

Exchange Rate and Trade Dynamics in Indonesia:

Connecting the Dots

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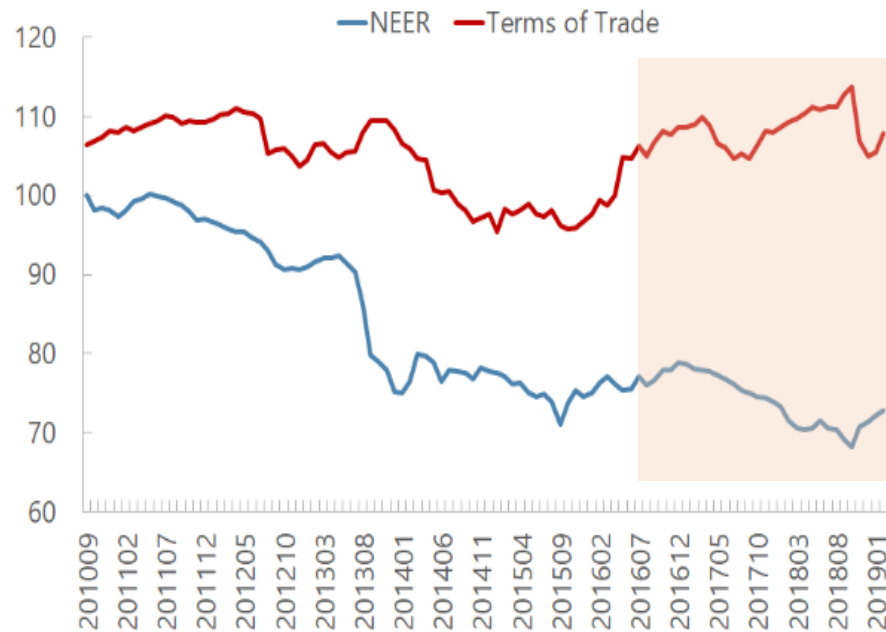
What drives exchange rate movements and how does it transmit to the current account?

- *2018 External Sector Developments:*
 - Two shocks: Terms of Trade and global financial tightening
 - Exchange rate depreciation ~ 8% (ToT or Financial?)
 - Current account deficit widened by 1.4% of GDP
- Did the CA reflect adjustment to the ER depreciation or was it not sensitive to these fluctuations?
- This paper: Explores exchange rate movements in relation to both trade and financial shocks and estimates the extent to which trade adjusts.

Exchange rate and current account: Is there a disconnect ?

Exchange Rate Drivers: Real Sector

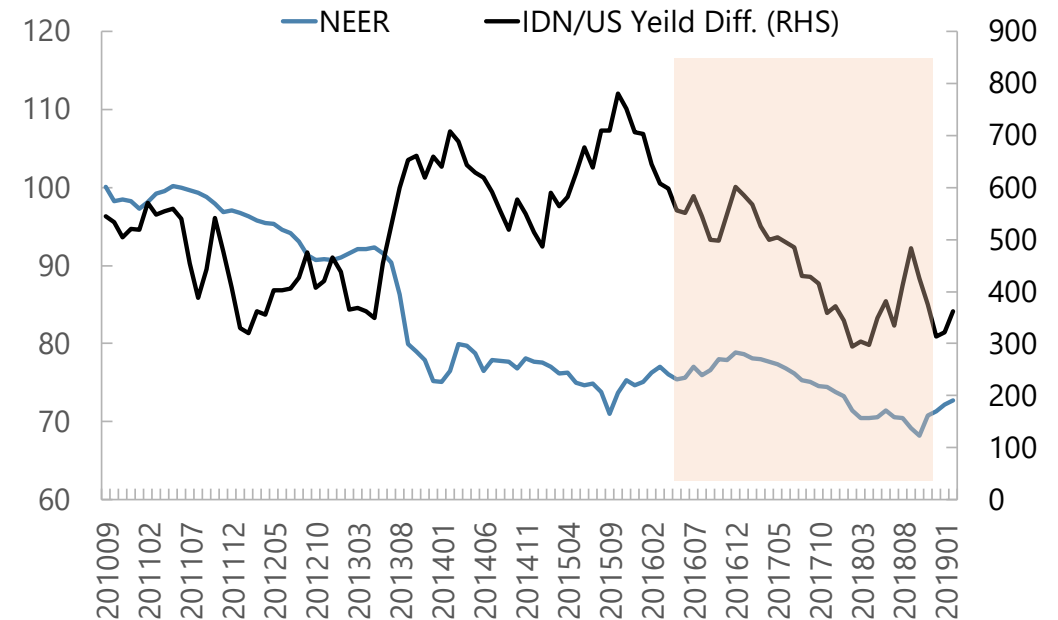
(Effective Exchange Rates and Terms of Trade Index, Base Year 2010)



Sources: Haver and IMF Staff Calculations

Exchange Rate Drivers: Financial Markets

(Nominal Effective Exchange Rate and Yield Differential)



Sources: Haver and IMF Staff Calculations

Decoupling and volatility of ER in recent times...

- Exchange rate volatility >> Volatility of fundamentals (by 4 s.d.)
- REER tracks closely the NEER and displays a similarly large persistence and volatility.
- **High exchange rate volatility is intrinsically linked to a limited pass-through of exchange rates to trade prices.**

Correlation of Exchange Rate with Terms of Trade and Interest Rate Differentials

	2011-2014	2015-2018
ToT, NEER	0.67	-0.32
IRD, NEER	-0.65	0.49

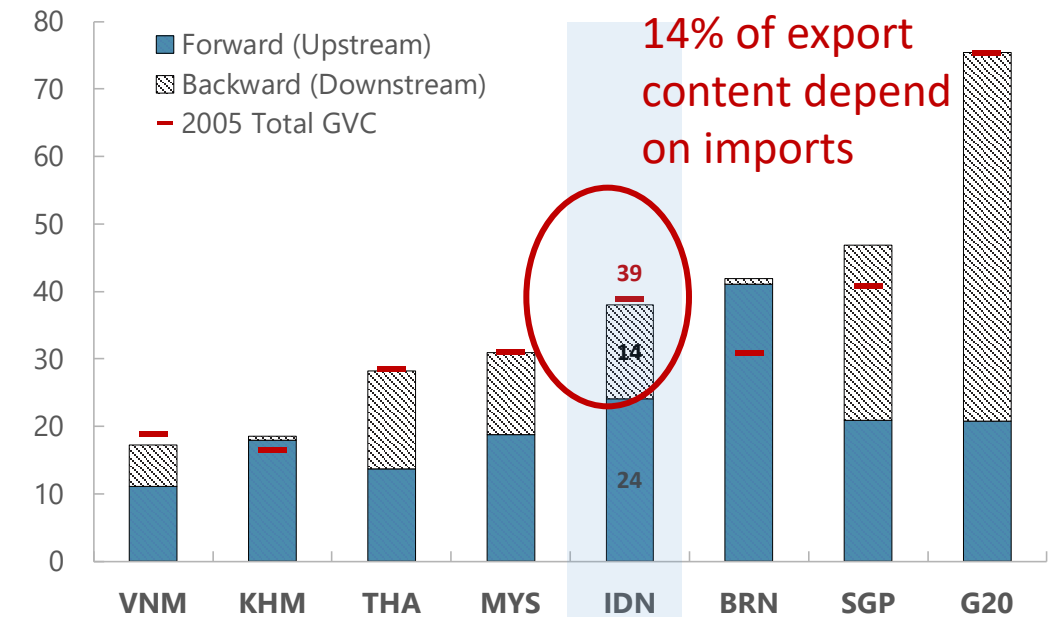
Note: ToT refers to Terms of Trade, NEER to Nominal Effective Interest Rates and IRD to the IDN-USA interest rate differential (in bps). All pairwise correlation coefficients are significant at the 5% level.

Limited pass-through of ER to trade suggests less adjustment capacity

- **Nature of Shock:** Literature posits that **risk-premium shocks** have small effects on the rest of the economy.
- **Transmission Mechanism:** Pass-through can vary by the type of price-setting and the **structure of international trade** markets – *e.g., import-intensive exports show less pass-through.*

Global Value Chain Integration

(Percent of Exports in Backward and Forward GVC for 2015)



Sources: OECD and IMF staff calculations

Data and Methodology

- *Data*: sectoral data from BPS on import and export volume and prices at a monthly frequency. Additional data from BIS, IMF and OECD.
- *Methodology*: Augment the ER pass-through equation with commodity price shocks and account for the asymmetric response to shocks.

$$\underbrace{\Delta mp_{i,c}}_{\text{Import Price}} = \underbrace{\beta_i^+ \Delta e_c^+ + \beta_i^- \Delta e_c^-}_{\text{Exchange Rate}} + \underbrace{\gamma_i^+ \Delta c_c^+ + \gamma_i^- \Delta c_c^-}_{\text{Commodity Price}} + \underbrace{\rho_q}_{\text{Quarter}} + \epsilon_{i,t}$$

- **Aggregation Bias**: Estimating this by pooling all sectors results in a significant downward bias because some sectors experience large price changes, but are relatively more elastic.

Import Price Elasticity to ER

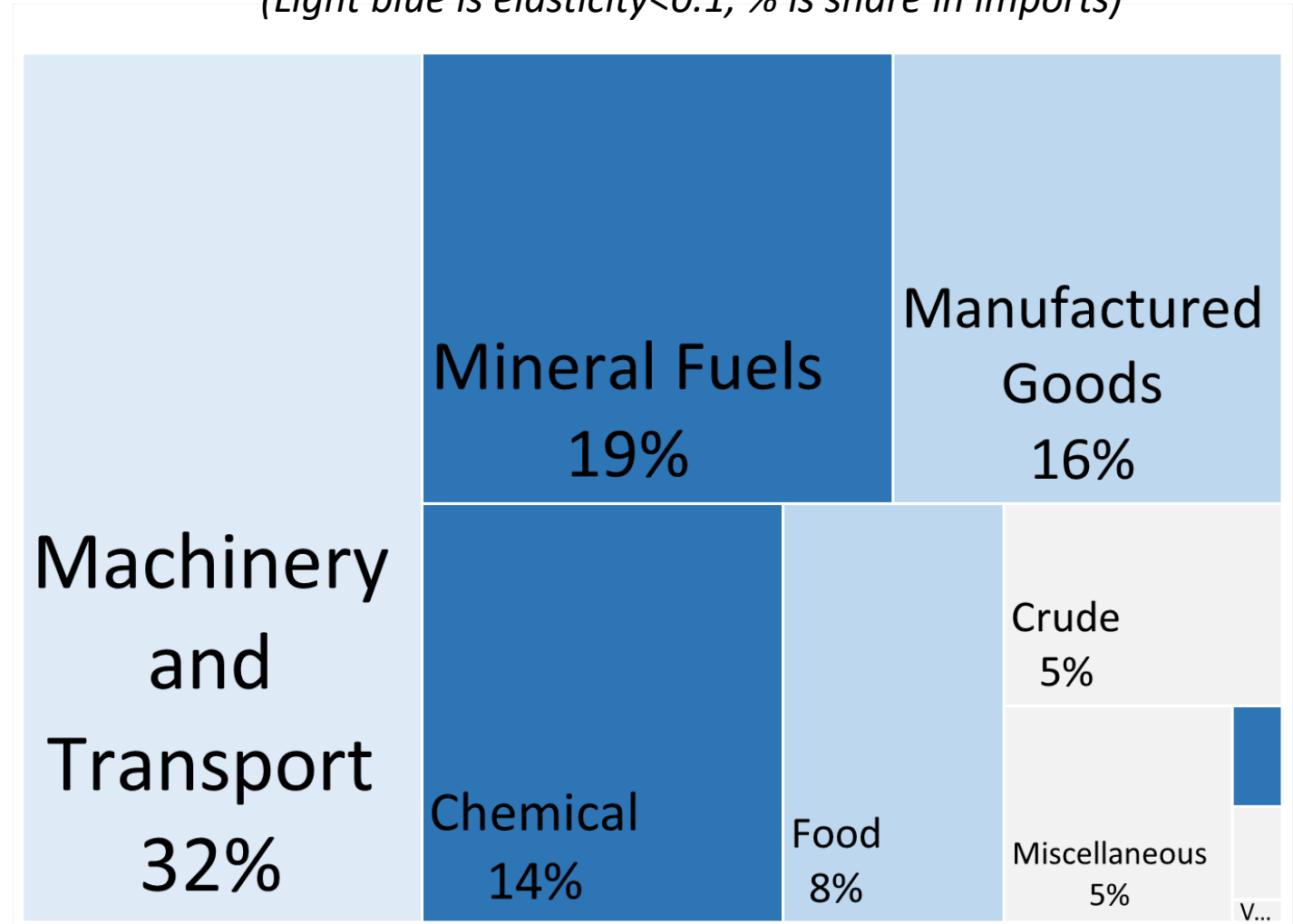
Short Run (6m) Elasticity:
-0.57

*ER increase of 10% reduces
import price by 5.7% in the
short-run*

Medium-Run (1y) Elasticity:
-0.70

Sectoral Elasticities

(Light blue is elasticity < 0.1, % is share in imports)



Export Price Elasticity to ER

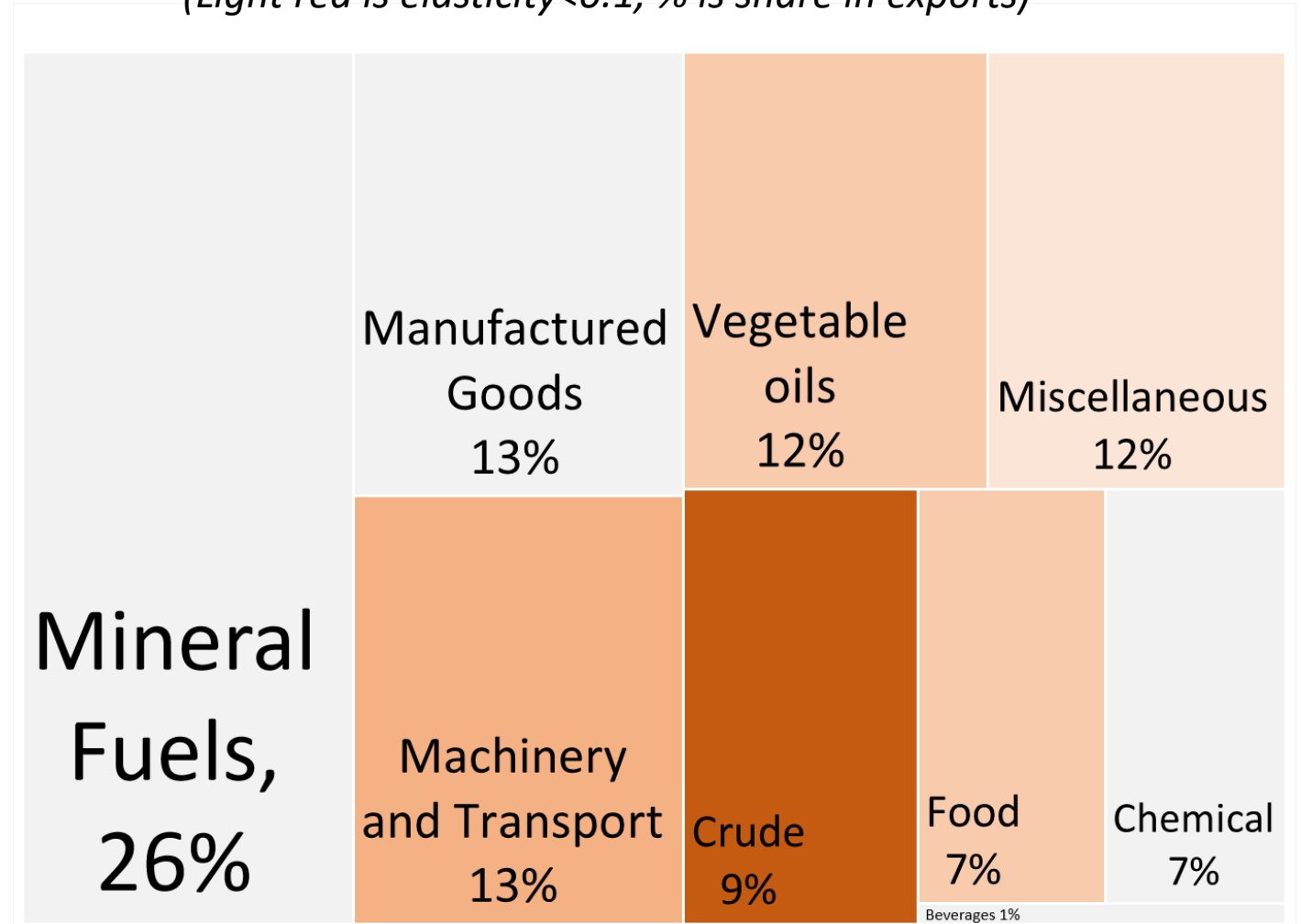
Short Run (6m) Elasticity:
0.44

*ER increase of 10% increases
export price by 4% in the short-
run*

Medium-Run (1y) Elasticity:
0.14

Sectoral Elasticities

(Light red is elasticity < 0.1, % is share in exports)



Asymmetric Effects: Depreciation vs Appreciation

- **Imports** more responsive to appreciation with a lag (medium-run),
- **Exports** more sensitive to depreciation in the short-run.

	Imports		Exports	
	<i>Appreciation</i>	<i>Depreciation</i>	<i>Appreciation</i>	<i>Depreciation</i>
<i>Short-Run</i>	-0.80	-0.31	0.28	0.61
<i>Medium-Run</i>	-1.01	-0.43	0.09	0.25

Possible Explanations and Conclusion

- *Nature of Shock:* Pass-through effects of trade prices *are weaker* when ER fluctuations are derived *from risk-premium shocks*.
- *Transmission Mechanism:* GVC participation matters;
 - Export-pass through higher for sectors with less dependence on imports.
 - Import pass-through lower for sectors with high shares of re-exported imports.
- **Analysis documents heterogeneity in the transmission of exchange rates fluctuation on trade, depending on sectors and type of ER shocks.**
 - *Policy should consider the different driving forces in play that affect the transmission mechanism and extent of adjustment.*

Impact of Monetary Policy Communication in Indonesia

Approaches – Assessing MP from different angles

- Transparency and clarity
- Predictability
- Efficacy (impact on market rates)

Monetary Policy with Multiple Objectives

	Date	Tightening	Loosening	Motivation for rate change
Taper Tantrum (tightening)	6/13/2013		1	Inflation, macro and financial stability
	7/11/2013		1	Inflation (after fuel price increase)
	8/29/2013		1	inflation expectation, external conditions
	9/12/2013		1	Inflation, external (exchange rate stability)
	11/12/2013		1	External (current account deficit and global uncertainty)
Loosening	1/14/2016		1	stable macro (inflation), external (easing uncertainty of global financial markets)
	2/18/2016		1	stable macro (inflation), external (easing uncertainty of global financial markets)
	3/17/2016		1	stable macro (inflation), external (easing uncertainty of global financial markets)
	6/16/2016		1	low inflation, external (controlled current account and stable exchange rate)
2018 EM Pressure (tightening)	5/17/2018		1	Macro stability, External (tightening global conditions)
	5/30/2018		1	External (pre-emptive, front-loaded policy) for exchange rate stability, against volatile global markets.
	6/29/2018		1	External (safeguarding competitiveness of domestic financial market against changing monetary policies in other countries)
	8/15/2018		1	External (safeguarding competitiveness of domestic financial market against changing monetary policies in other countries)
	9/27/2018		1	External (reduce the current account deficit and maintain attractiveness of domestic financial market)
	11/15/2018		1	External (reduce the current account deficit)

- Why is monetary policy rate adjustment is justified by a ranges of issues, and at times there is no mention of inflation or output gap?

Transparency and Clarity – The literature

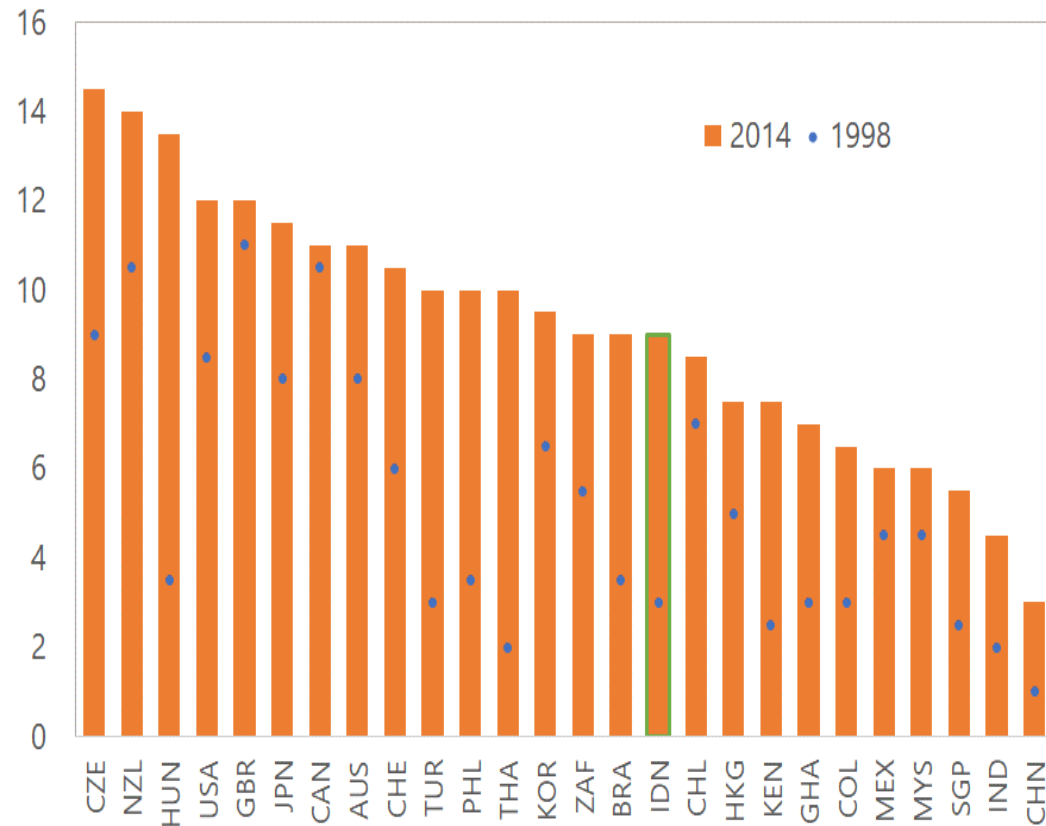
- Transparency provides the public with a better understanding of the central bank's objective and the factors that motivate monetary policy decisions (Dincer and Eichengreen, 2014).
- Greater clarity in central bank communication is associated with lower volatility in inflation, interest rate dynamic, and various financial instruments (Jansen, 2011; Tang and Yu, 2011).
- Using the Flesch-Kincaid measure of readability, Bulir, Cihak, Jansen, (2014) measured the clarity of inflation reports by four central banks before and during the GFC, and found an association of clarity and reduced market volatility.
- The Flesch-Kincaid readability index suggests that clarity declines when sentences are longer and words contain too many syllables.

Transparency and Clarity of Communication

- Transparency improved and is among highest in EMs.
- Monetary policy press releases have provided more information and become longer over time.

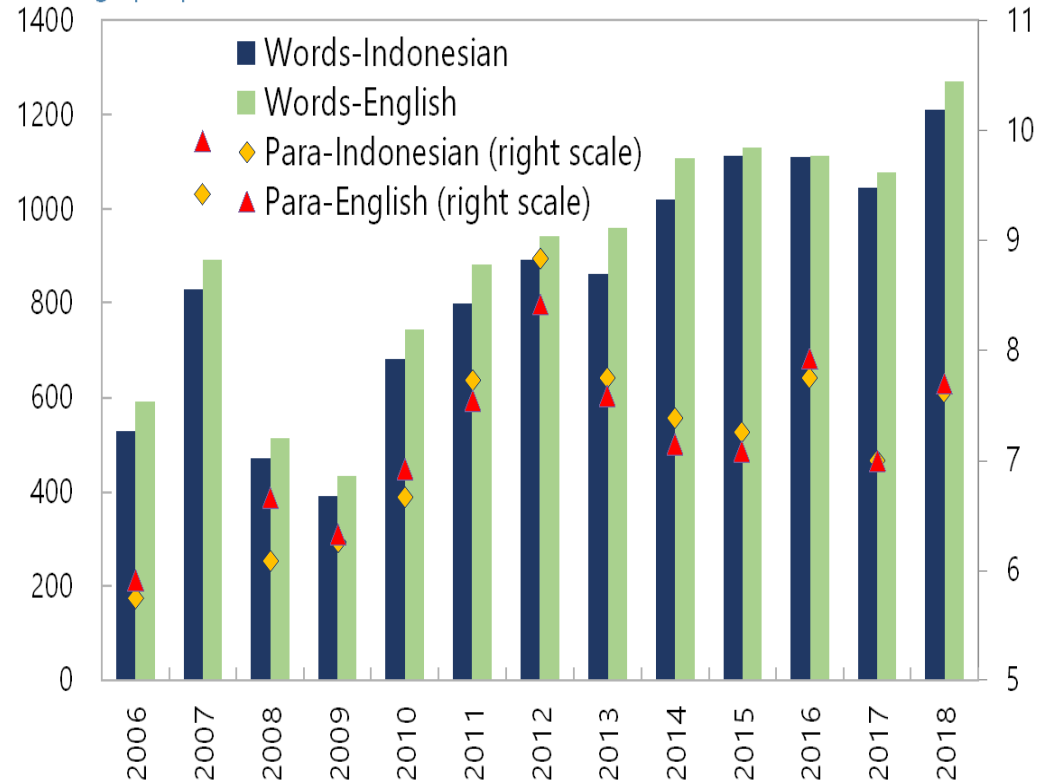
Central Bank Transparency Index

(Dincer and Eichengreen)



Number of Words and Paragraphs

(Average per press release)



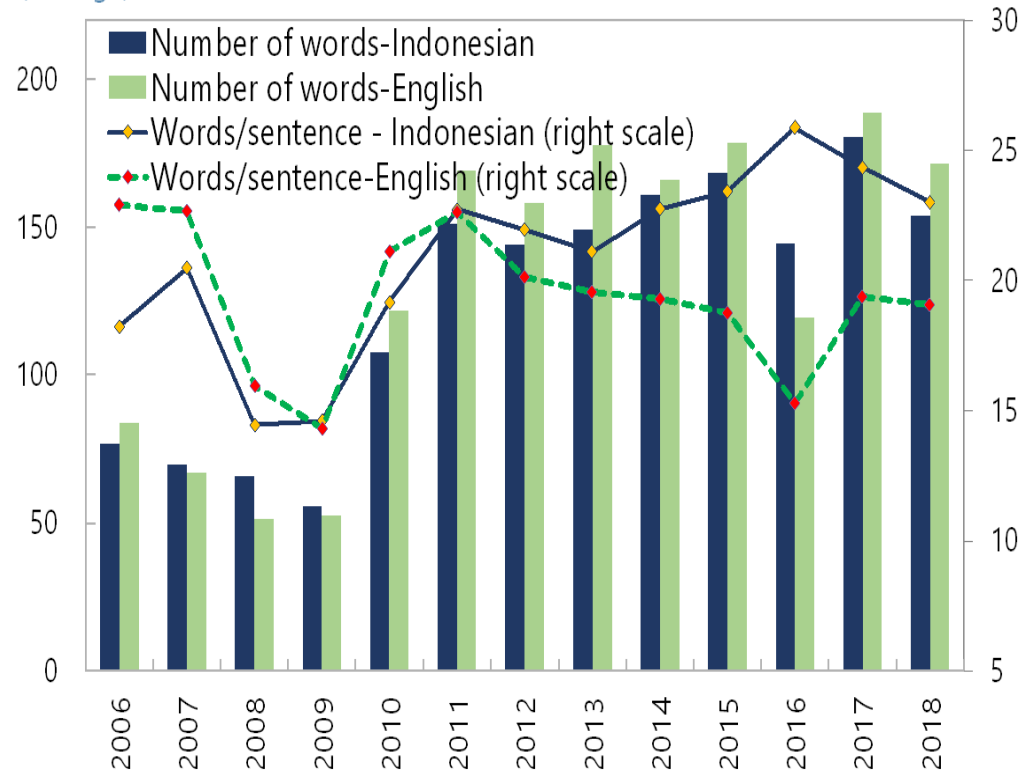
Sources: BI Website; and IMF staff estimates.

Transparency and Clarity of Communication

- However, clarity may have been lost (sentences became complex over time): longer sentences and longer paragraphs.

Policy Decision Paragraphs

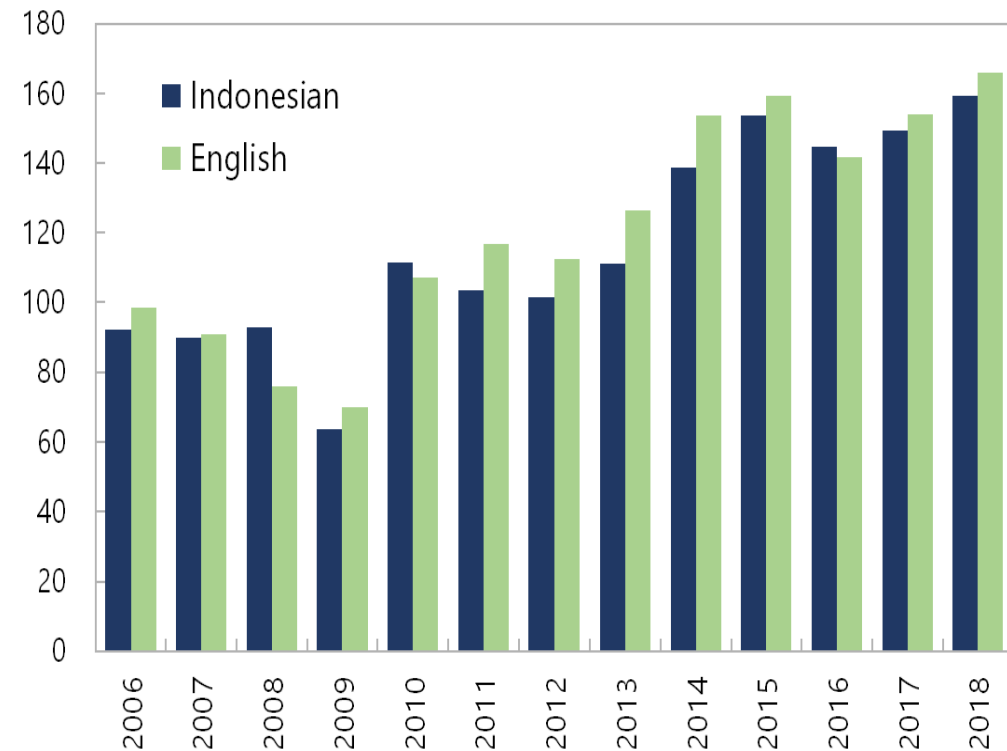
(Average)



Sources: BI Website; and IMF staff estimates.

Number of Words in One Paragraph

(Average)

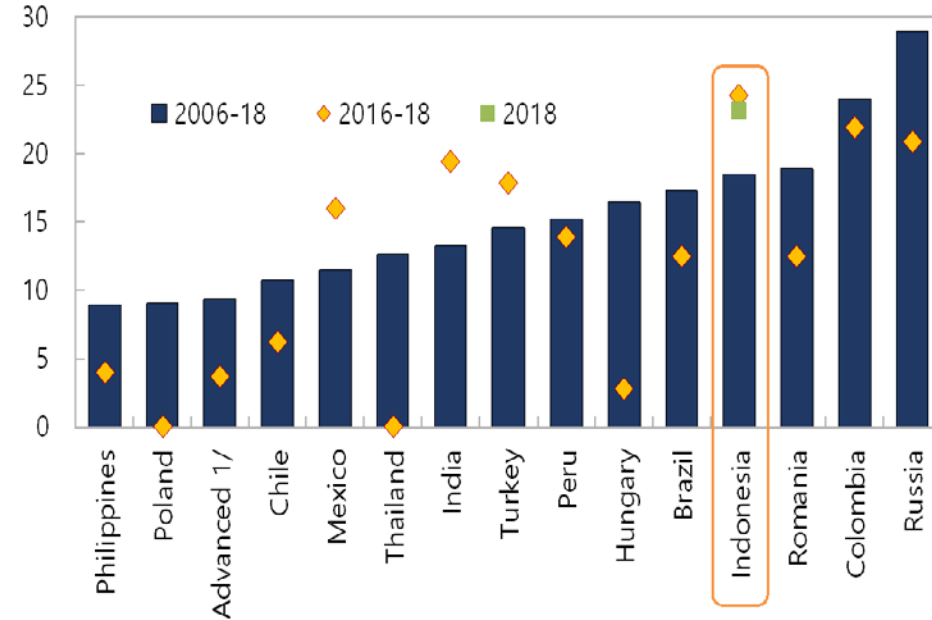


Sources: BI Website, IMF staff estimates.

Predictability – Relatively frequent surprises, particularly in periods of stress

Frequency of Monetary Policy Surprises, 2006-18

(In percent of total monetary policy meetings)

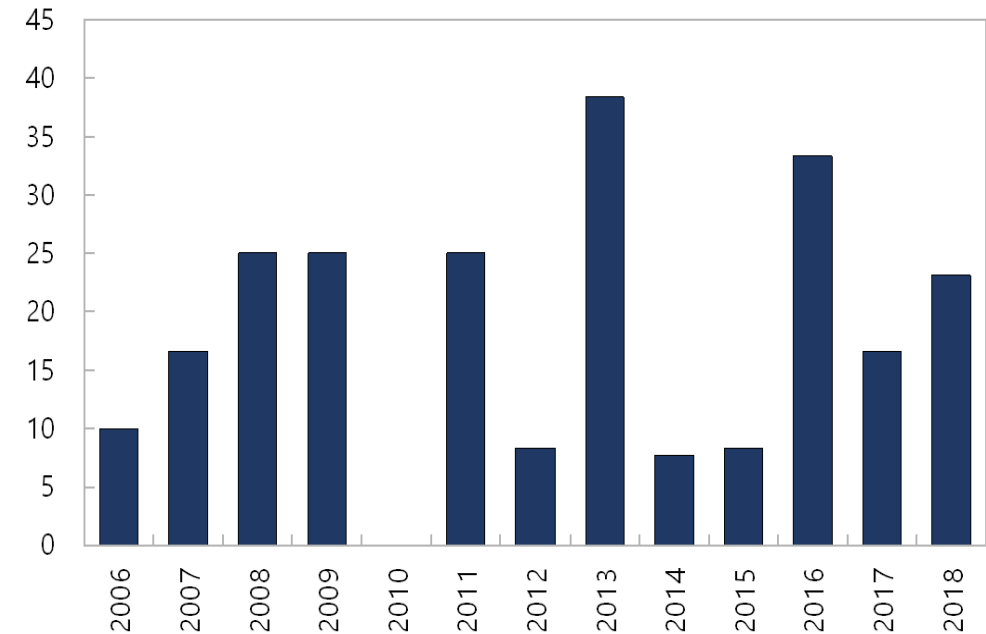


Sources: Bloomberg LP.; and IMF staff estimates.

1/ Average of Canada, Australia, Czech Republic, Korea, New Zealand, Norway, United Kingdom, and United States.

Frequency of Monetary Policy Surprises

(In percent of total monetary policy meetings)



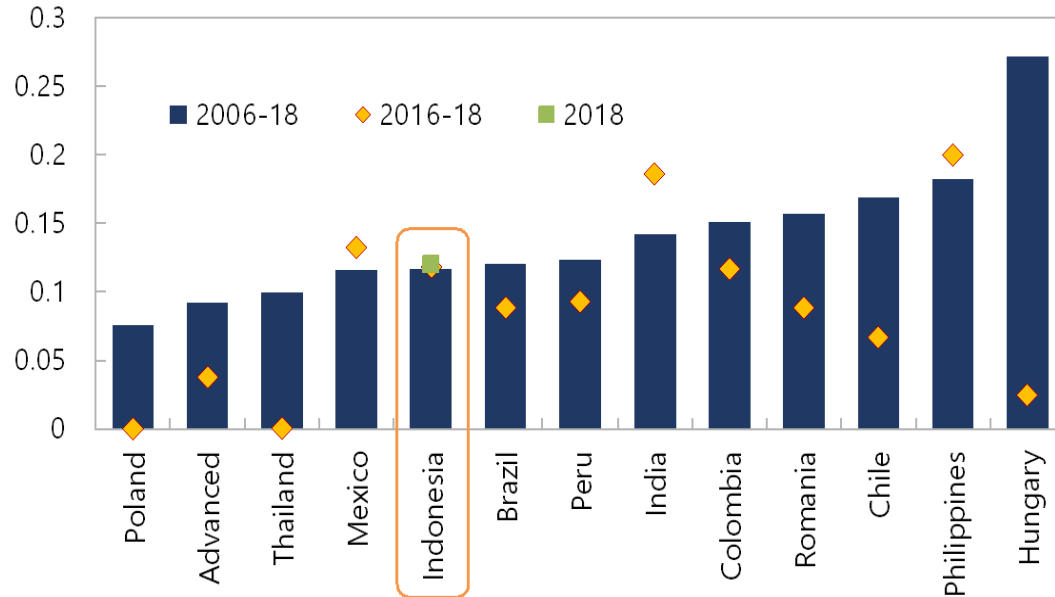
Sources: Bloomberg LP.; and IMF staff estimates.

- *Policy rate change = unanticipated + anticipated change*
- $\Delta r_t = (r_t - E_{i,t-1}r_t + E_{i,t-1}r_t - r_{t-1}) = \Delta r_{i,t}^u + \Delta r_{i,t}^a$

Predictability – surprises of moderate size

Size of Monetary Policy Surprises, 2006-18

(Root mean square error of monetary policy forecasts)

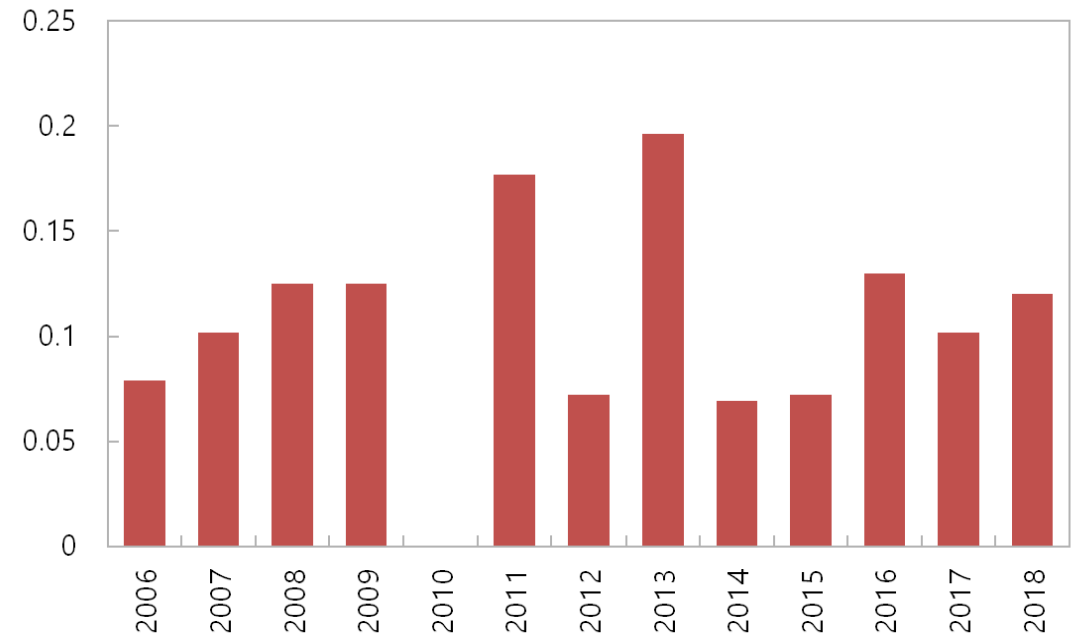


Sources: Bloomberg LP.; and IMF staff estimates.

1/ Average of Canada, Australia, Czech Republic, Korea, New Zealand, Norway, United Kingdom, and United States.

Size of Monetary Policy Surprises

(Root mean square of monetary policy forecasts)



Sources: Bloomberg LP.; and IMF staff estimates.

- Moderately predictable monetary policy: Even though analysts misjudge policy rate adjustments frequently, they are off by relatively small amounts

Efficacy – How do markets rates react to policy rate decisions?

Variables	Overnight Interbank	1 week Interbank	2 weeks Interbank	3 weeks Interbank	1 month Interbank	1 year Gvt Bd Yield	5 year Gvt Bd Yield	10 year Gvt Bd Yield	Exchange Rate
Unanticipated	1.369 ***	1.000 ***	1.195 ***	0.469 ***	0.540 ***	0.285	0.133	-0.008	112.883
	0.357	0.190	0.252	0.170	0.210	0.175	0.113	0.096	75.787
Anticipated	0.442	0.334	0.505 *	0.203	0.231	-0.014	0.001	-0.115	0.946
	0.376	0.224	0.258	0.221	0.167	0.087	0.057	0.058	20.736
Constant	-0.014	0.003	0.014	0.005	0.010	-0.003	-0.003	-0.006	-2.198
	0.039	0.016	0.019	0.016	0.025	0.015	0.010	0.048	5.420

- Markets are functioning as expected, though only at very short maturities
 - Rate surprises (unanticipated rate changes) affect short-term market rates.
 - Anticipated rate changes have no significant impact on short-term or long-term market rates.
 - No significant impact on government bond yields or exchange rate
- Notes
 - Sample = days corresponding to MPC meetings (2006-2018, 158 observations).
 - For all regression, we control for change in U.S. federal fund rate, 1month U.S. treasury bill + 10 year U.S. treasury bond, IDN CDS, IDN EMBI spread.

Efficacy – impact of monetary policy press release

Variables	1 week Interbank	2 week Interbank	3 week Interbank	1 month Interbank	1 year Gvt Bd Yield	5 year Gvt Bd Yield	10 year Gvt Bd Yield	Exchange Rate
Overnight	0.759 ***	0.327 **	0.063	-0.211	-0.055	0.009	-0.071	47.169
	0.100	0.144	0.081	0.313	0.091	0.089	0.083	34.571
Surprise dummy	-0.046 **	-0.051	0.028	-0.005	0.029	0.012	0.008	-14.485
	0.018	0.034	0.032	0.050	0.030	0.019	0.014	10.925
Surprise dummy*Overnight	-0.439 ***	-0.095	-0.087	0.304	-0.094	-0.023	0.077	-51.566
	0.106	0.178	0.078	0.315	0.141	0.090	0.084	35.952
Unanticipated	1.008 ***	1.201 ***	0.466 ***	0.539 **	0.213	0.159	-0.015	134.627 *
	0.147	0.246	0.171	0.212	0.159	0.117	0.090	81.048
Anticipated	0.301 **	0.479 **	0.214	0.237	-0.049	0.009 *	-0.056 *	-7.623
	0.141	0.208	0.227	0.152	0.112	0.061	0.028	22.487
Constant	0.028 ***	0.042 **	-0.010	0.013	-0.010	-0.008 ***	0.037	5.984
	0.008	0.017	0.017	0.037	0.023	0.013	0.010	5.707

- In the absence of rate surprise, significant movement in rates can be attributed to information in the press release.
- Here there is NO such significant impact → Monetary policy press releases have impact on short end of the curve, but that does not propagate to the rest of the curve.

Efficacy – impact of monetary policy reviews and reports (MPR)

Variables	1 week	1 week	2 week	2 week	3 week	3 week	1 month	1 month	1 year	1 year	5 year	5 year	10 year	10 year	Exchange	Exchange
	IB	IB	IB	IB	IB	IB			Bd Yield	Bd Yield	Bd Yield	Bd Yield	Bd Yield	Bd Yield	Rate	Rate
Overnight Interbank Rate	0.330 ***		0.185 ***		0.028		0.010		0.054		0.009 *		-0.005		4.028	
	0.063		0.070		0.023		0.030		0.037		0.005		0.013		3.590	
Overnight rate (full sample)		0.313 ***		0.242 ***		0.031 **		0.012 *		-0.002		0.001		-0.001		1.6
		0.029		0.040		0.014		0.007		0.004		0.002		0.003		1.402
Constant	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	-0.002	0.000	-0.129 ***	0.020 ***	-2.117	4.554 **
	0.023	0.006	0.026	0.006	0.015	0.005	0.030	0.006	0.010	0.004	0.005	0.002	0.014	0.004	5.499	2.110

- Do we observe larger movements in market rates on days of release of MPRs, compared to other days?
- No → MPRs do not have a significant impact on market rates.

Efficacy: Impact of press release and MPRs – alternative approach

Variables	Overnight Interbank	1 week Interbank	2 week Interbank	3 week Interbank	1 month Interbank	1 year Gvt Bd Yield	5 year Gvt Bd Yield	10 year Gvt Bd Yield	Exchange Rate
Press Release Dummy	-0.051	-0.005	0.010	-0.014	0.008	0.000	0.011	-0.117 **	-5.434
	0.052	0.020	0.022	0.018	0.023	0.013	0.008	0.050	6.642
MPR Release Dummy	0.002	0.028	0.006	-0.029 *	0.015	-0.021 *	-0.017 ***	-0.012	-8.120
	0.076	0.032	0.027	0.017	0.027	0.011	0.005	0.090	6.662
Policy Rate Change	-0.401	-0.262 **	-0.197	-0.131	-0.097	0.033	-0.002	0.061	-18.329
	0.233	0.127	0.164	0.143	0.114	0.049	0.037	0.048	29.573
Macroeconomic releases dummy	-0.042	-0.035 **	-0.050 ***	-0.007	-0.056 ***	-0.004	-0.004	-0.011	-7.000
	0.038	0.015	0.013	0.016	0.012	0.010	0.005	0.056	6.430
Constant	0.253 ***	0.142 ***	0.150 ***	0.081 ***	0.158 ***	0.095 ***	0.062 ***	0.230 ***	70.726 ***
	0.018	0.008	0.008	0.006	0.007	0.004	0.002	0.022	5.299

- Dependent variables here are absolute value of change in market rates.
- Press releases do not affect market rates beyond the impact of policy rate change.
- MPRs do not have a significantly effect market rates.

Preliminary Conclusions

- Multiple objectives of monetary policy appear difficult to communicate to markets
- Monetary policy is somewhat predictable (relatively more surprises, but small magnitude of gaps)
- Monetary policy surprises have a statistically significant impact on the money market (though the market is liquid only at 1month maturity or less)
- Monetary policy press releases and monetary policy reports do not appear to have significant impacts on market rates → impact of monetary policy communication per se is not significant

Growth-at-Risk Analysis for Indonesia

IMF Article IV Team

May, 2019

Growth-at-Risk: Key Concept

- Lesson from the GFC: “**Macrofinancial developments, such as changes in assets prices and leverage, affect economic growth.**”
 - **Macrofinancial vulnerabilities** increase in buoyant economic conditions when risks appear subdued.
 - Once macrofinancial vulnerabilities are elevated, a tightening of **financial conditions** can pose significant downside risks to economic activities.
- **Tracking the evolution of financial conditions and macrofinancial vulnerabilities** provide valuable information regarding risks to future growth.

List of Macroeconomic Variables

List of Macroeconomic Variables for the Indonesia GaR Analysis

Financial Conditions

- Real long-term interest rates
- Term spread
- Sovereign spreads
- Corporate spreads
- CEMBI market cap
- Equity returns
- Change in foreign exchange rate
- VIX

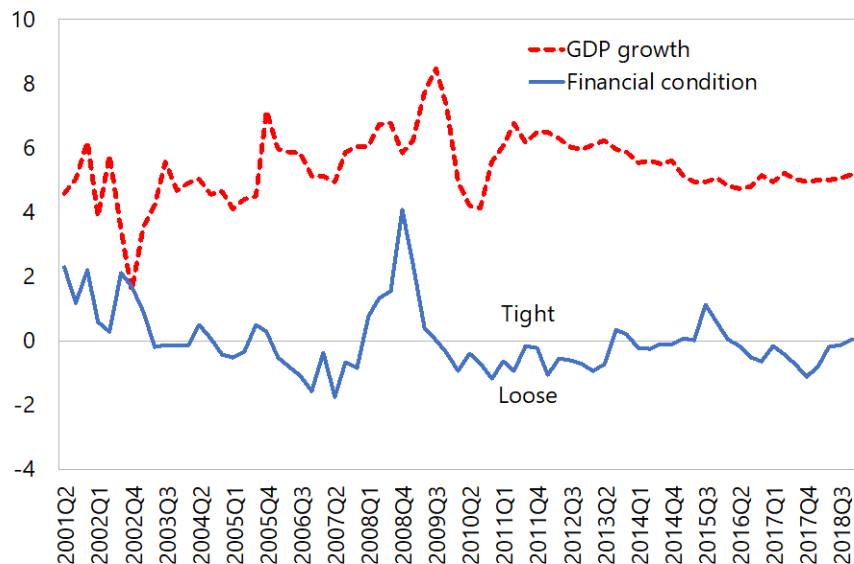
Macroeconomic Vulnerability

- Credit growth
- Credit gap
- NPL ratios in the banking system
- Ratio of external debt to GDP
- Ratio of currency account balance to GDP
- House price growth

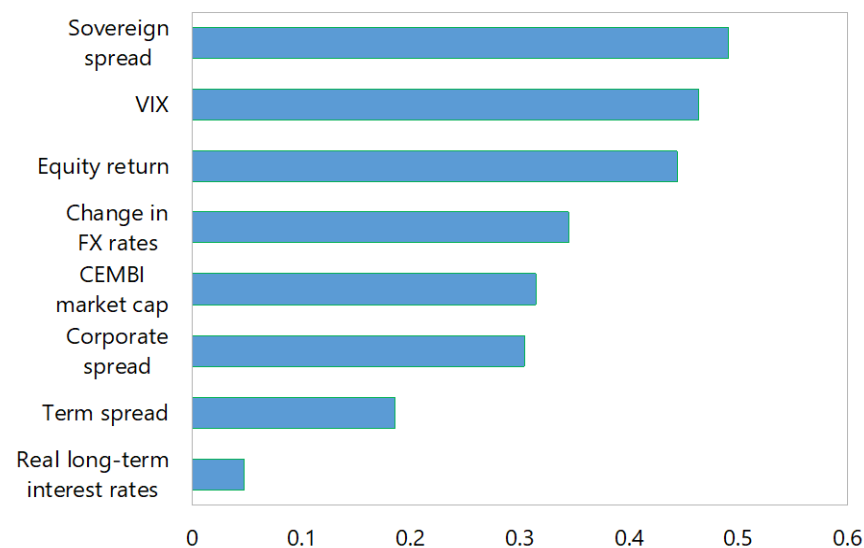
Financial Conditions

- Financial condition index (FCI) is constructed by extracting the first principal component from a collection of eight variables.
- Financial conditions are driven by both domestic and external factors.
- Tightening of financial conditions before the GFC is well reflected.
- The FCI has tightened in recent quarters to a neutral level by historical standard.

FCI and GDP Growth Rate



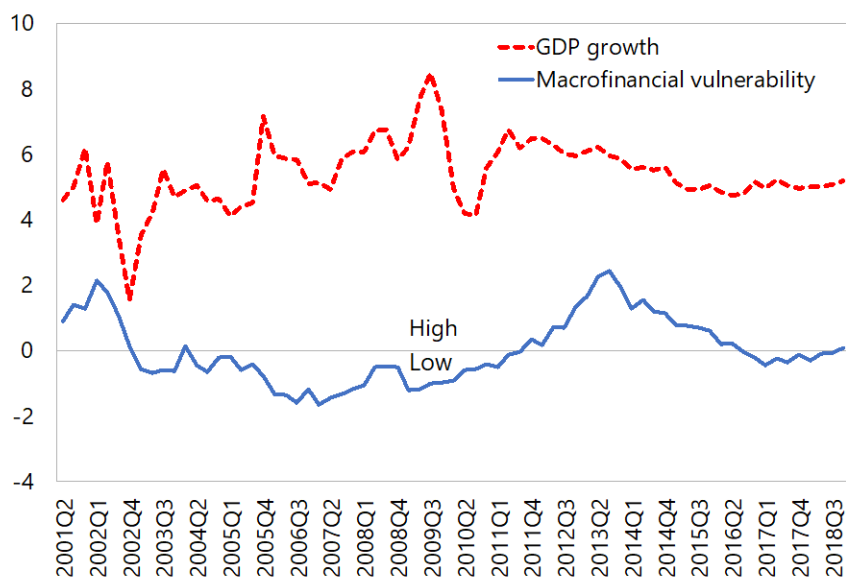
Factor Loadings for FCI



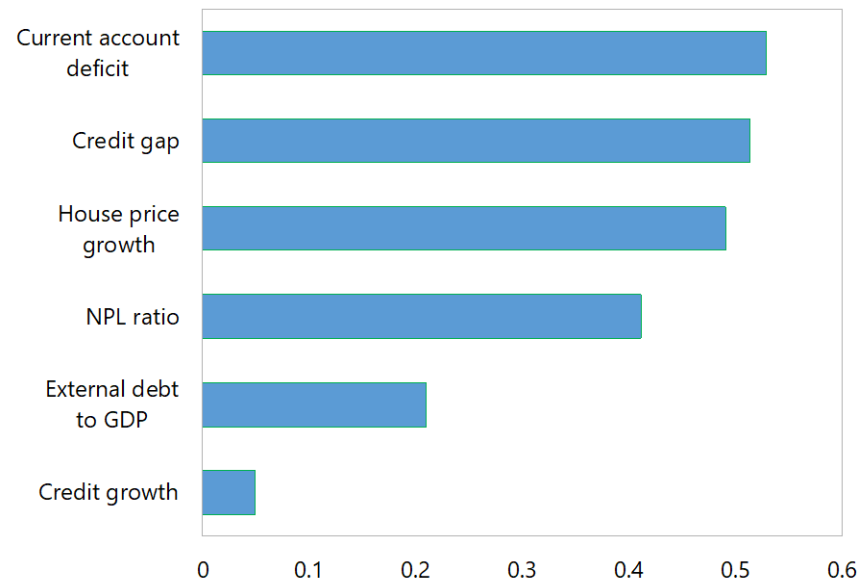
Macrofinancial Vulnerabilities

- Macrofinancial vulnerability index (MVI) is the first principal component from a list of slow-moving credit aggregates and sectoral indicators, capturing credit booms-busts and macrofinancial imbalances.
- CADs and credit gap are two key variables to explain the MVI.
- The MVI increased in 2018 and turned to positive at the end of 2018 as CADs were widened and corporate external debt increased.

MVI and GDP Growth Rate



Factor Loadings for MVI

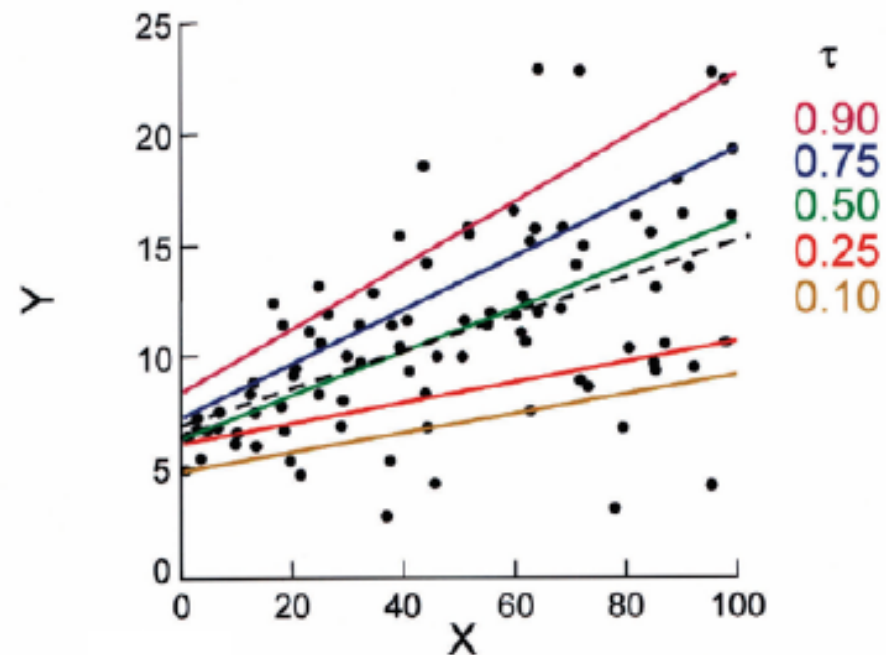


Quantile Regression: Model

- Quantile regression: $y_{t+h} = \alpha^\tau + \sum_{i \in I} \beta_i^\tau X_{i,t} + \varepsilon_{i,t}^\tau$, for $\tau \in \{10, 25, 50, 75, 90 \text{ percentile}\}$, where

- y_{t+h} represents future GDP growth h quarters ahead.
- $X_{i,t}$ includes three partitions (FCI, MVI, and external factor).
- β_i^τ are coefficients of the τ quantile regression.

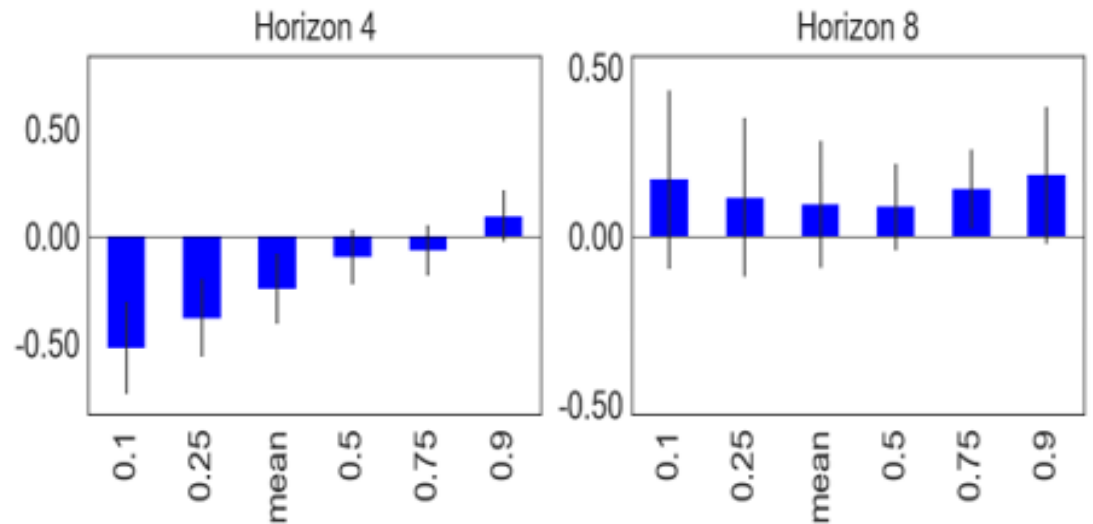
Example of Quantile Regression



Quantile Regression: Results

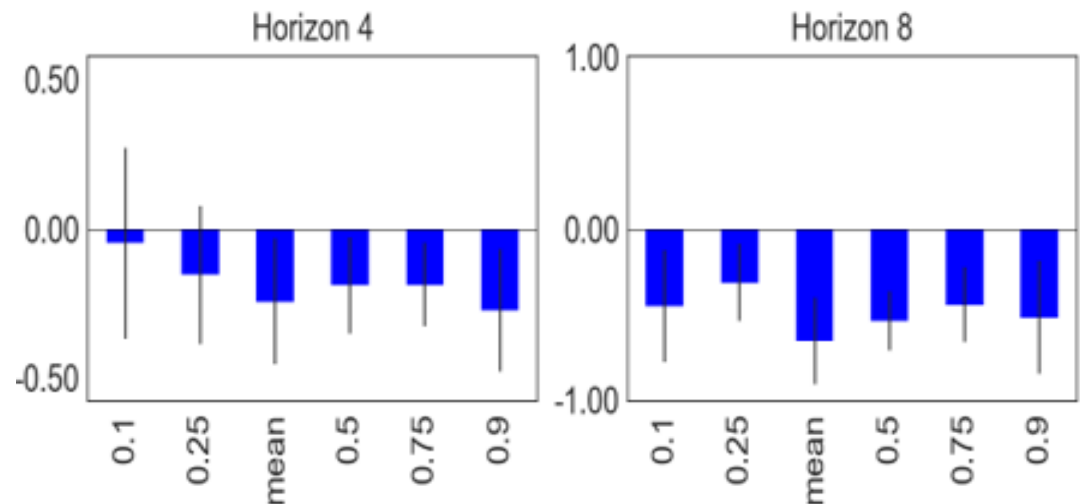
- Tighter financial conditions are associated with lower GDP growth in the short-term and higher growth over the medium term.

Coefficients for FCI over four and eight quarters ahead



- Elevated macrofinancial vulnerabilities are associated with weaker growth regardless of the horizon.

Coefficients for MVI over four and eight quarters ahead



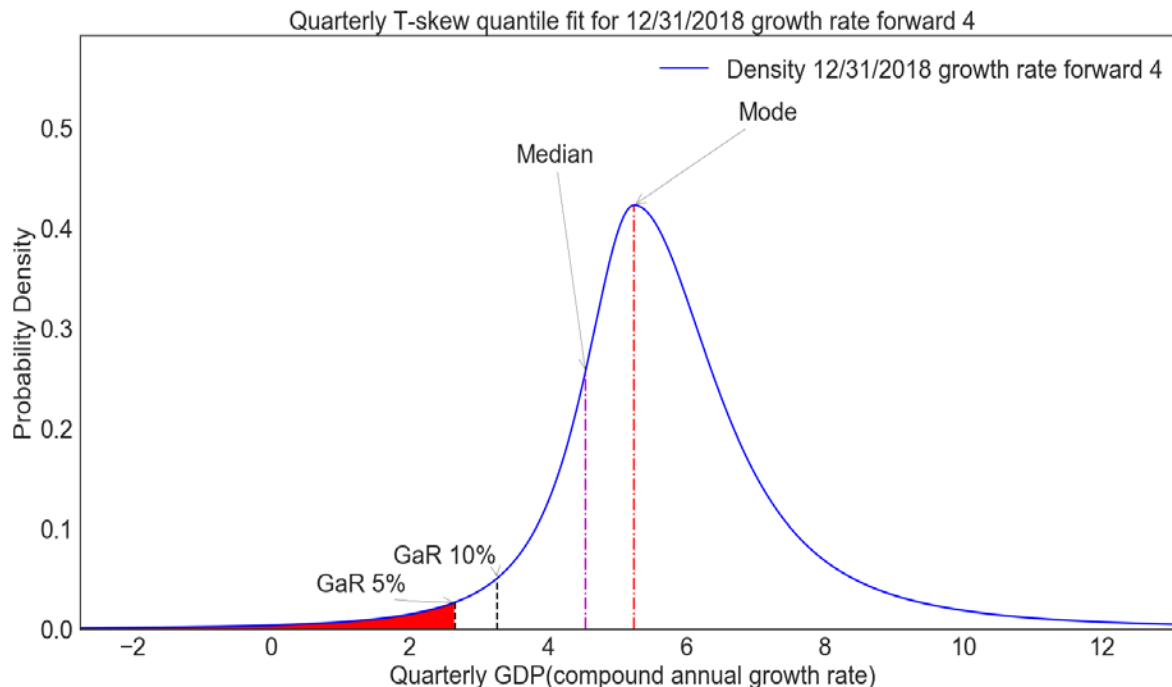
Parametric Fit of GDP Growth Rate (1)

- Parametric method to fit the conditional quantiles of future GDP growth with a T-skew distribution.

loc^* , $scale^*$, $skew^*$, $kurtosis^*$

$$= \underset{\tau}{argmin} \left[\sum_{\tau} \{tsk. quantile(\{loc, scale, skew, kurtosis\}, \tau) - Q(y_{t+h}, \tau)\}^2 \right]$$

- The 2019 GDP growth rate is most likely to be 5.2 percent, conditional on financial conditions and macrofinancial vulnerabilities at end-2018.

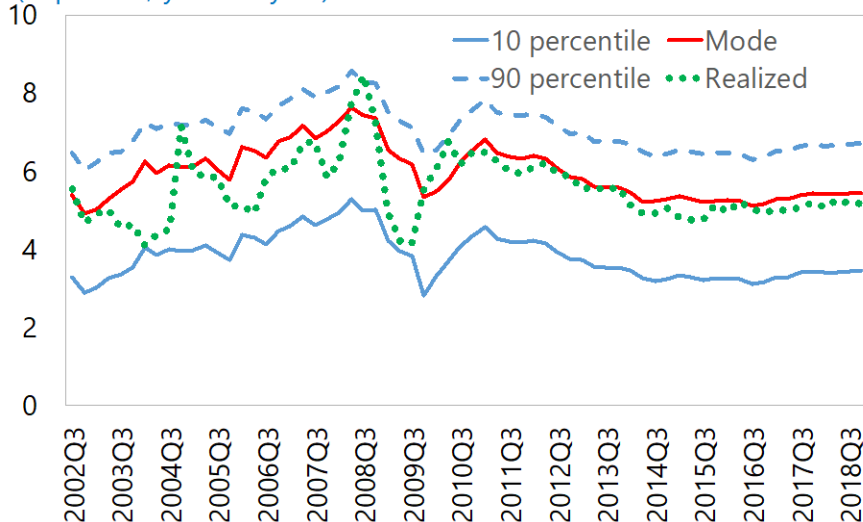


Parametric Fit of GDP Growth Rate (2)

- The predicted growth rate (mode) closely tracks the realized growth.
- The probability of a recession is less than 1 percent in 2019.
- **Caveat:** Note that the estimation does not cover the Asian Financial Crisis period.

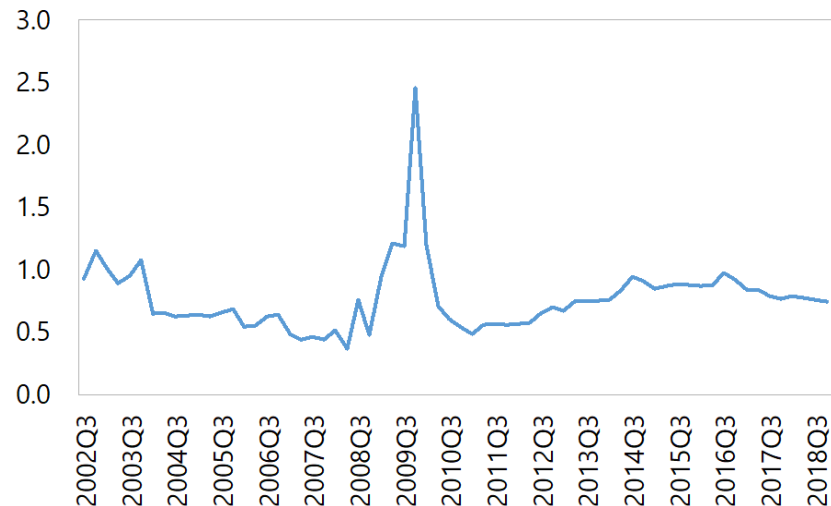
Forecasted GDP Growth Distribution

(In percent, year-on-year)



Probability of Recession

(In percent, four quarters ahead)



Growth-at-Risk: Resource

- The GaR method is open-source, public, and available on Github: <https://github.com/IMFGAR/GaR/>
- Full documentation available in the folder, including the technical appendix.
- IMF WP 19/36 on Growth-at-Risk: Concept and Application in IMF Country Surveillance (2019).
- Original Paper: Adrian and others, "Vulnerable Growth" (AER 2019, vol. 109, pp. 1263-89).

Thank you for your attention!

Growth-at-Risk: Steps

- **Collect and Select** relevant **macrofinancial variables**.
- **Group** them **into three partitions**: financial conditions, macrofinancial vulnerabilities, and external factors.
- **Extract** the information from three groups of variables and summarize it **into three principal components**.
- **Estimate quantile regressions** to link three components with quantiles of future GDP growth rates.
- **Derive the parametric fit** of the conditional quantiles of future GDP growth.