen Co-integration

NPL	GDP	ROA	IR	IF
1	<u>-0.062764</u>	<u>-0.188434</u>	<u>0.011337</u>	<u>0.003522</u>
Standard Error	-0.05284	-0.03048	-0.01605	-0.01994
t-Statistic	1.18781	6.18222	-0.70636	-0.17663

These coefficients of the Johansen co-integration will be normalized as the long run coefficients in the research paper.

5. VECM Result

$$D(NPL) = C_1*[NPL_{-1} - 0.0628*GDP_{-1} - 0.1884*ROA_{-1} + 0.0113*IR_{-1} + 0.0035*IF_{-1}] + C_2*D(NPL_{-1}) + C_3*D(NPL_{-2}) + C_4*D(GDP_{-1}) + C_5*D(GDP_{-2}) + C_6*D(ROA_{-1}) + C_7*D(ROA_{-2}) + C_8*D(IR_{-1}) + C_9*D(IR_{-2}) + C_{10}*D(IF_{-1}) + C_{11}*D(IF_{-2})$$

Variable	Coefficient		F-statistic	
	Lag 1	Lag 2	Statistic	p-value
GDP	-0.05776**	-0.23242	-2.32612	0.02666
ROA	-0.08341***	-0.01315	2.95277	0.00510
IR	0.00491**	0.04467	-2.68060	0.01097
IF	-0.00265**	-0.01529	2.41956	0.02136

Note: ** and *** denoted the level of significant at 5% and 1%, respectively. **R = 0.855997 and Adj-R = 0.749745**
 Speed of adjustment = 0.34290***

6. Model Criteria

Criteria	Test	Test Statistics	p-value
Serial Correlation	Breusch-Godfrey	1.80887	<u>0.2001</u>
Heteroskedasticity	Breusch-Pagan-Godfrey	0.44764	<u>0.9256</u>

The insignificant of both Breusch-Godfrey and Breush Pagan Godfrey test allow us to accept the null hypothesis of the testes. Therefore, there is no serial correlation and heteroscedasticity in the model.

VII. Conclusion

- There is no long run relationship between the dependent and independent variables while the short run is existed in the model.
- In short run, growth rate of GDP, inflation, return on asset, and the lending interest rate of the loan of micro-finance jointly can explain 74.97% of the total non-performing loan of the micro-finance sector in Cambodia.
- Growth rate of GDP, return on asset, and inflation negatively related to the non-performing loan of the micro-finance sector in Cambodia.
- Lending interest rate of micro-finance positively related to the non-performing loan of micro-finance sector in Cambodia.

- As the significant growth of DGP, this benefits to all micro-finance sector in Cambodia as increasing the people income and guarantee the market sentiment and lower the ratio of no-performing loan. However, micro-finance shall aware of the exposure related to the default of the loan as more disbursements are made.
- Targeting the inflation and interest rate could stable the price level in the market and consumer's purchasing power. This activities enlarge consumer capability to repay the loan and reduce the ratio of non-performing loan. On the other hand, micro-finance institutions must justify their products' pricing with the actual inflation rate so that these products can satisfy the consumers and guarantee the adequate growth for both institutions and customers.
- As a negative relationship between non-performing loan and ROA, this indicating that higher profitability of the micro-finance makes management team less pressures in generating the revenue from the credit activities and lower the exposure to the risk. As a part of micro-finance efficiency perspective, institution with higher efficient in credit assessment, credit monitoring and credit analysis are less expose to the credit risk and decrease the bad liquidity asset as compare to the less efficient institution.

VIII. Recommendations and Suggestions

1. Adequacy and Efficiency Management of Credit Risk Assessment and Credit Monitoring:

- Higher management level of the credit assessment, monitoring and credit analyst.
- Provide enough resource to loan officer to support the monitoring activities from the time of disbursement till the final repayment.
- Regularly visit of the internal control to the credit management team to ensure the compliance with the provision of the credit management policy.
- Effective monitoring of the loan facility and periodic review of the customer's account.

2. Sufficiency and effective training course for credit officer and management:

- Risk management, NPL exposures, financial analyst training should be provided to credit officer and management;
- Banker and micro-finance experts shall be seasonal invited for the professional training related to the health of loan portfolio, moral hazard and adverse selection and credit facilities;
- Highly commitments from management to ensure the successful implementation of the training courses.

3. Facility management of credit security:

- Demanding some of security so that MFIs could recover part of the indebtedness in the event of default;
- Review the security requirement policy so that the effectiveness of the security is up to date and adequacy.

4. CBC is not enough to proof the credit record of the loan customer:

- Realize the customer debt provision form friends, relative and other non-license organization which have no record in CBC
- Aware that some of the real estate company also have the loan product for real estate property but still have no record in CBC;

5. Further Research Suggestion

- Allow model to perform with non-standard distribution of the error term.
- Employ larger observation, can be up to 5 to 10 years.
- Consider to add more explanatory variables such as exchange rate, unemployment rate, gross loan size, lending interest rate of loan in Khmer Riels etc.,.

The End!

Thanks for your attention!

Q&A