

Assessing the Economy-wide Impacts of Strengthened Bank Capital Requirements in Indonesia using a Financial Computable General Equilibrium Model

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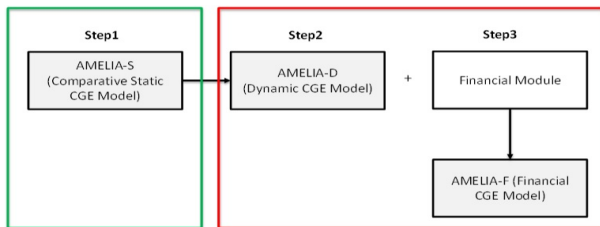
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Background

- After GFC, majority of Basel Committee on Banking Supervision (BCBS) countries implemented Basel III principles on banks capital regulation.
- This paper analyses the economy-wide impact of a 100 basis points increase in banks capital adequacy ratio (CAR) in Indonesia using a Financial CGE model.



Source: Author's PhD Candidature Report

Figure 1: A Model of Economic Linkages for Indonesia-FCGE (AMELIA-F)

Steps in Building AMELIA-F

- Transform static CGE to dynamic CGE based on Mini-MONASH (Dixon and Rimmer, 2002), by adding physical capital, public and foreign debt accumulations, and sticky wage adjustment.
- Prepare financial database from the 2018 Financial Account and Balance Sheet Indonesia (FABSI, 2018).
- Add financial theory following Giesecke et al.(2017) and Nassios et al.(2020).
- Connect the real to financial side of the model through four linkages.
- Simulate a 100 basis point rising in commercial banks capital adequacy ratio.

Activation of the Linkages

		Asset Agent (a)								
FLOW	1 Inds	2 CB	3 Banks	4 NBFi	5 Govt	6 HH	7 ROW	8 Housing	Total	
1 Inds				Net position*					d_invest (NH)	
2 CB							Net position**			
3 Banks										
4 NBFi										
5 Govt				Net position*					d_gov_def	
6 HH										
7 ROW										
8 Housing			F						d_invest (H)	
Total						d_Savings	d_CAD			

* Liabilities - Assets, ** Asset - Liabilities.

Source: Authors

Figure 2: Four linkages connecting the core model and financial module

Behaviours of Liability and Asset Agents

Liability agents set capital structure by minimising CET function of weighted average cost of capital.

$$\begin{aligned} &\text{Minimise} \quad CET(A1_{(s,f,d)} \cdot R_{(s,f,d)}, \quad \forall f, d), \quad s \in LALF \\ &\text{subject to} \quad L_{(s)} = \sum_f \sum_d (A1_{(s,f,d)} - A0_{(s,f,d)} \cdot V_{(s,f,d)}). \end{aligned}$$

Asset agents set portfolio combination by maximising CES function of weighted rates of return on assets.

$$\begin{aligned} &\text{Maximise} \quad CES(A1_{(s,f,d)} \cdot R_{(s,f,d)}, \quad \forall s, f), \quad d \in LALF \\ &\text{subject to} \quad A_{(d)} = \sum_s \sum_f (A1_{(s,f,d)} - A0_{(s,f,d)} \cdot V_{(s,f,d)}). \end{aligned}$$

The optimal solutions of liability and asset agents are given respectively by the following equations

$$\begin{aligned} a1_{(s,f,d)} &= l_{(s)} - \tau_{(s)}(r_{(s,f,d)} - wacc_{(s)}), \quad s \in LALF; \\ a1_{(s,f,d)} &= a_{(d)} + \sigma_{(d)}(r_{(s,f,d)} - averor_{(d)}), \quad d \in LALF. \end{aligned}$$

Modelling banks capital adequacy ratio

Given the regulatory risk weighted assets

$(\sum_s \sum_f W_{(s,f,Banks)} \cdot A1_{(s,f,Banks)})$, banks maximise the CES of weighted average of return on assets.

Maximise $CES(A1_{(s,f,Banks)} \cdot R_{(s,f,Banks)}, \forall s, f)$,

subject to $A_{(d)} = \sum_s \sum_f A1_{(s,f,Banks)} = A_{(Banks)}$,

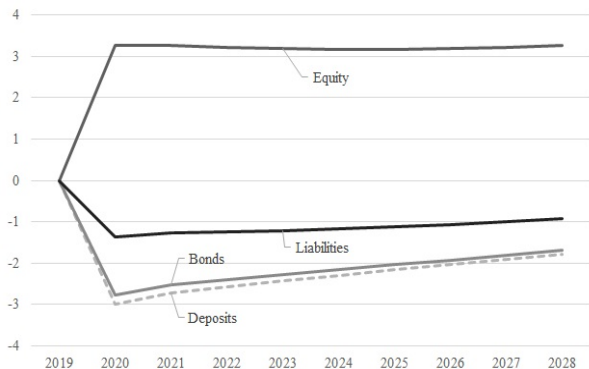
$$\sum_d A1_{(Banks,Equity,d)} = KAR \cdot \sum_s \sum_f W_{(s,f,Banks)} \cdot A1_{(s,f,Banks)}.$$

As banks equity issuance is determined to satisfy regulatory CAR, the optimal solution of banks asset acquisitions becomes:

$$a1d_{(Banks,f)} = pbblneq_{(Banks)} + \tau(rpowd_{(f,Banks)} - averorne_{(Banks)}),$$

$f \in FINEQ$.

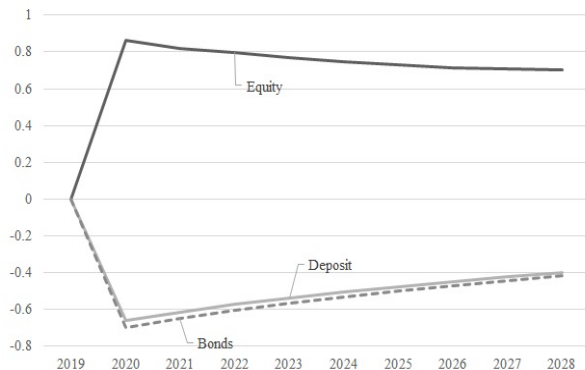
Banks Liabilities



Source: Authors' Simulations

Figure 3: Financing Instruments of the Commercial Banks
(% Deviation from Baseline)

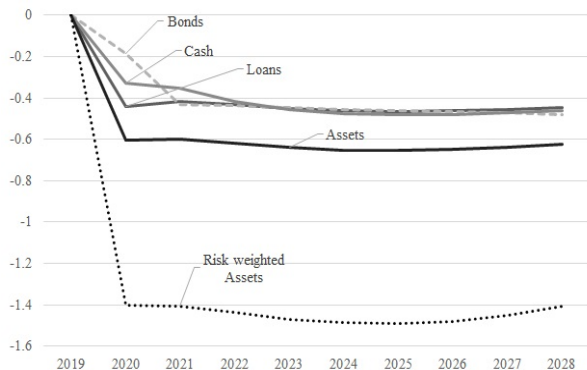
Banks Rates of Return



Source: Authors' Simulations

Figure 4: Power of Rates of Return on Commercial Bank Liabilities
(% Deviation from Baseline)

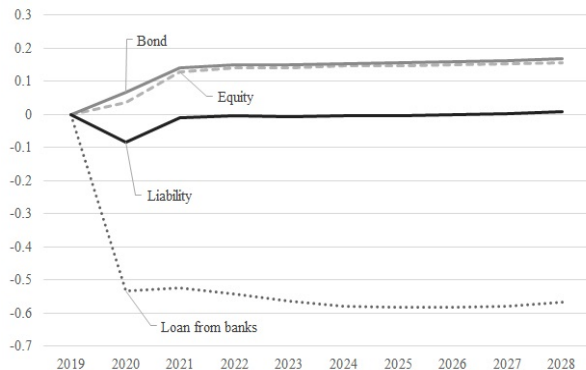
Banks Assets



Source: Authors' Simulations

Figure 5: Asset Acquisition by the Commercial Banks
(% Deviation from Baseline)

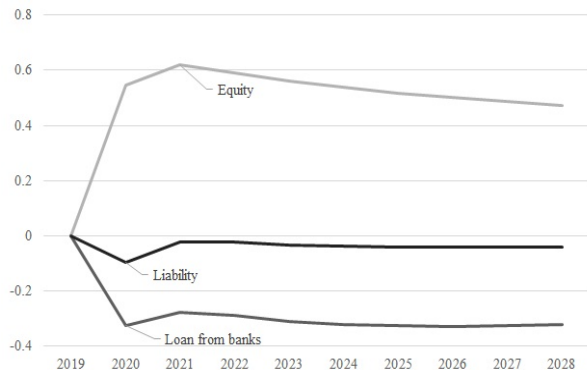
Industry Liabilities



Source: Authors' Simulations

Figure 6: Industry Financing Instruments
(% Deviation from Baseline)

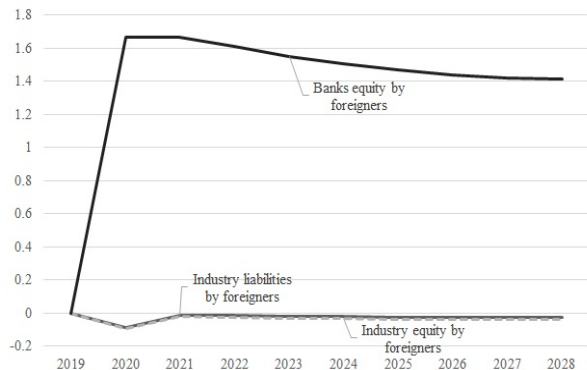
Housing Liabilities



Source: Authors' Simulations

Figure 7: Housing Financing Instruments
(% Deviation from Baseline)

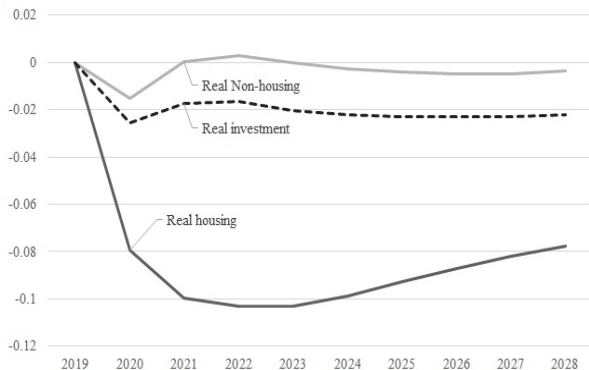
Foreigner Assets



Source: Authors' Simulations

Figure 8: Foreigner Assets Holding
(% Deviation from Baseline)

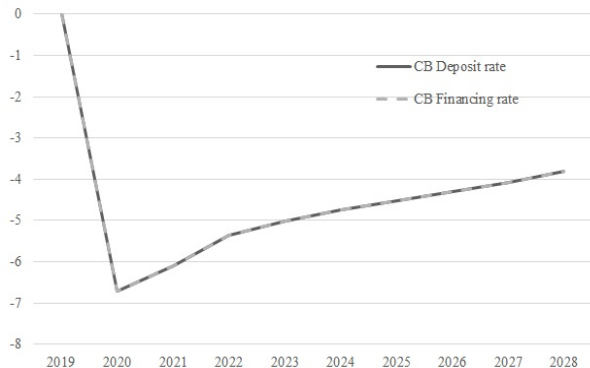
Real Investments



Source: Authors' Simulations

Figure 9: Real Industry Investment, Housing Investment, Aggregate Investment (% Deviation from Baseline)

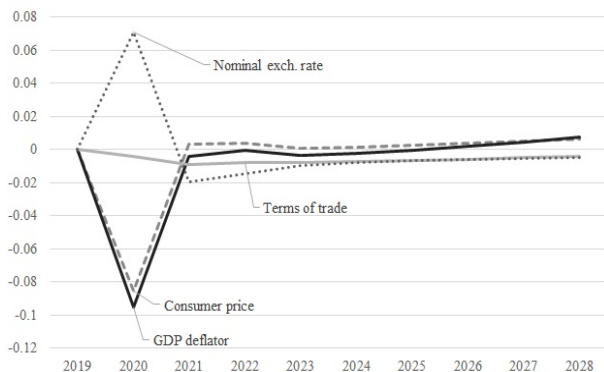
Policy Rates



Source: Authors' Simulations

Figure 10: Central Bank Policy Rates (Basis Point Change from Baseline)

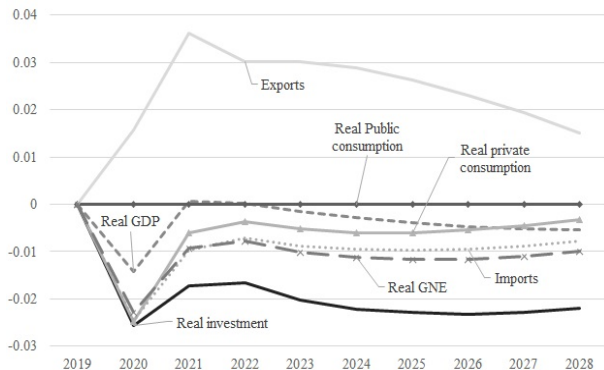
Price Movements



Source: Authors' Simulations

Figure 11: GDP Deflator, Consumer Price, Nominal Exchange Rate and Terms of Trade (% Deviation from Baseline)

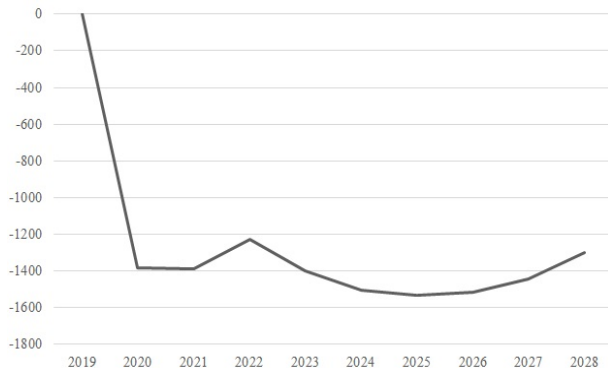
Expenditures GDP



Source: Authors' Simulations

Figure 12: Expenditure-side Components of Real GDP at Market Prices
(% Deviation from Baseline)

Current Account Deficit



Source: Authors' Simulations

Figure 13: Current Account Deficit (Rp billion)

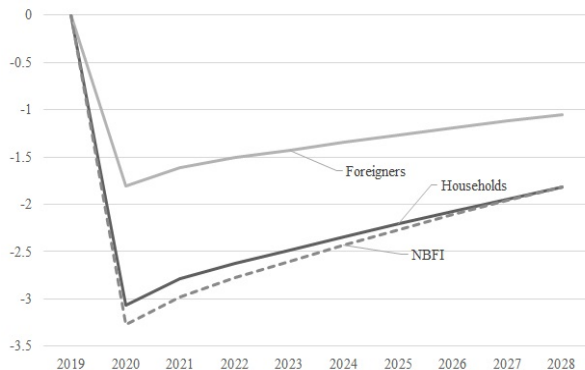
Conclusions

- A 100 basis points increase in banks CAR causes small negative consequences for the economy.
- Banks balance sheets reduce as they move away from riskier assets and finance their activity by expensive equity rather than debts.
- This impacts negatively on the industry and housing agents capacity to invest in physical capital formation.
- Real GDP decreases by 0.01 per cent from the baseline in the event year and returns to the baseline thereafter.
- The central bank reduces its policy rates to counter the negative impacts on the employment rate and consumer prices.
- Falling real investments decreases external financing requirement as indicated by a positive change in current account deficit.

End of Presentation

Thank You

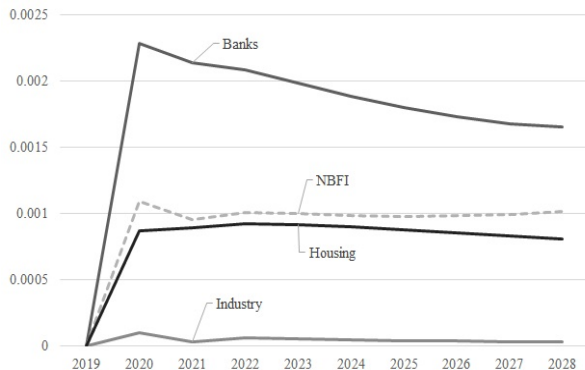
Banks Liabilities Holders



Source: Authors' Simulations

Figure 14: Household and Foreign Deposits with Commercial Banks
(% Deviation from Baseline)

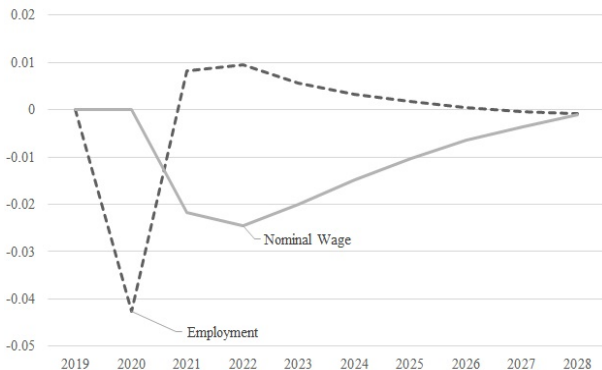
Weighted Average Cost of Capital by Agent



Source: Authors' Simulations

Figure 15: Weighted Average Cost of Capital of Banks, NBFI, Housing, and Industry (% Deviation from Baseline)

Labour Market



Source: Authors' Simulations

Figure 16: Employment Rate and Nominal Wage (% Deviation from Baseline)

Basel III Principles on Capital Requirement in Indonesia

Table 1: Implementation Schedule

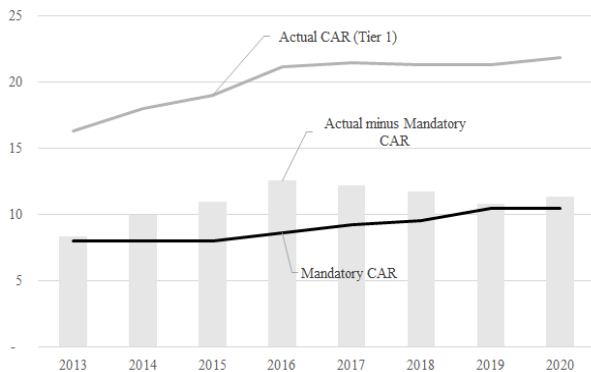
2014	2015	2016	2017	2018	2019
CET1=4.5% +AT1=6% +Tier2=8%	Conservation Buffer	0.625ppt	1.25ppt	1.875ppt	2.5ppt*
	Counter Cyc. Buffer	Maximum 0.625ppt	Maximum 1.25ppt	Maximum 1.875ppt	Maximum 2.5ppt
	Capital Sur- charge	1-3.5ppt			

Source: Adapted from Indonesian Banking Booklet 2019.

Note: ppt = percentage points, AT1=Alternative Tier-1 capital equivalent, Tier2= Tier2 capital equivalent, D-SIB = domestically systemic important bank.

*For capital greater than Rp5 trillion.

Stylised Facts: Banks Capital Development in Indonesia



Source: CEIC

Note: The mandatory CAR is calculated the implementation schedule.

Figure 17: Indonesia's Mandatory and Actual Bank CAR, Tier-1 (%)

Table 2: Indonesia's Banks' CAR by Type of Ownership (%)

	2013	2014	2015	2016	2017	2018	2019	2020*
Private Banks	16.4	18	19.0	21.2	21.5	21.3	21.9	22.2
State Owned Banks	15.9	17.1	19.3	21.0	21.1	20.9	21.2	18.8
Regional Banks	17.6	17.8	20.6	21.7	21.7	22.0	21.2	22.1
Foreign Banks	34.5	44.8	46.5	48.9	53.1	47.9	50.4	54.6

Note: *as of November 2020.

Stylised Facts: International Comparisons

Table 3: Bank Capital and Profitability Indicators in Selected Countries (%)

	Indonesia Q1-19	Malaysia Q1-19	Thailand Q1-18	Australia Q1-19	Japan Q3-18	U.K. Q3-18	U.S. Q1-19
CAR	23.3	18	17.8	14.7	17	20.9	14.8
T1 CAR	21.6	14.3	15	12.7	14.8	17.7	13.8
ROA	2.5	1.3	1.3	0.8	0.3	0.5	0.4
ROE	16.4	11.9	9.4	12.9	7.3	7.4	3.4

Source: IMF Financial Soundness Indicators

Table 4: Previous Studies

Study	Impact on bank WACC	Impact on real GDP growth	Scope
Miles et al., (2012)	↑ 18 bps	0.15% reduction in the long run real GDP growth	U.K.
Slovik & Cournède (2011)	↑ 50 bps	0.05-0.15% reduction in the real GDP growth in 5 year	OECD countries
BIS (2010)	↑ 13 bps	0.09% reduction in real GDP growth	6,600 banks in emerging and advanced countries in 1993-2007
Taskinsoy (2018)	N.A.	0.33% reduction in average long run real GDP	ASEAN5
IIF (2011)	N.A.	3.2% reduction in average real GDP in 5 years	U.S., E.A., Japan, U.K., and Switzerland
Surhaningsih, et. al., (2015)	↑ 6 bps	N.A.	Indonesia
Giesecke et al., (2017)	↑ 4 bps	0.005% reduction in the long run real GDP relative to baseline	Australia
Nassios et al., (2020)	↓ WACC	Increase in real GDP growth relative to baseline	U.S.

Financial Agents and Instruments

Table 5: Financial Agents

No	Agent short name	Description
1	Inds	Non-financial industry, excluding housing
2	CB	Indonesia central bank
3	Banks	Commercial banks
4	NBFI	Non-bank financial institutions, including insurers and pension funds
5	Govt	Government
6	HH	The representative household
7	ROW	Rest of the world
8	Housing	Single representative housing sector

Table 6: Financial Instruments

No	Instrument name	short	Description
1	GldSDR		Gold or Special Drawing Rights
2	Cash		Cash
3	DepLoans		Currency and deposits
4	Debt		Interest-bearing securities, e.g., bonds, of varying terms of maturity
5	Equity		Claims that lie further along the risk-return spectrum than debt and loans

Database

- **Core database** is processed from 2010 Indonesia Input-Output table (BPS, 2015). This is updated by simulation to 2018, to match financial database.
- The core database comprises 51 aggregated commodities and industries, from 185 in the original database.
- **Financial database** is developed from the 2018 financial account balance sheet for Indonesia (FABSI) provided by Bank Indonesia.
- I created single representative housing sector and assign the banks financing amount from mortgage available in published Indonesian Financial Statistics (Bank Indonesia, 2020).
- Using DER of property and real estate sector at the Indonesian stock market statistics (Indonesia Stock Exchange, 2020), I estimated equity finance of the housing agent held by the households.

Model Closures

The closure assumptions used in AMELIA-F are similar to those in Giesecke et al.(2017) and Nassios et al.(2020).

- Sticky wage adjustment process.
- Exogenous determined public deficit/GDP.
- GDP expenditures are endogenously determined.
- Capital fixed in the short run and adjust to respond rates of return in medium to long run.
- Central banks responds to deviations of employment rate and inflation from the targets, according to the Taylor Rule (Taylor 1993, Orphanides 2007, Giesecke et al. 2017, and Nassios et al. 2020).