Overview of Financial Stability and Systemic Risk

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Seminar on Macroprudential Supervision

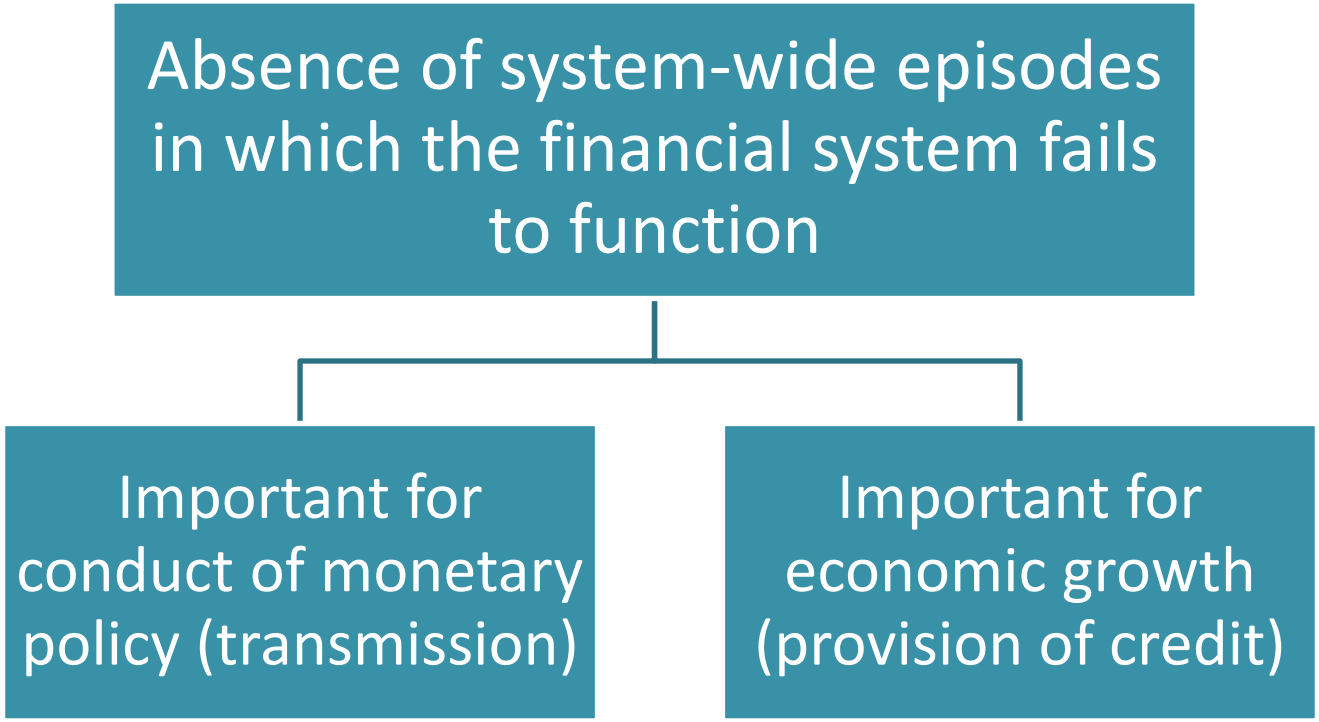
IMF – South Asia Training and Technical Assistance Center
APEC Financial Regulators Training Initiative
Bangkok, 16-19 July 2018

Outline

1. Financial Stability
2. Systemic Risk
3. Systemic Risk and Balance Sheet Linkages
4. Conclusion

Financial Stability

What is Financial Stability?



Likely to have financial stability when there is:

1. Monetary stability and employment close to "natural" rate
2. Efficient and smooth transfer of resources from savers to investors
3. Financial risks are appropriately assessed, priced, and managed
4. Confidence in financial system and in absorption of shocks

Definition of Financial Instability

Financial Instability is the materializing of systemic financial risks

FI is characterized by three features:

1. important financial asset prices diverge sharply from fundamentals; and/or
2. market functioning and credit availability significantly distorted, with the result that
3. aggregate spending can deviate significantly from the economy's potential

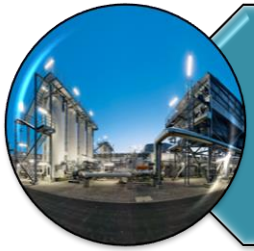
→ **Monitoring and containing systemic risks** key

Systemic Risk

Definition of Systemic Financial Risk

Risk of widespread disruption to the provision of financial services

Caused by an impairment of part or all of all of the financial system



And which can cause serious consequences o the real economy

IMF-FSB-BIS elements of Effective Macroprudential Policies, Aug 2016

Dimensions of Systemic Risk

Time dimension

(How aggregate risk evolves over time)

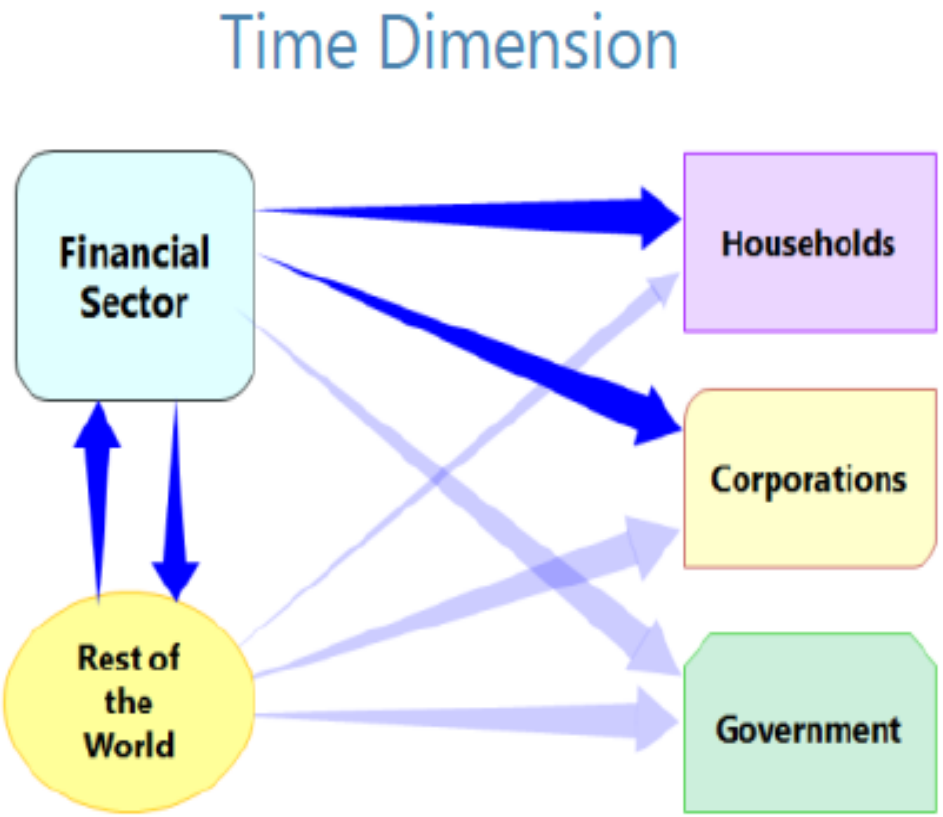
- Pro-cyclicality and macro-financial linkages
  - Process of amplifying feedback between financial sector and real economy
- Policy question: how to dampen pro-cyclicality?

Structural dimension

(How risk is distributed in the system at a given point in time)

- Common exposures across institutions leading to externalities
  - Direct exposures to similar asset classes
  - Indirect exposures through counter-party relationships
- Policy question: how to limit joint failures of institutions that represent a significant portion of the system?

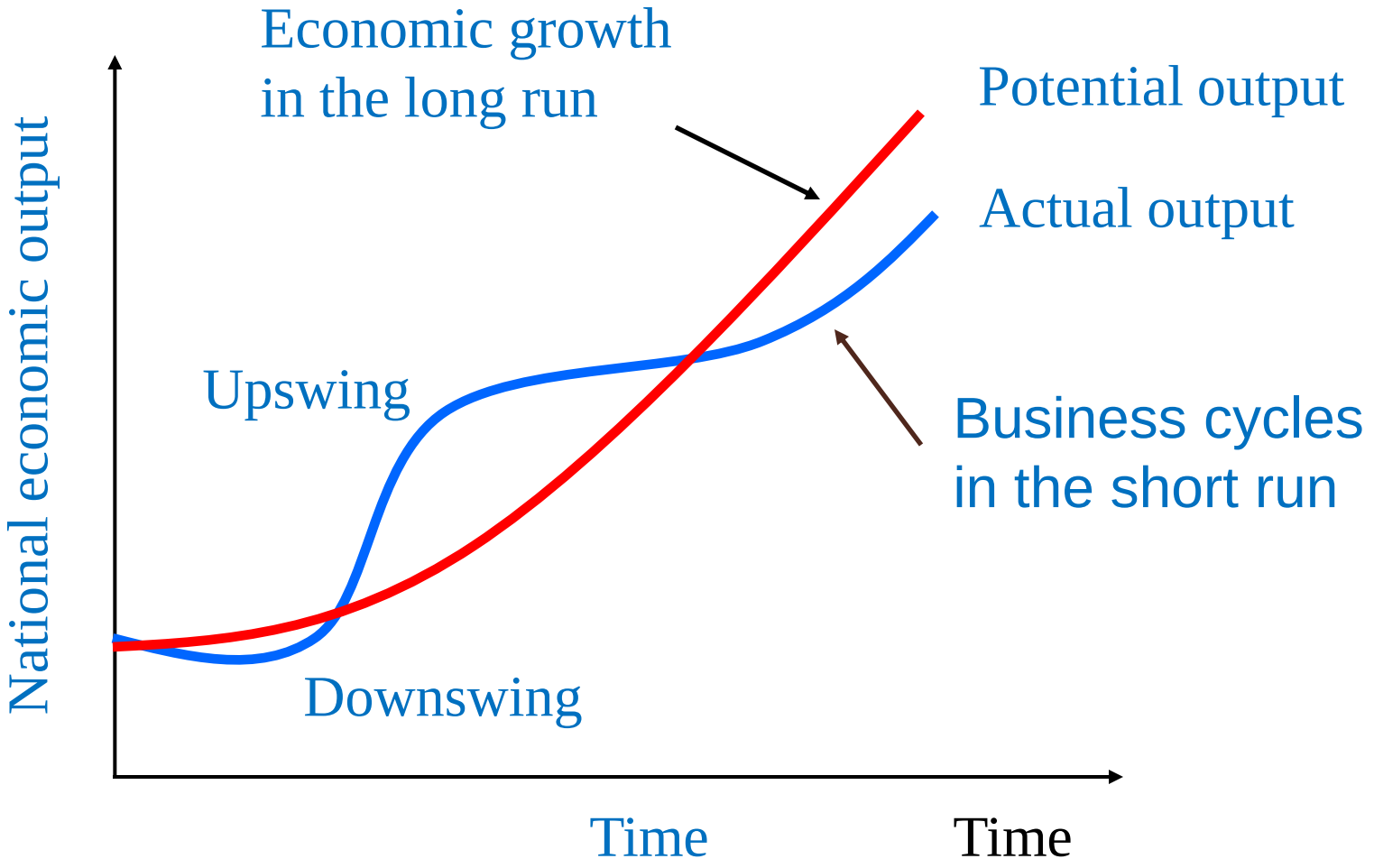
Time Dimensions of Systemic Risk



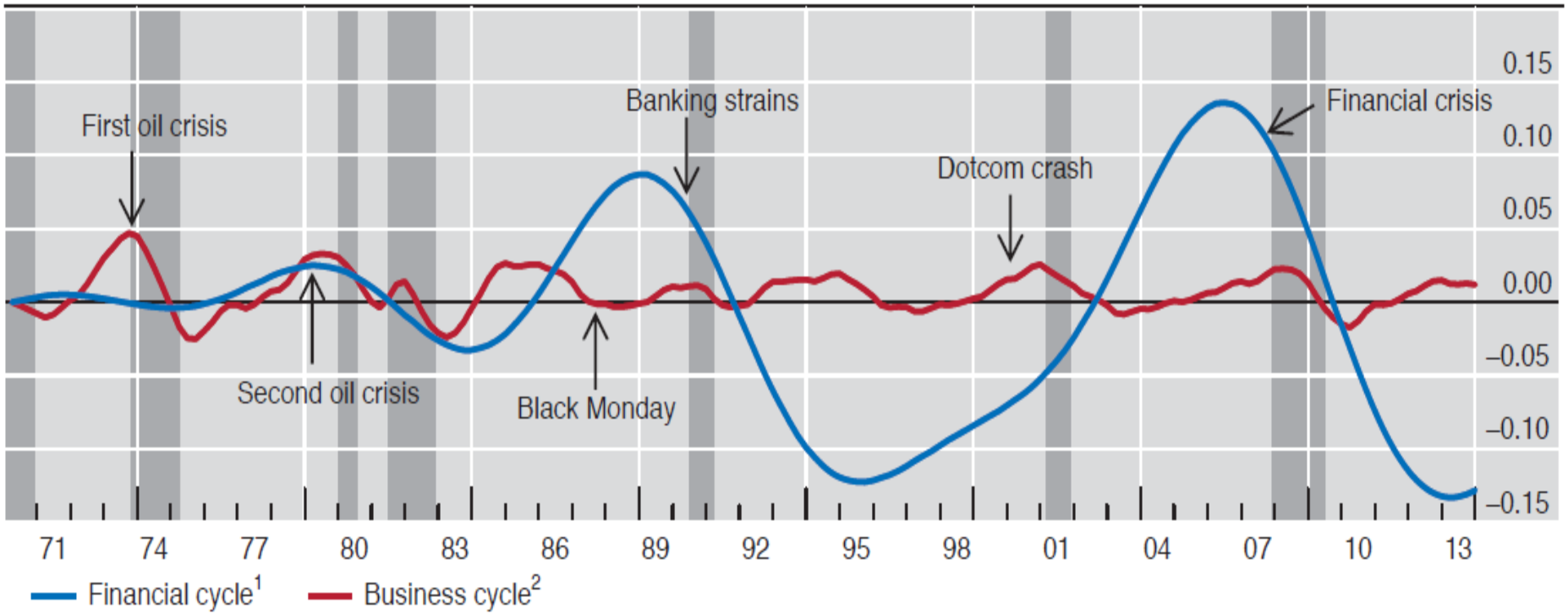
Source: IMF, 2014, *Staff Guidance Note on Macroprudential Policy*.

The Economy and the Business Cycle

The short run vs. the long run



Financial Stability and the Financial Risk Cycle

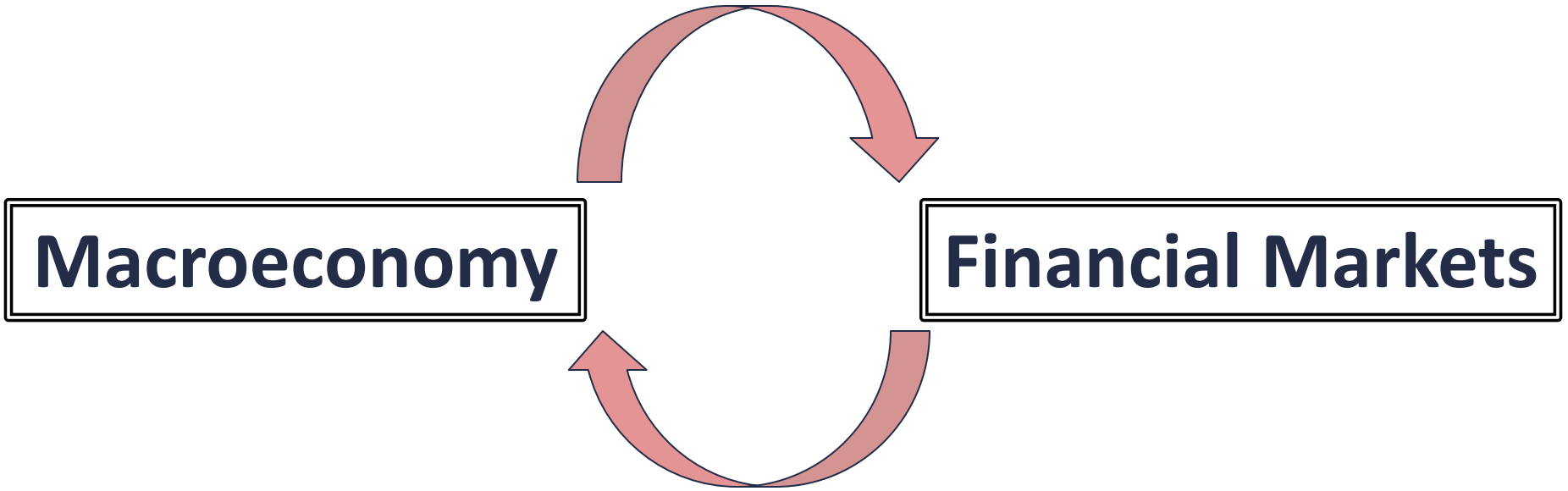


[1] The financial cycle as measured by frequency-based (bandpass) filters capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices. [2] The business cycle as measured by a frequency-based (bandpass) filter capturing fluctuations in real GDP over a period from one to eight years.

Source: BIS Annual Report, 2014 and Borio (2012).

Feedback Loop between the Macroeconomy and Financial Markets

The interactions between the financial system and the real sector can be mutually reinforcing



- Ongoing efforts to understand, model, and quantify these linkages
- Important to improve policymaking and reduce the frequency/costs of crises

Link Between Finance and Macroeconomy

The financial sector can be:

An **amplification mechanism** for macroeconomic shocks (including policy shocks)

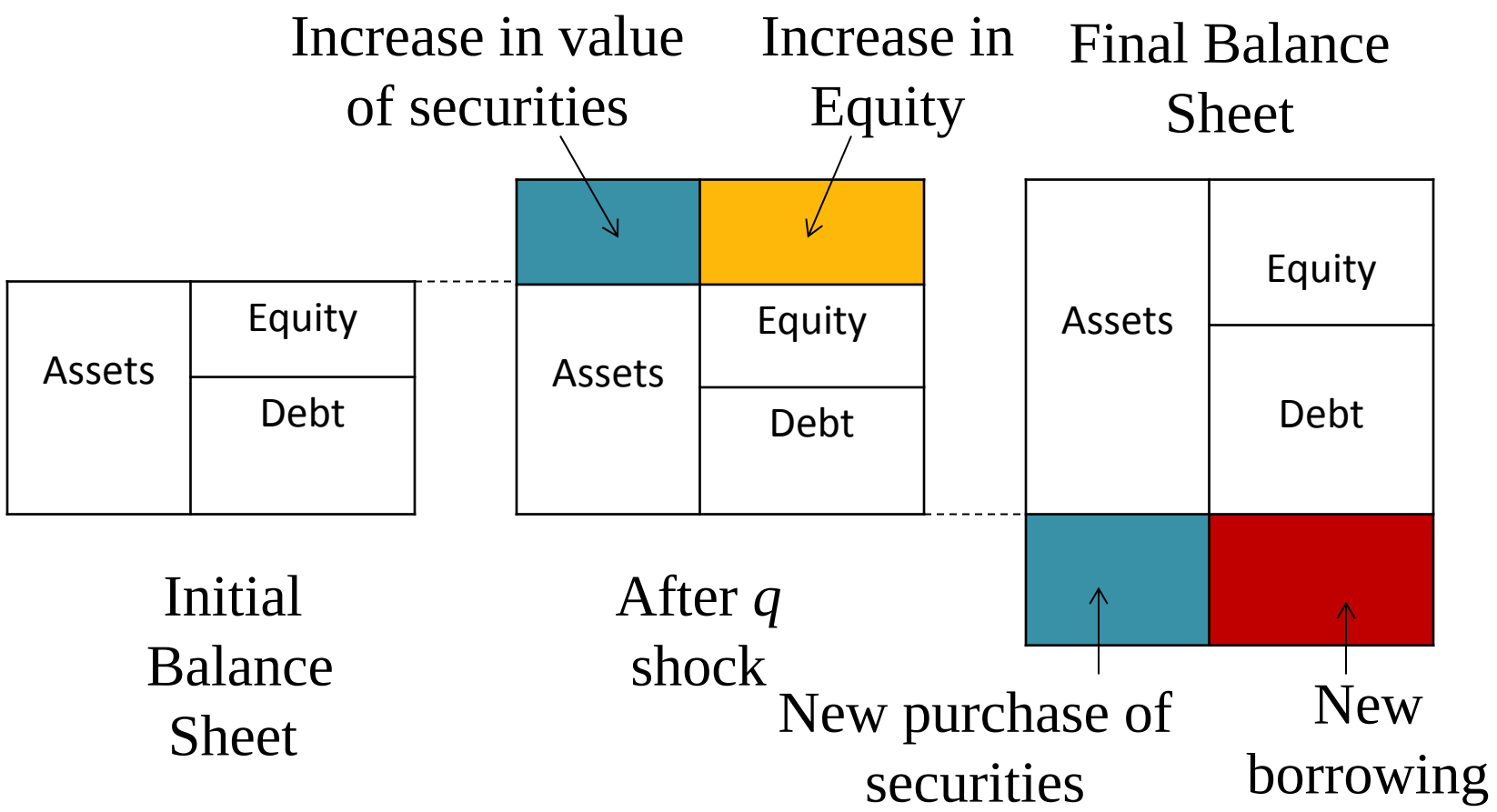
A source of **shocks** (sometimes, “crises”)

A source of **information** about agent’s expectations on macroeconomic variables

Amplification: Financial Accelerator and Leverage

- The "Financial Accelerator" (FA) mechanism is related to the concept of leverage which is also related to net worth
- Leverage is how much you borrow (relative to your own resources) to undertake your activities
- The most damaging credit and asset booms for the real economy are when these booms combined with leverage (deleveraging is damaging: prices of assets fall alongside slow or negative credit growth)
- Assessing the level of leverage in the corporate, household and financial sectors is critical to assess the size and duration of cycles

Pro-Cyclicality of Leverage



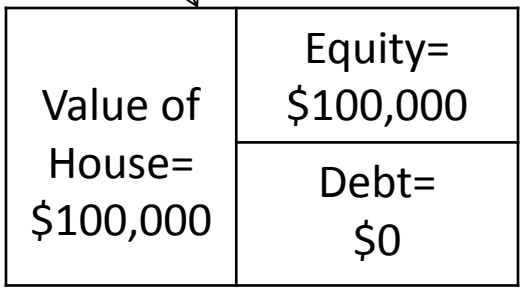
$$L = \frac{A}{E} = \frac{A}{A - D},$$

where $A =$ Assets; $D =$ Debt; and $E =$ Equity

Pro-Cyclicality of Leverage (1)

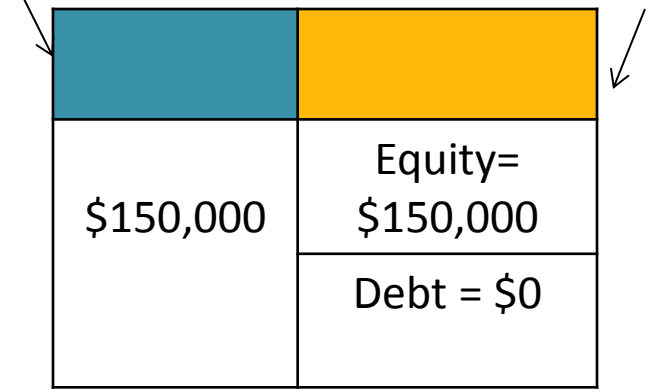
No leverage scenario

Initial value



Increase in value of the house

Increase in your equity and return

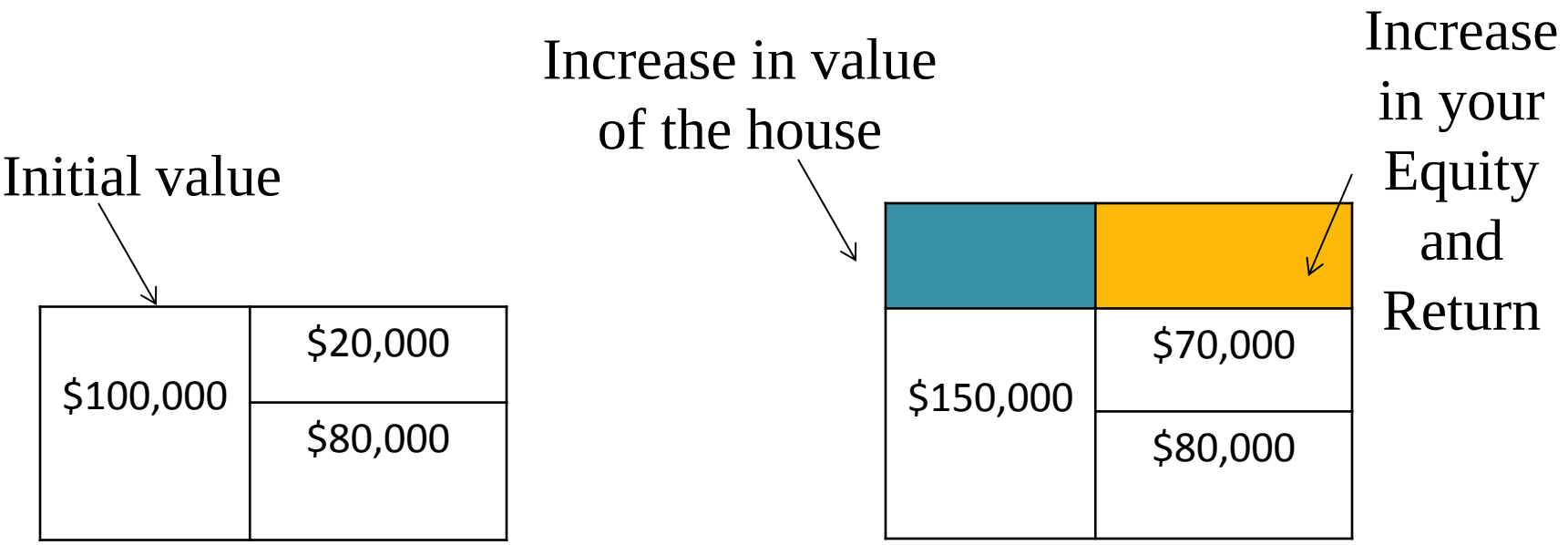


You purchase a house for $100,000. Pay $80,000 from your funds and borrow $20,000 from a bank

After 1 year, house prices go up by $50,000 -> You sell the house. Return = 50,000/150,000*100 = 33%

Your profit is $50,000 from an investment of $100,000 (after 1 year).

Pro-Cyclicality of Leverage (2)



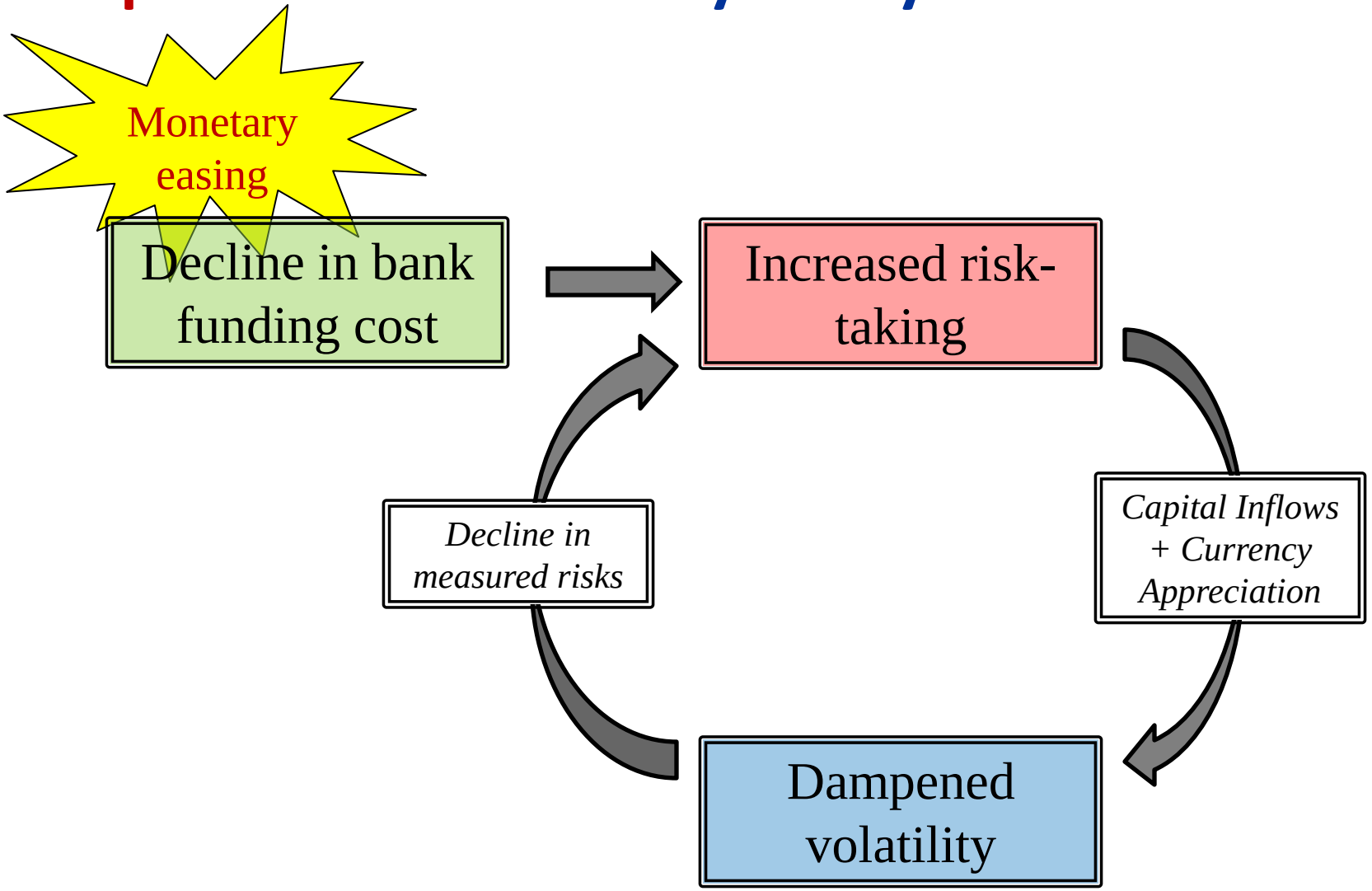
You purchase a house for $100,000. Pay $20,000 from your funds and borrow $80,000 from a bank

After 1 year, house prices go up by $50,000 -> You sell.
Return = 50,000/20,000*100 = 250%

Your profit is $50,000 from an investment of $20,000 (after 1 year).

So, leverage has amplified your returns!

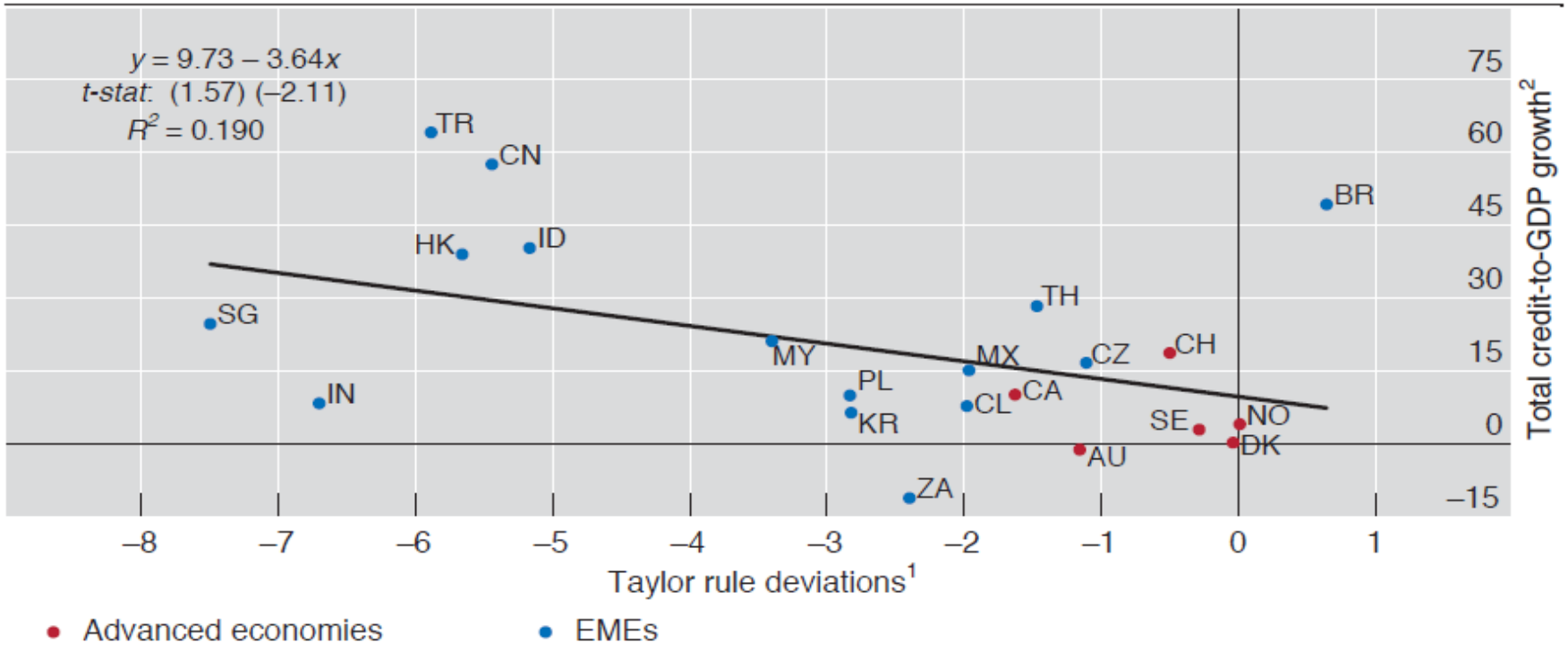
Amplification: Monetary Policy and Bank Funding



Source: Bruno and Shin, 2012, "Capital Flows and the Risk-Taking Channel of Monetary Policy", *BIS Working Papers*, No 400.

Policy rates in Emerging Markets

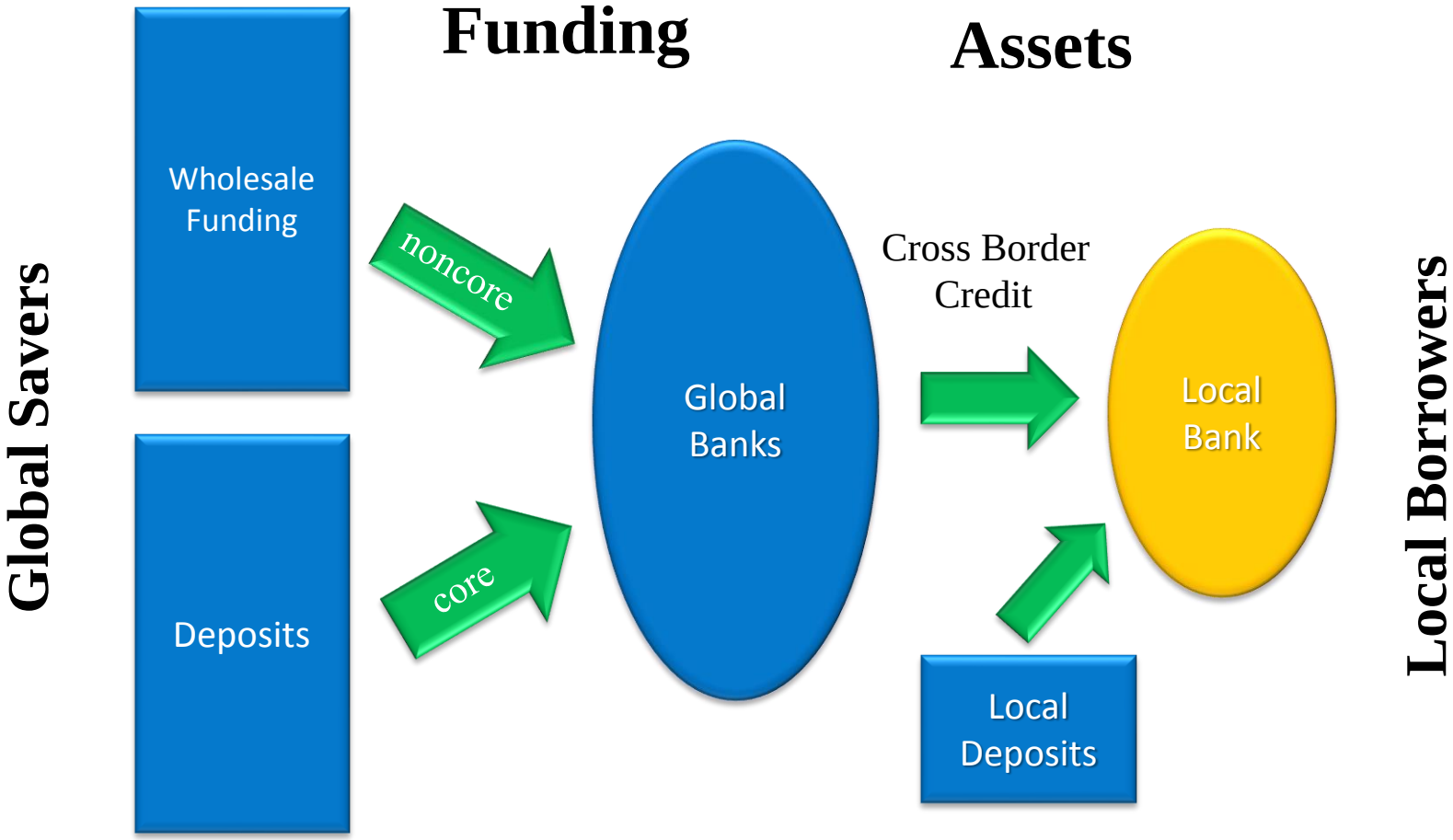
Credit Booms and Low Policy Rate



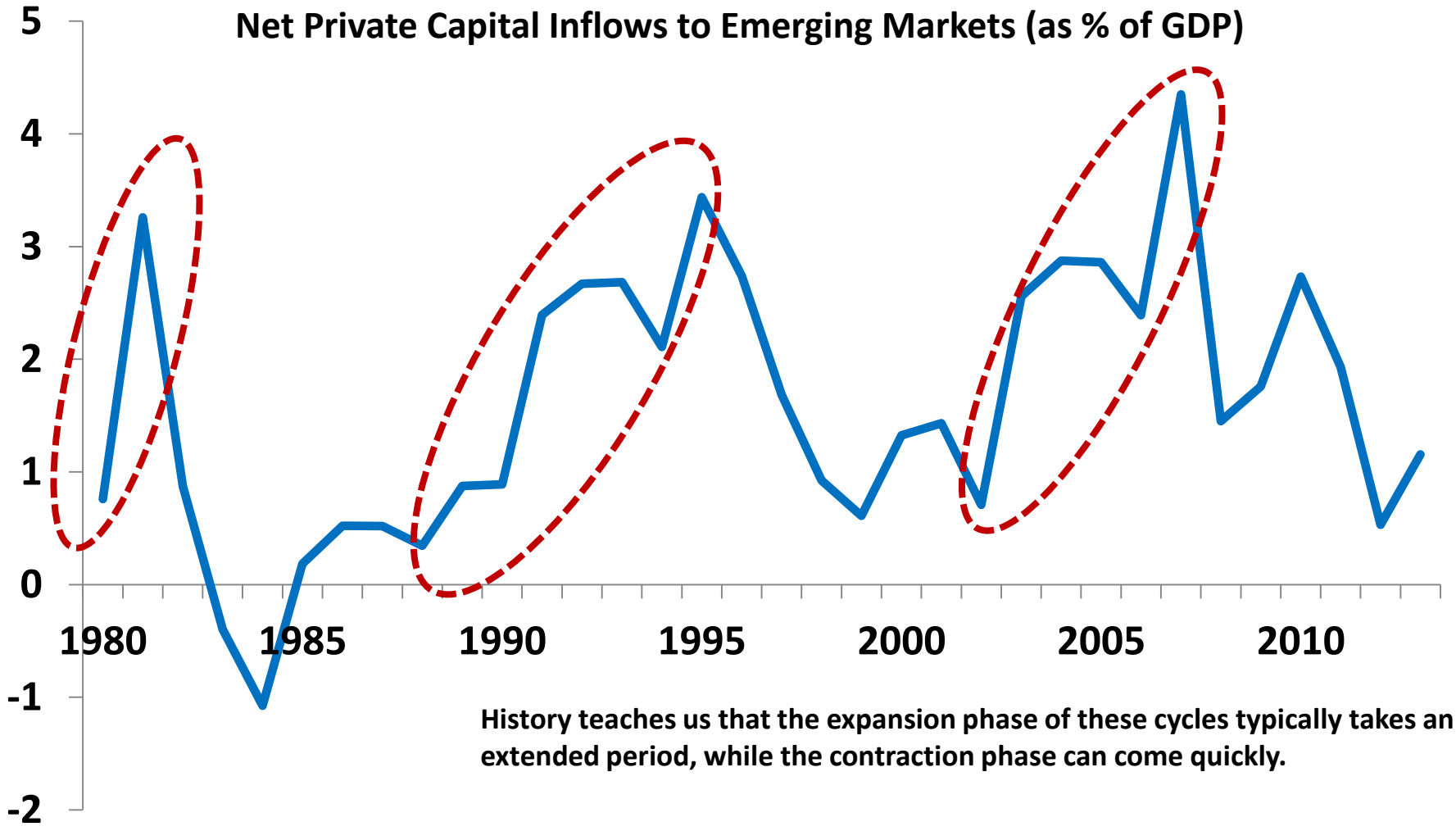
AU = Australia; BR = Brazil; CA = Canada; CH = Switzerland; CL = Chile; CN = China; CZ = Czech Republic; DK = Denmark; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MX = Mexico; MY = Malaysia; NO = Norway; PL = Poland; SE = Sweden; SG = Singapore; TH = Thailand; TR = Turkey; ZA = South Africa.

[1] Policy rates minus Taylor rule rates, average over the period from end-2008 to end-2013. [2] Growth rates of total credit to the private non-financial sector as a ratio of GDP over the period from end-2008 to end-2013.

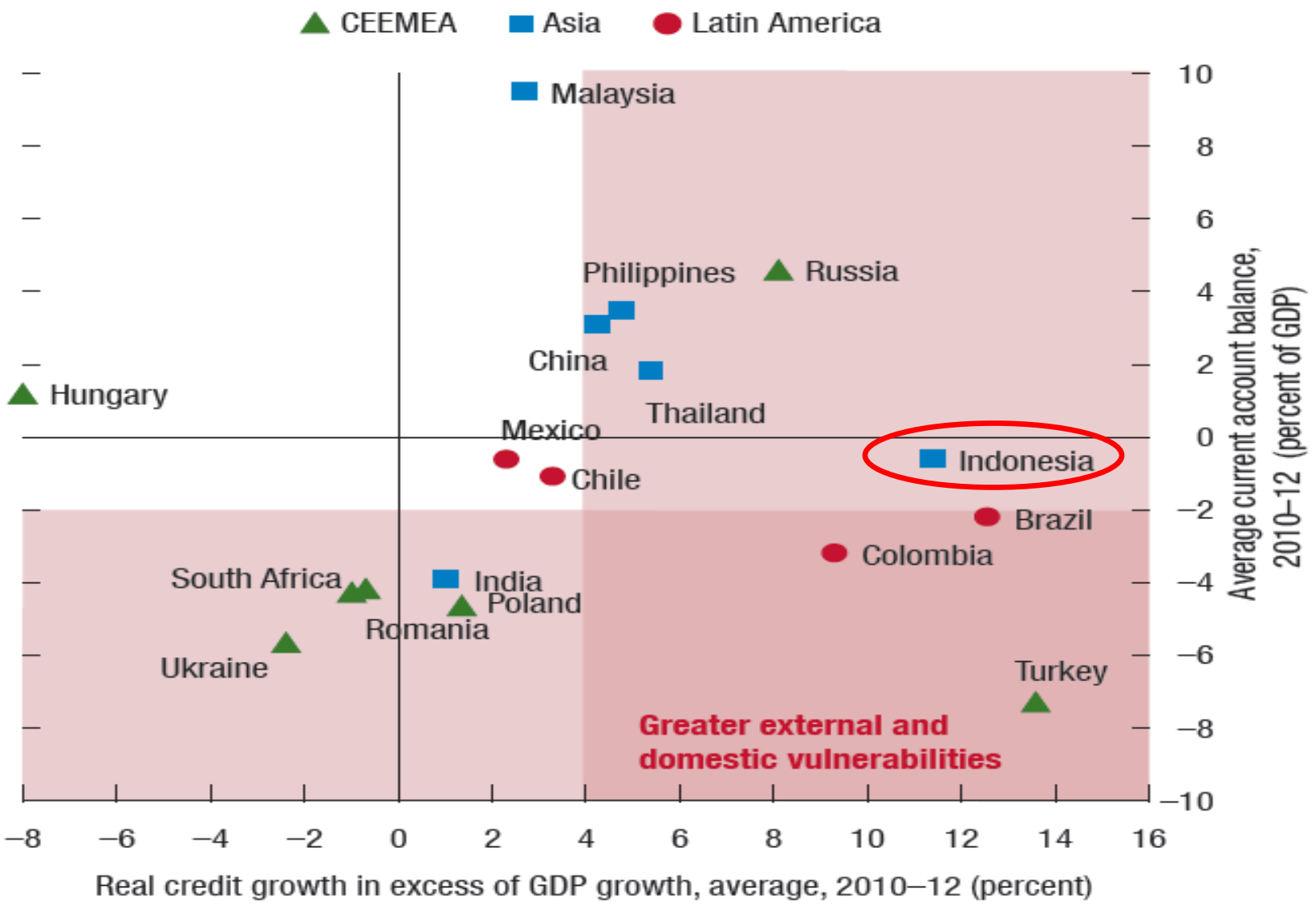
Amplification Global Intermediation of Cross-Border Flows



Importance of Capital Flows in Macro-Financial Linkages



Credit and the Current Account

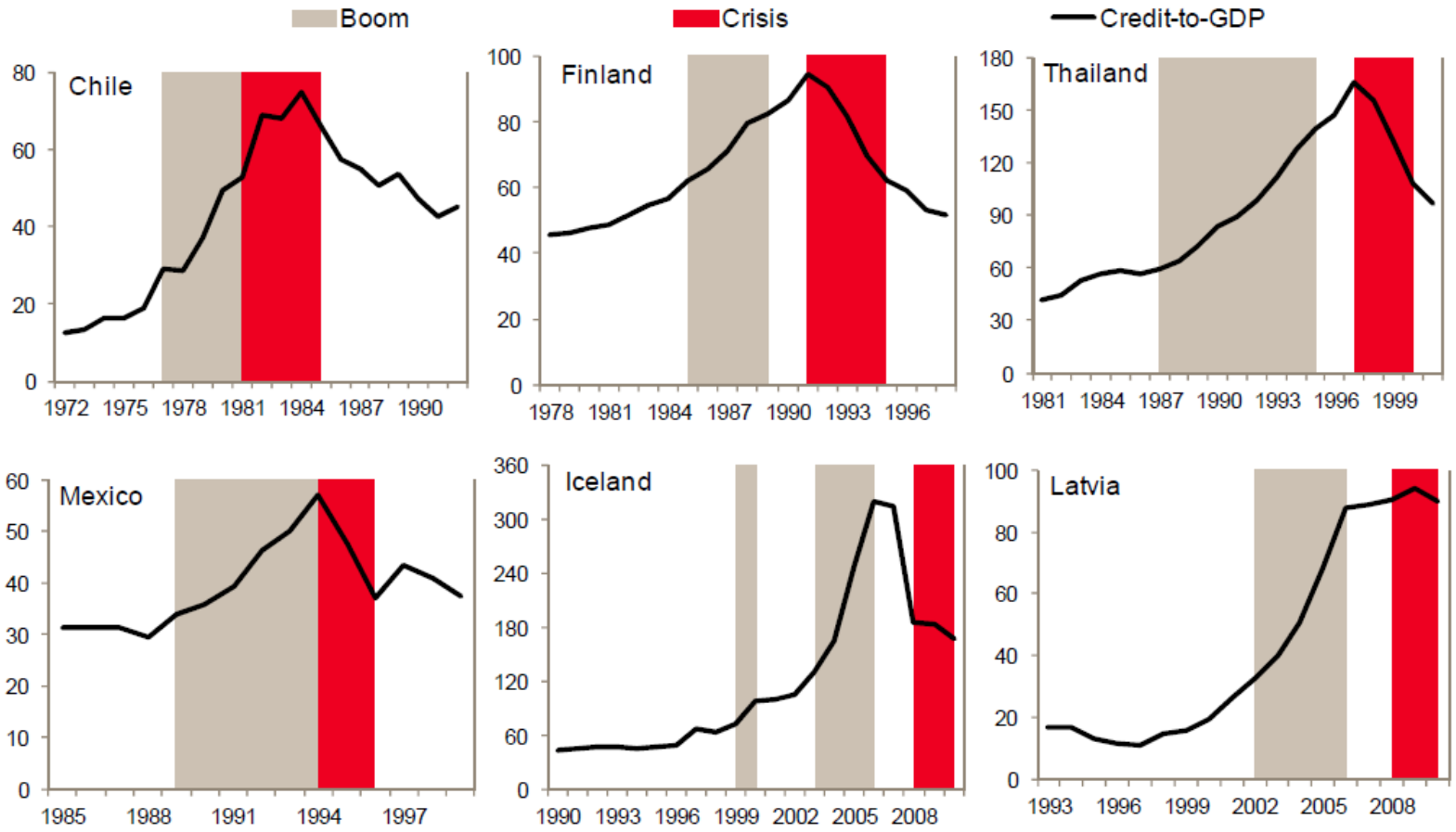


Source: IMF, Global Financial Stability Report, October 2013.

Amplifications and Macro-Financial Risks

- Cross-border funding can lead to currency mismatches, exacerbating pro-cyclicality
- EMs wholesale funding tends to be short-term and in FX as local currency wholesale markets are often shallow
- Low global interest rates also encourage cross-border funding (currency and maturity mismatches)
- Even with NOP limits, indirect mismatches can arise
- Capital inflows → exchange rate appreciates → stronger bank balance sheet in local currency → more risk taking → pro-cyclical feedback loop between domestic credit and the exchange rate

Credit Booms and Financial Crises



Sources: Laeven and Valencia (2010), IMF *International Financial Statistics*; staff calculations.

Managing the Financial Cycle

- Why do we want to manage the Financial Cycle?

  Busts of financial cycles go hand-in-hand with balance sheet recessions → **VERY COSTLY**

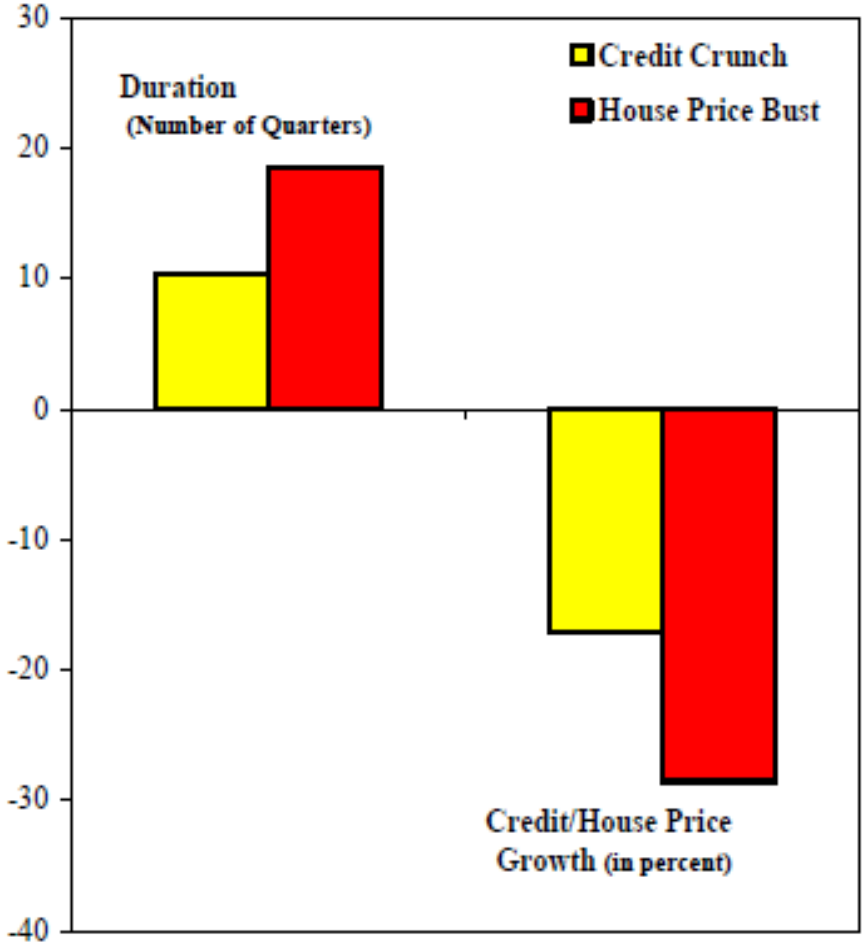
- But setting policy without regard to the financial cycle can be costly → Political economy considerations

- Can central banks meet two objectives (inflation control and financial stability) with one tool (interest rates)? → **Role for macroprudential policies**

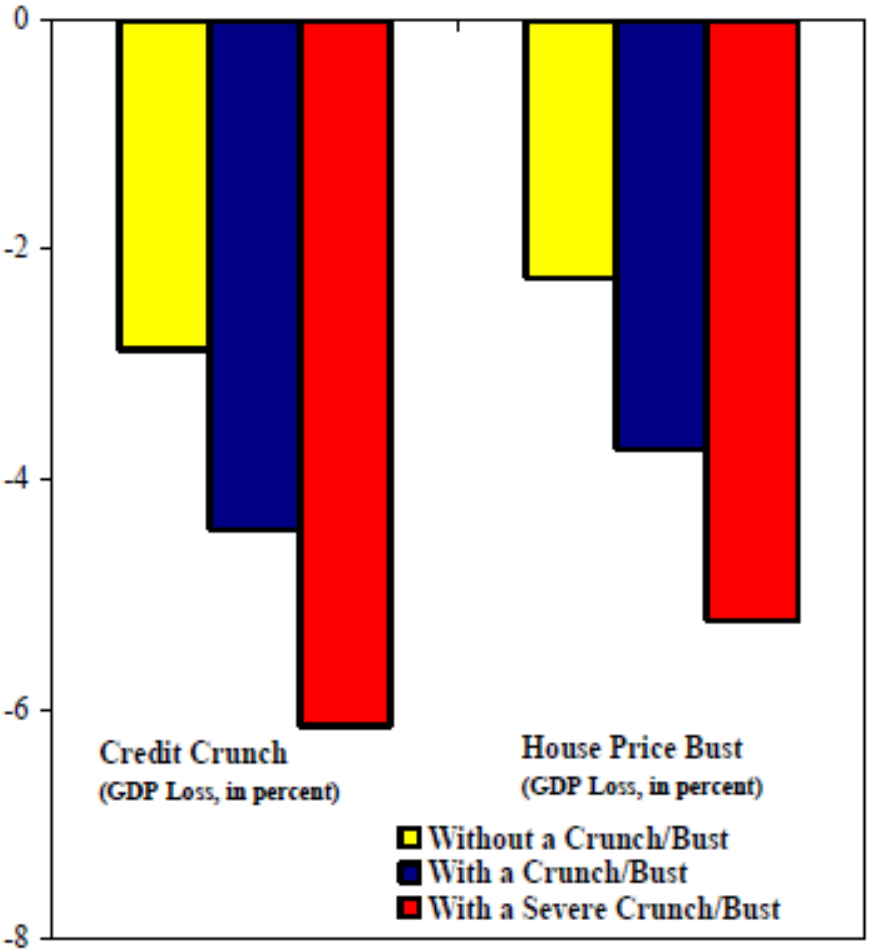
Source: BIS Annual Report (2014).

Costs of Macro-Financial Crisis

Crunches and busts are typically long with substantial declines in credit and house price

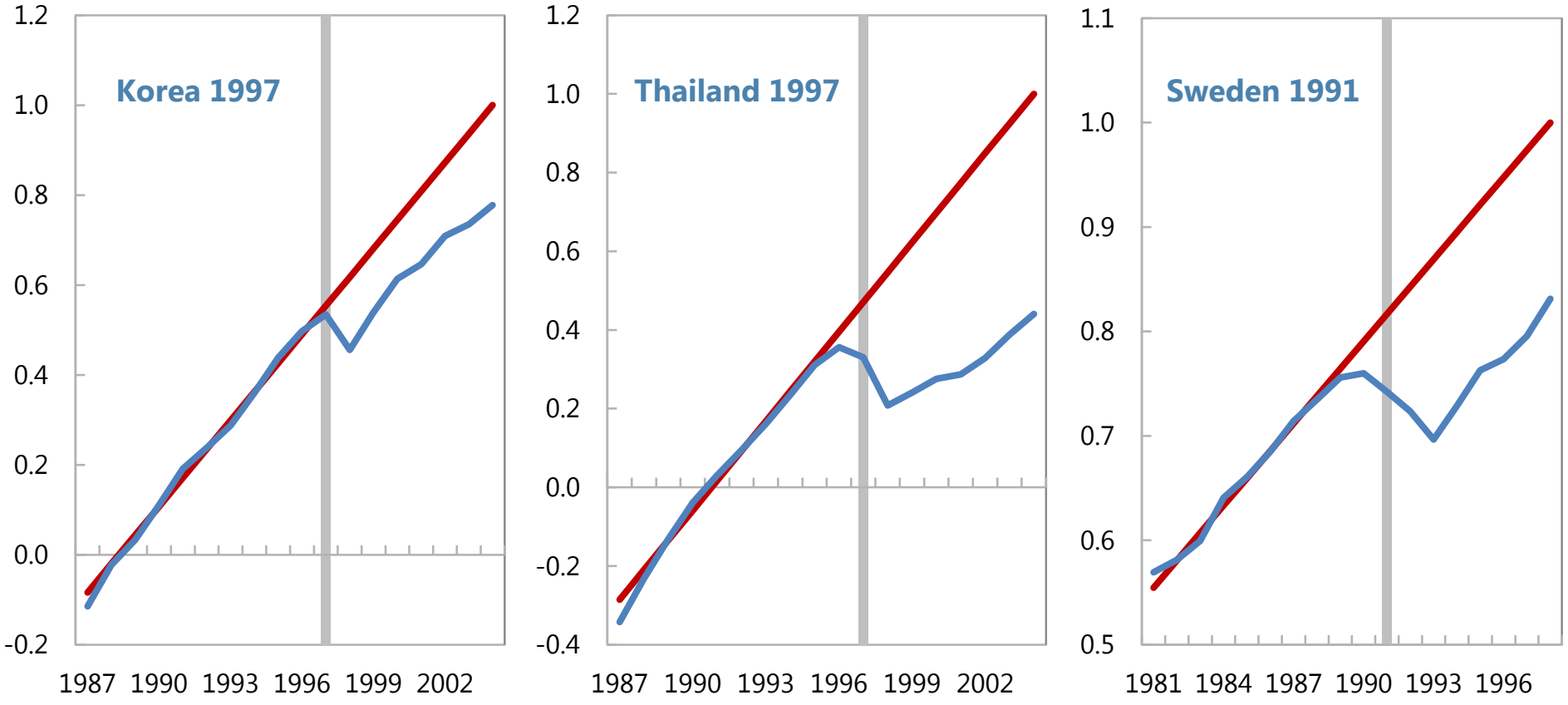


Credit-crunch and house-price-bust recessions are usually deeper



Source: Claessens et al., 2008, "What Happens During Recessions, Crunches and Busts?", IMF Working Paper WP/08/274.

Medium-Term Output per Capita after Financial Crises



Source: IMF, 2009, World Economic Outlook (Chapter 4, October 2009).

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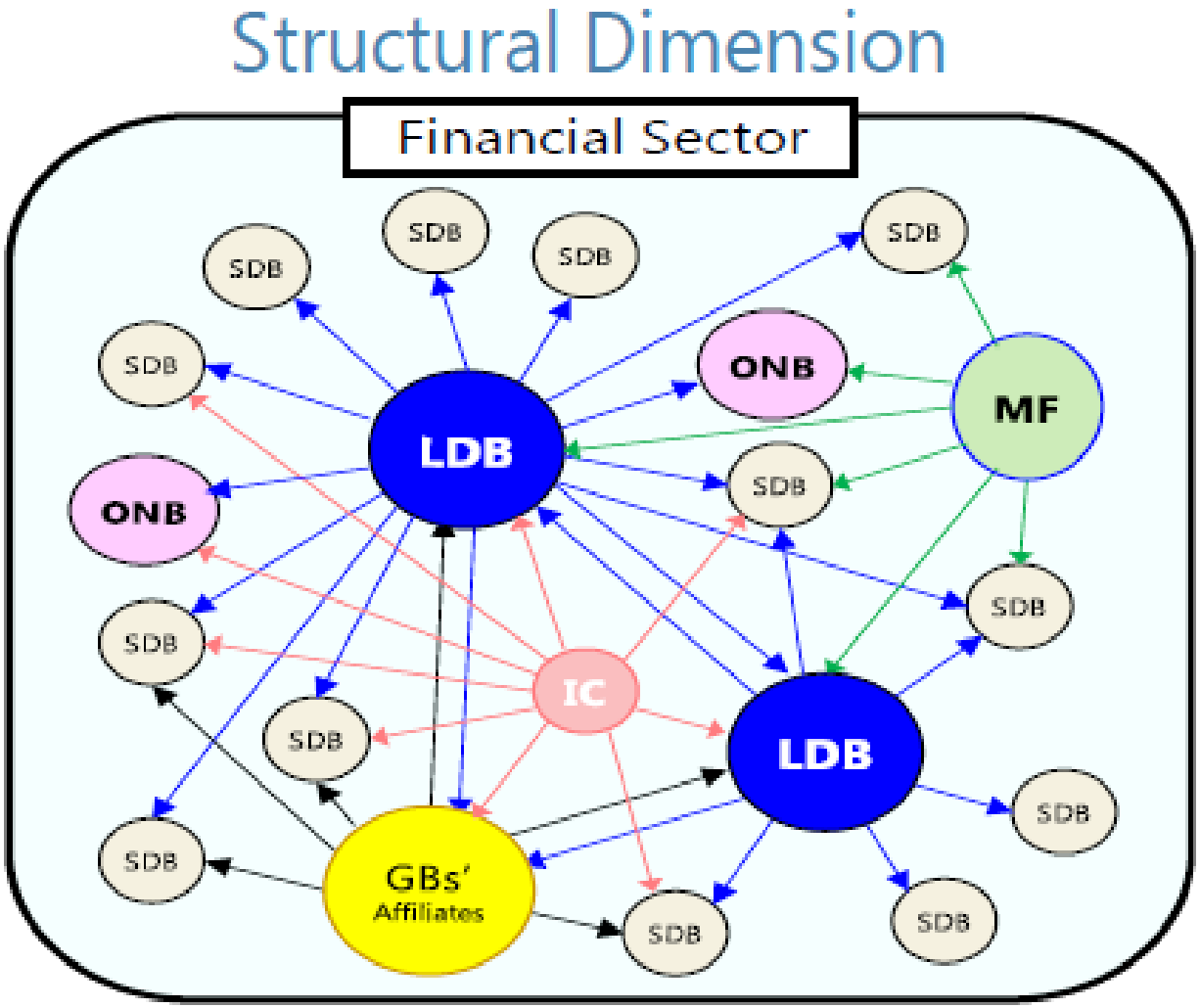
Structural Dimension of Systemic Risk



Note: Large Domestic Bank (LDB), Small Domestic Bank (SDB), Mutual Fund (MF), Insurance Company (IC), Global Bank (GB), and Other Nonbanks (ONB).

Source: IMF, 2014, *Staff Guidance Note on Macroprudential Policy*.

Assessing the Structural Dimension

How to assess/quantify the systemic importance of financial institutions?

How to gauge the likely impact of distress at a given institution, or group of institutions, on the stability of the overall system?

Capturing the Structural Dimension

- Balance sheet exposures at the level of financial institutions, jurisdictions, and sovereigns
- Risk-adjusted balance sheets
- Probabilities of distress for institutions
- Network analyses of bilateral and common exposures
- Other market-based indicators e.g. regime shifts in financial market volatility

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G-SIBs: quantitative identification

Indicator-Based Measurement Approach

Category (and weighting)	Individual Indicator	Indicator Weighting
Size (20%)	Total exposures as defined for use in the Basel III leverage ratio	20%
Interconnectedness (20%)	Intra-financial system assets	6.67%
	Intra-financial system liabilities	6.67%
	Securities outstanding	6.67%
Substitutability (20%)	Assets under custody	6.67%
	Payment activity	6.67%
	Values of underwritten transactions in debt and equity markets	6.67%
Complexity (20%)	OTC derivatives notional value	6.67%
	Level 3 Assets	6.67%
	Trading and Available for Sale Securities	6.67%
Cross-jurisdictional activity (20%)	Cross-jurisdictional claims	10%
	Cross-jurisdictional liabilities	10%

Source: Basel Committee on Banking Supervision, 2014, The G-SIB Assessment Methodology—Score Calculation.

G-SIB: analytical identification via “Smell Test”

Potential Questions to Ask About the Build-up of Vulnerabilities

Are there signs of speculative behavior?

Are particular asset classes heavily advertized or discussed in the media?

Are banks taking large positions where profits continuously exceed measured risks?

Are there relatively new products with large market shares, and have they been increasingly rapidly?

Are lending standards weakening?

Are profit margins decreasing?

Is competition increasing from the shadow banking sector?

Source: CGFS Papers No 48, 2012, Operationalising the Selection and Application of Macroprudential Instruments.

Systemic Risk and Balance Sheet Linkages

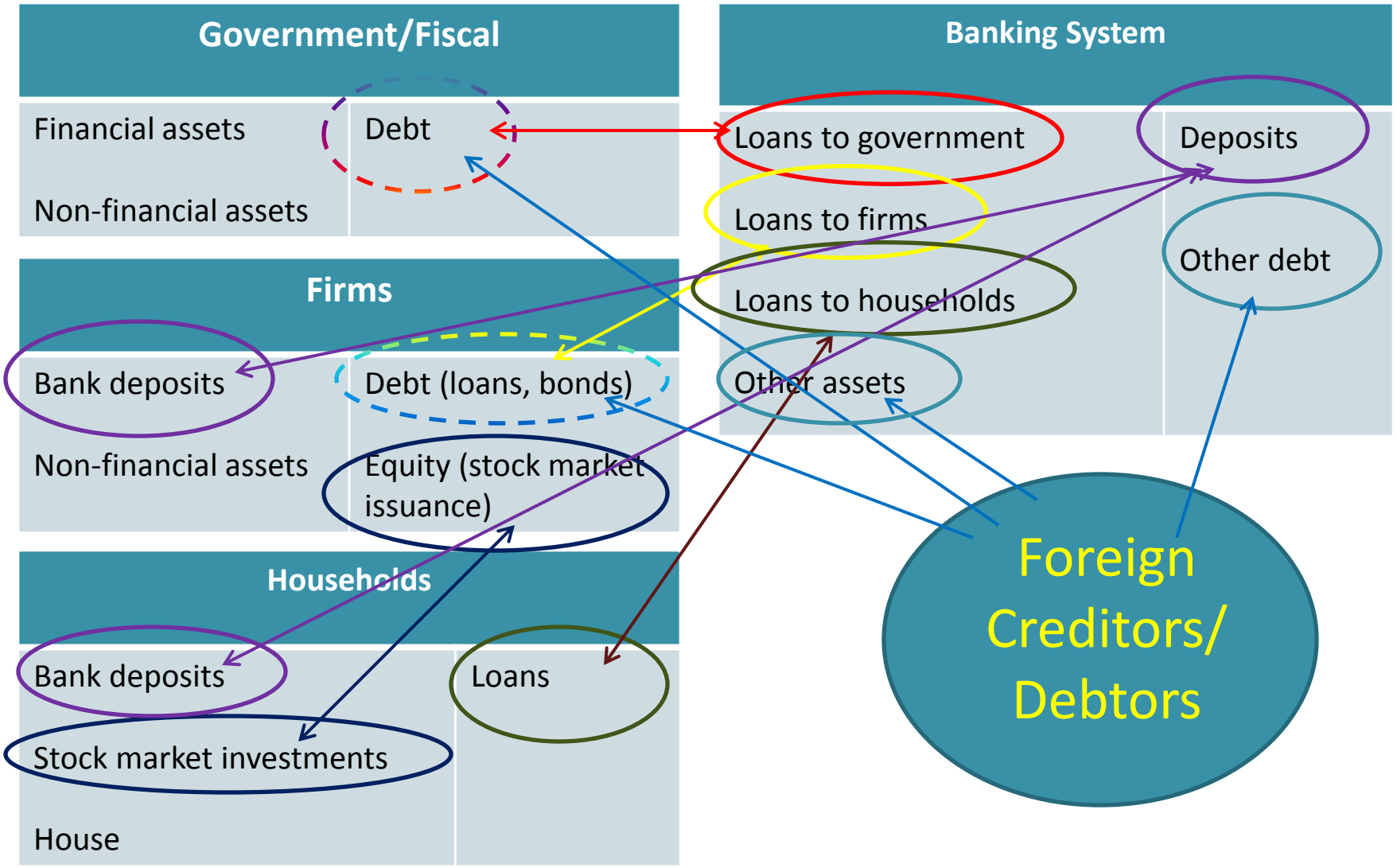
Key Role of the Banking Sector

- Provider /holder of assets and liabilities

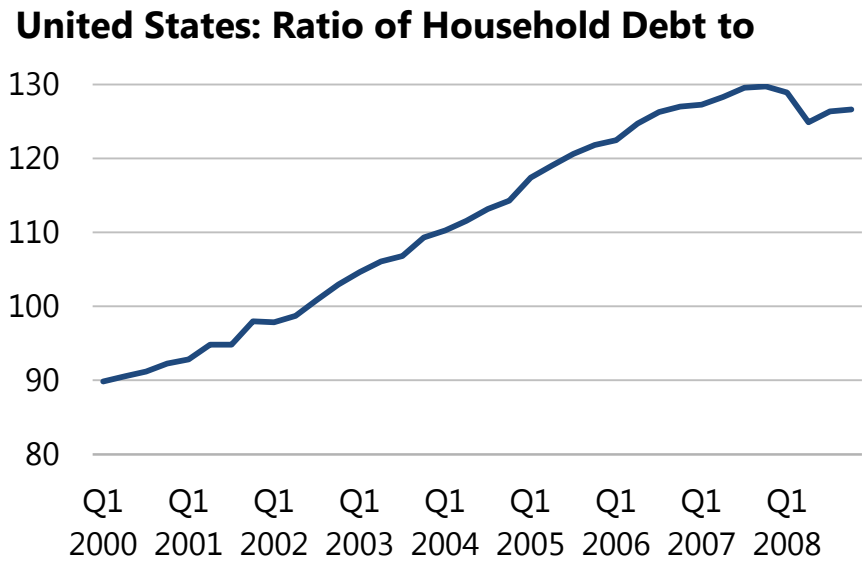
- Bank balance sheets are intertwined with entire economy
- Leverage of banks an amplification factor

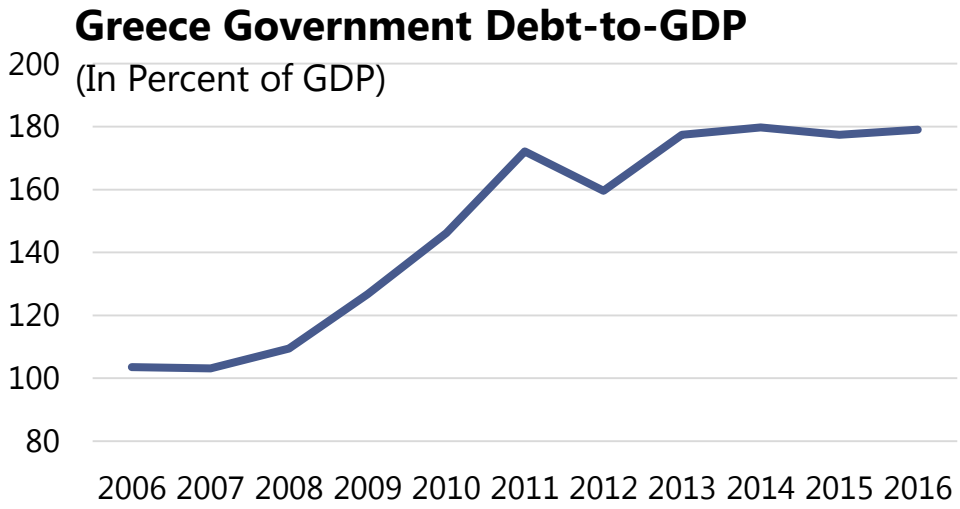
- Implication: systemic banking crises can be VERY severe

Balance Sheet Linkages augmenting risks



Global increases in assets/liabilities
US HH Debt and Greece Public Debt





Source: CEIC

Emerging Markets: Increases in Debt-to-GDP Ratios (percent)

		Emerging Market Economies									
		CHN	BRA	IND	ZAF	TUR	MEX	RUS	SAU	ARG	IDN
General Government	2006	25	66	77	31	45	38	10	26	70	36
	2016	44	78	70	52	28	58	16	13	54	28
Households	2006	11	14	10	39	9	12	8	12	4	11
	2016	44	23	10	35	18	16	16	15	6	17
Nonfinancial Corporations	2006	105	39	38	33	27	14	32	28	20	14
	2016	165	44	45	37	67	28	52	50	12	23
Total	**2006**	**142**	**118**	**125**	**104**	**81**	**64**	**49**	**66**	**93**	**61**
	2016	**254**	**145**	**125**	**124**	**113**	**103**	**84**	**78**	**73**	**68**

Source: IMF: Global Financial Stability Report, October 2017.

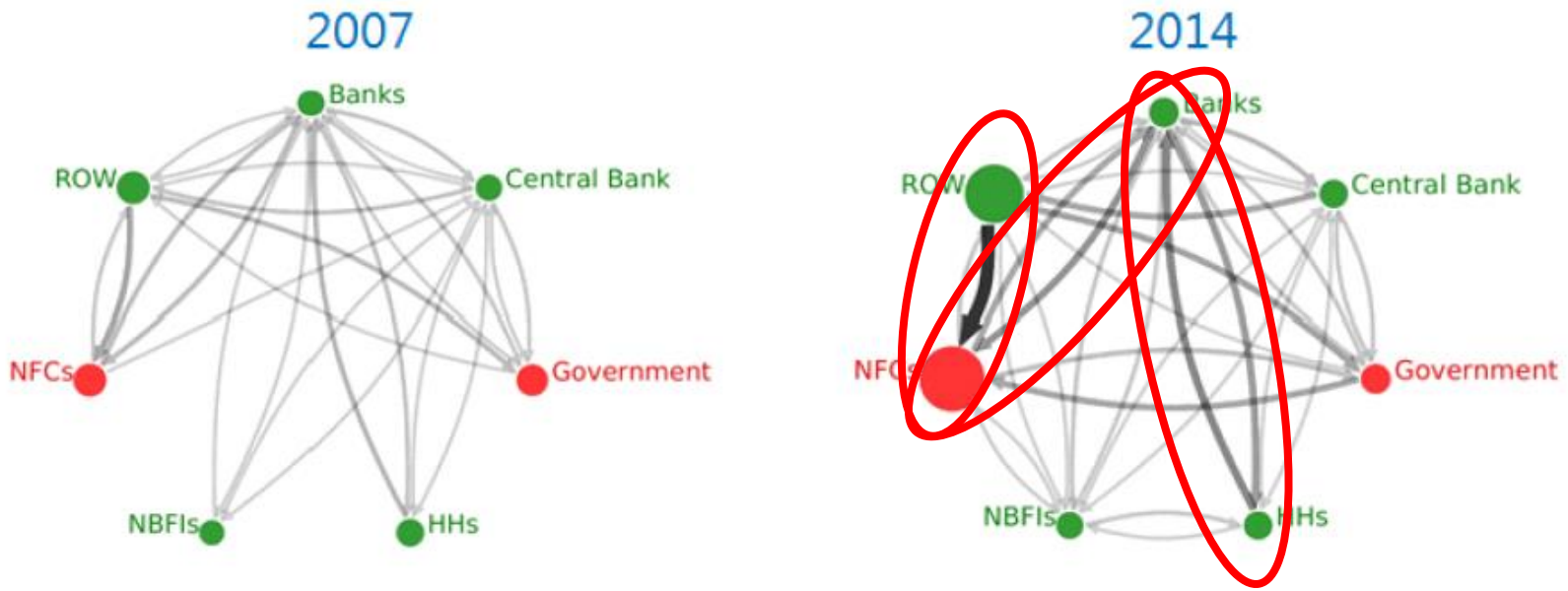
Assessing Scope of Balance Sheet Effects

- Key issue—need detailed information on assets and liabilities for each sector.
  - Currency composition→ currency risk/FX mismatch
  - Maturity (short- vs. long-term)→ rollover/liquidity risk
  - Fixed vs. flexible interest rates→ interest rate risk/rollover risk
  - Counterparties→ counterparty/funding risk

NOTE: Some balance sheet effects may be hidden/ masked→ need to look at the ultimate source of potential risk (e.g., foreign currency mortgages) and do "stress tests/scenario analysis".

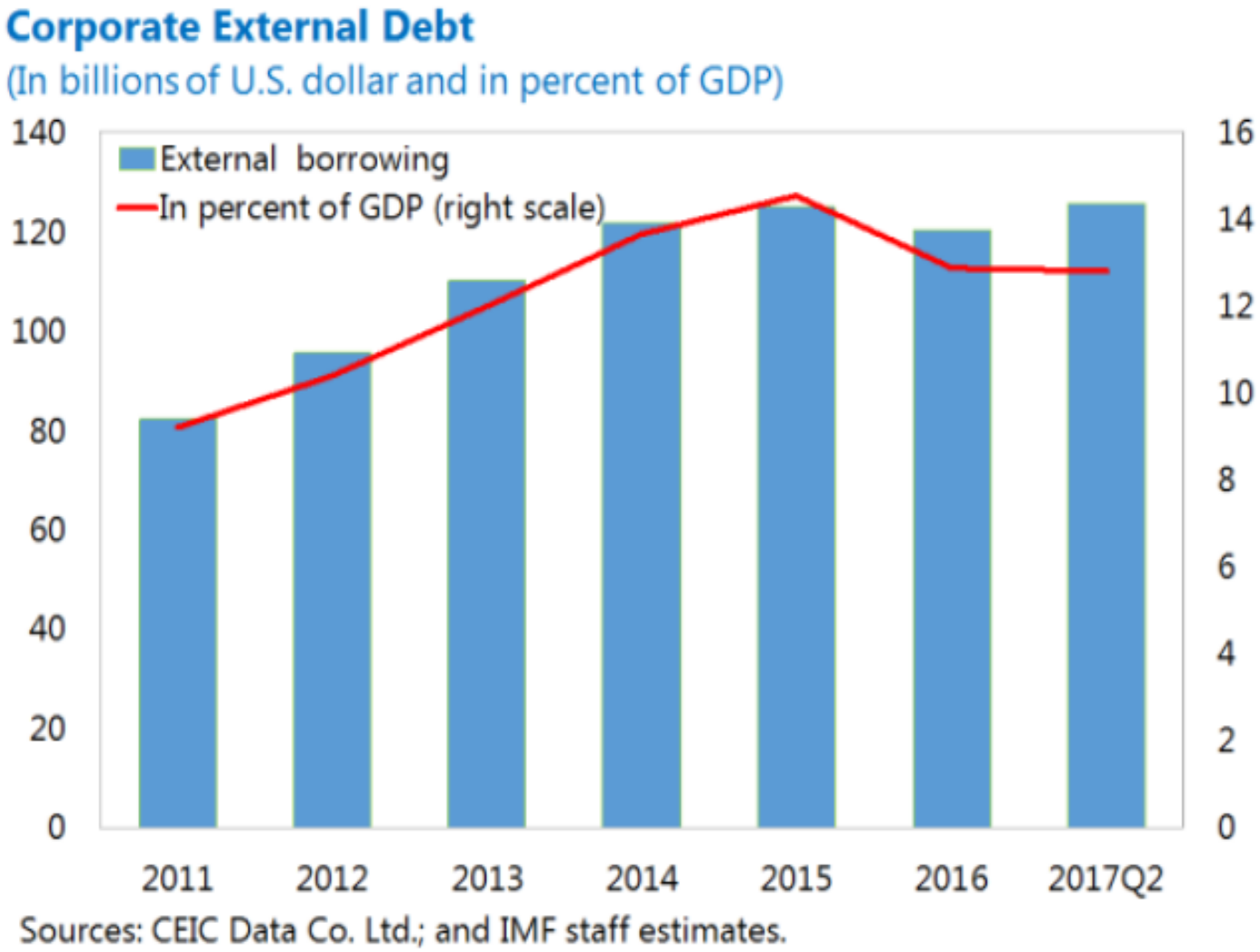
Indonesia: Balance Sheet Linkages

BSA Matrix in Network Map Form
(Gross exposures)



Sources: IMF; and IMF staff estimates.

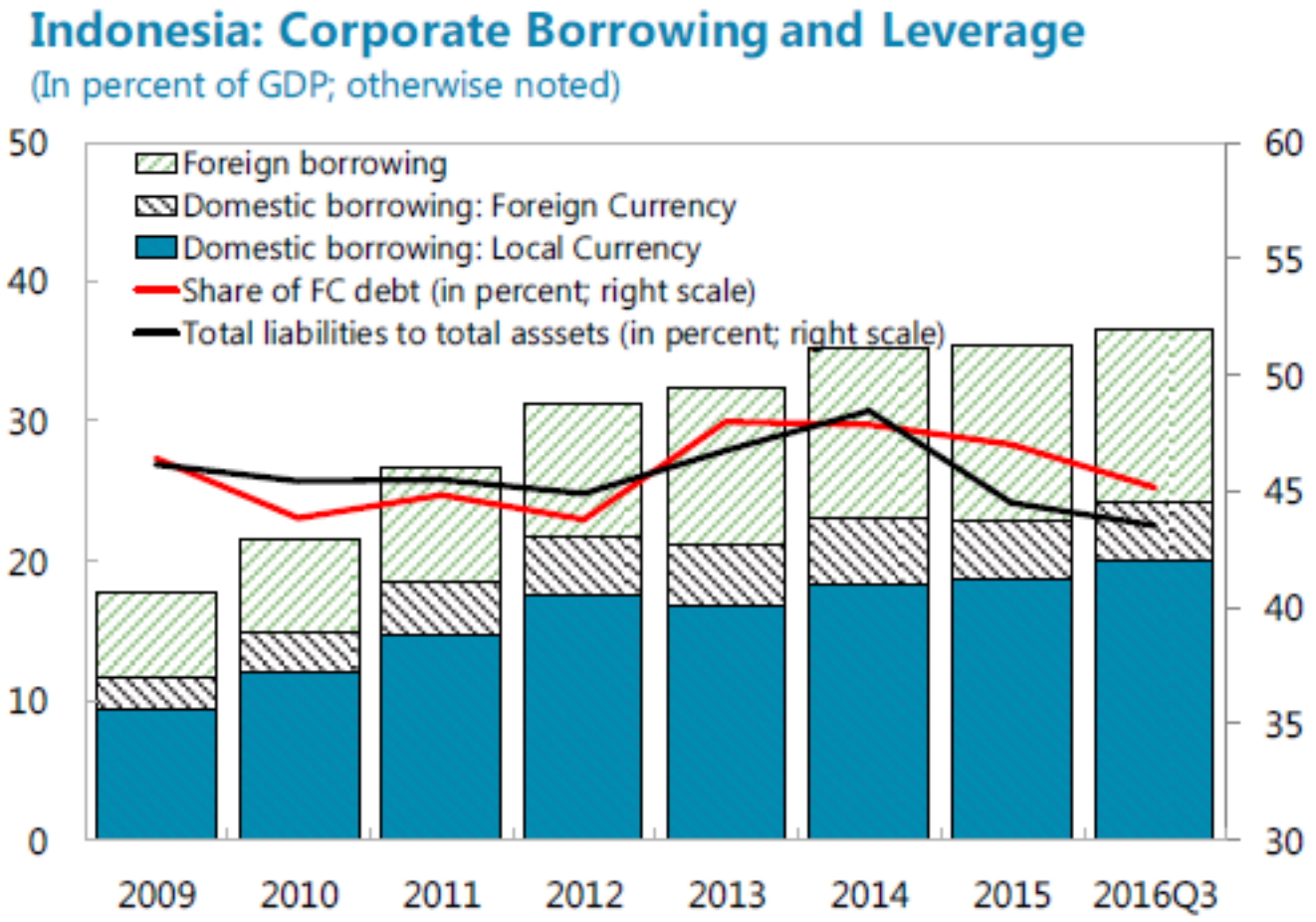
Indonesia: Corporate Debt



Corporate external debt stabilized in 2016-17, after rising rapidly in previous years

Source: IMF, Indonesia: Staff Report for the 2017 Article IV Consultation, February 2018.

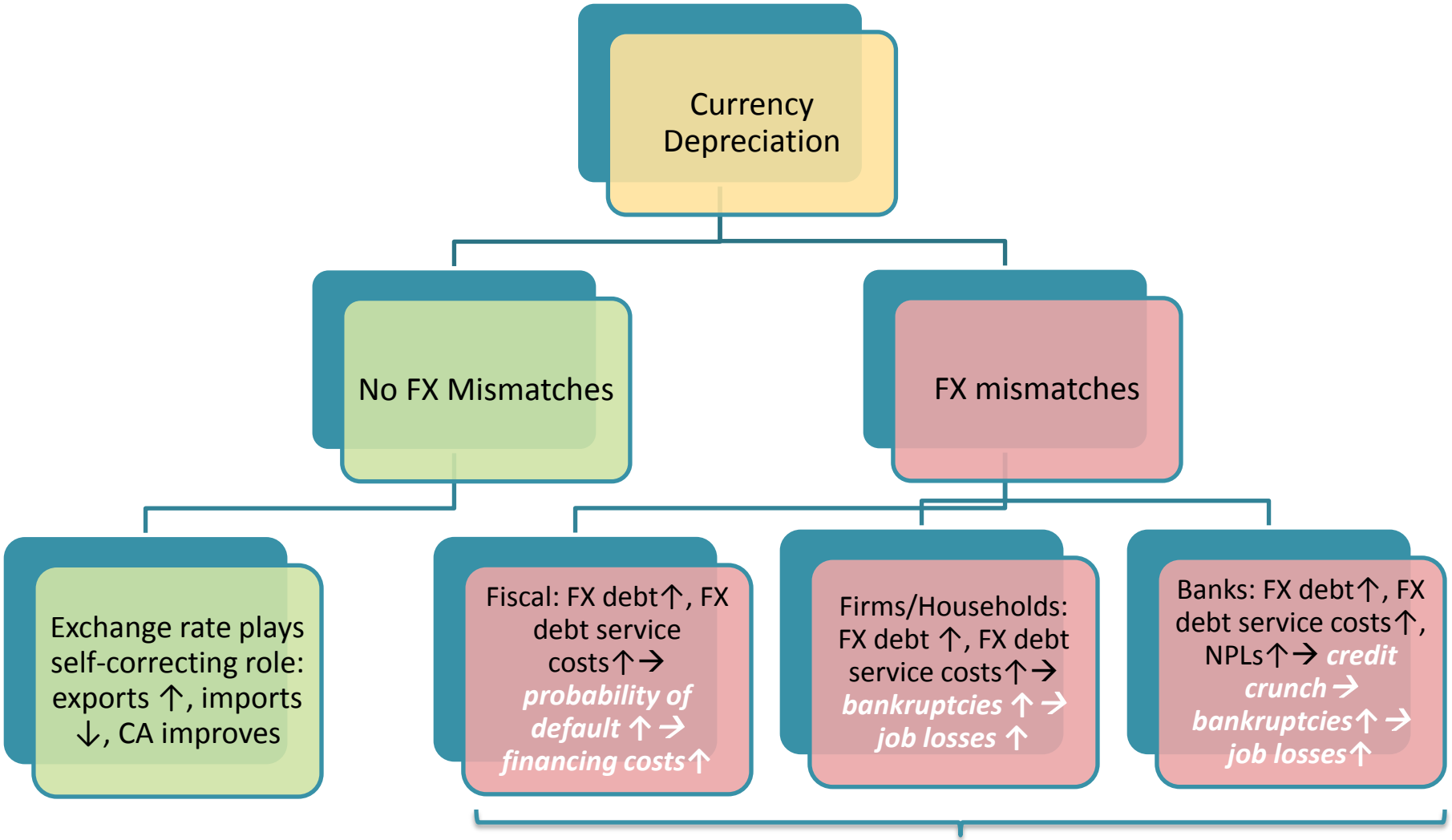
Indonesia: Corporate Debt



Overall corporate debt remains moderate

Source: IMF, Indonesia: Financial System Stability Assessment, June 2017.

Example: Capital Outflows



CA still improves, but because of large compression of domestic demand + more difficult financing conditions

Why FX Mismatches?

- Foreign currency interest rates lower→ appears "cheaper" to take on FX debt

- This situation can be exacerbated during a credit boom:
  - Credit boom→ domestic demand ↑
  - Domestic demand ↑→ inflation ↑
  - Inflation ↑→ central bank response (interest rates ↑)
  - Differential between local currency and foreign currency interest rates ↑→ ***incentive to borrow in FX for all!!!***

Conclusions

Conclusions

- Financial stability is essential for the proper functioning of the economy
- Two dimensions of systemic risk
  - time dimension & amplification processes
  - structural dimension & linkages and G-SIBs
- Policies should counteract amplifications in financial cycle along time and structural dimensions

We will discuss macroprudential policies next

Policies

- Policies to lean against the financial cycle and counteract the feedback mechanisms that amplify financial and business cycle risks are critical
- Addressing systemic risk through a macroprudential approach continues to evolve

We will discuss macroprudential policies next

Macro Prudential Policies
Part I & II

Mangal Goswami

Seminar on Macroprudential Supervision

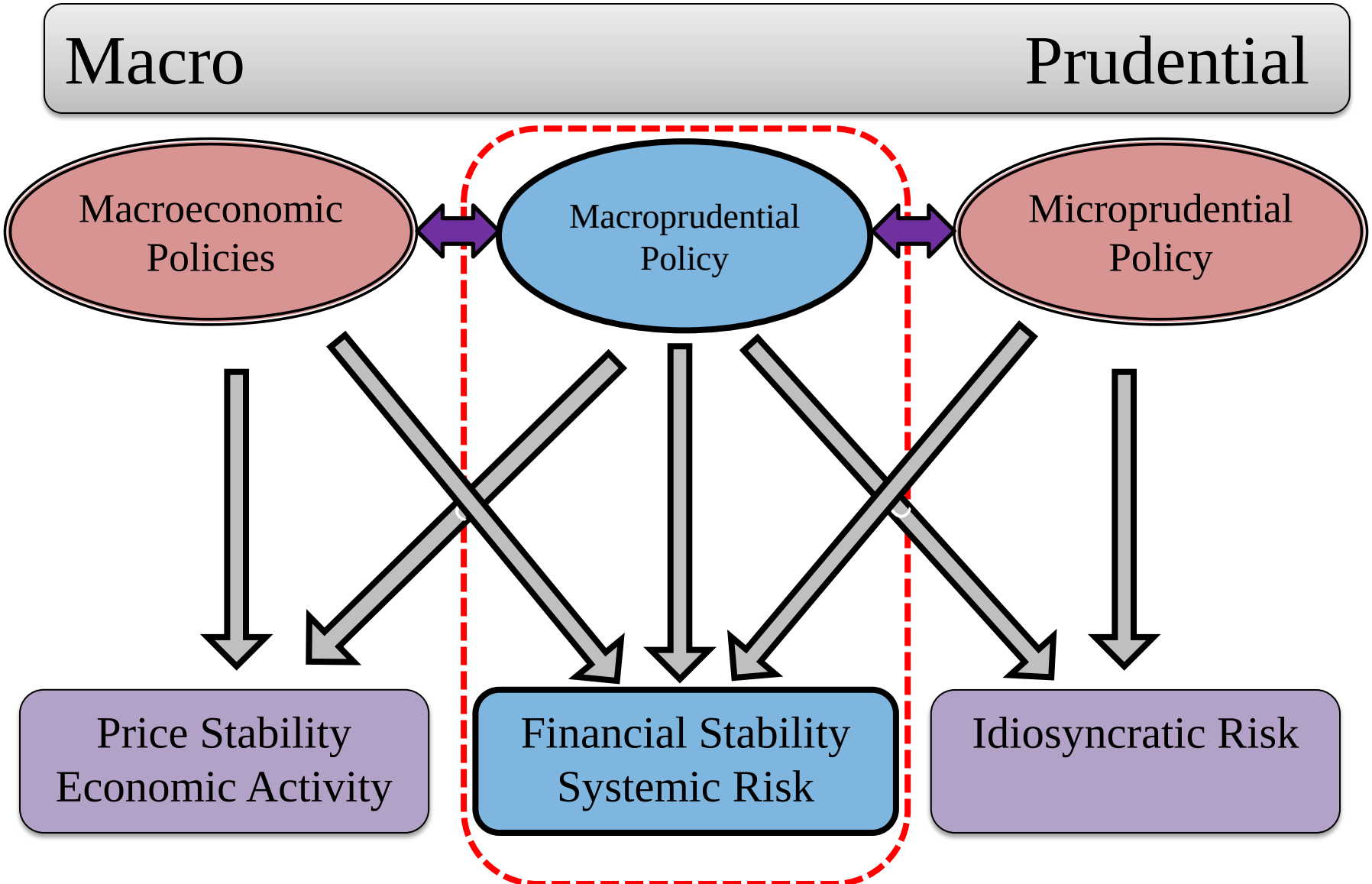
IMF – South Asia Training and Technical Assistance Center
APEC Financial Regulators Training Initiative
Bangkok, 16-19 July 2018

Presentation Outline

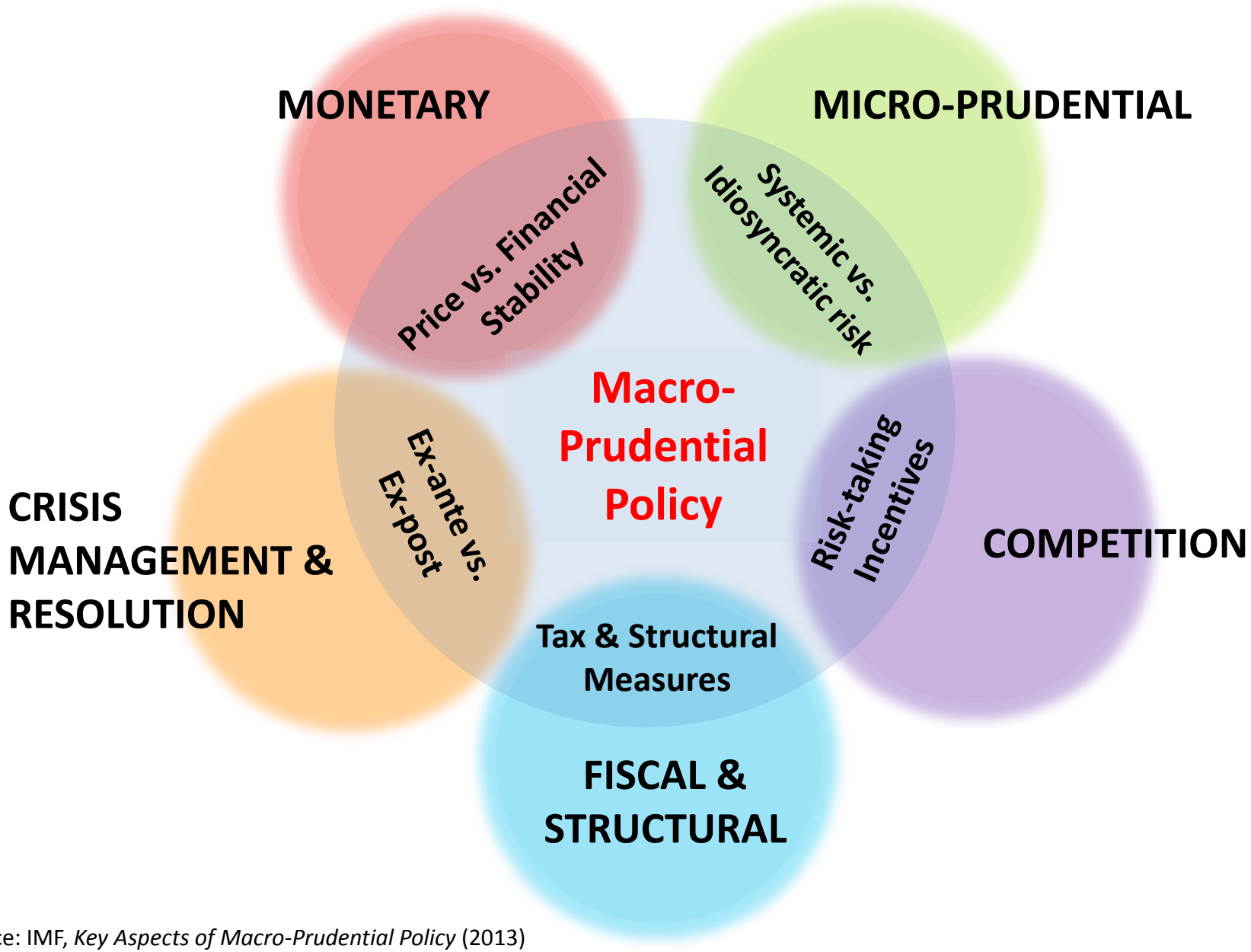
- Introduction to Macroprudential Policies
- Macro versus Micro Prudential Policy
- Types of macroprudential instruments
- Operationalizing macroprudential policies
- Capital Flow management vs Macroprudential policy
- IMF - Macroprudential Policy Survey
- Conclusions

Introduction to Macroprudential Policies

Macroprudential Policies



Financial Stability Framework



Source: IMF, *Key Aspects of Macro-Prudential Policy* (2013)

What are Macroprudential Policies?

Macroprudential policies seek to increase the resilience of the financial system to aggregate systemic shocks

- Build buffers that absorb the impact of shocks (maintain credit provision)
- Contain the build-up of systemic vulnerabilities *over time* (avoid pro-cyclical feedback between asset prices and credit/leverage)
- Control the build-up of vulnerabilities *within the financial system (*manage inter-linkages between financial institutions)

Macroprudential Policy: Objectives

- *Intermediate objective No. 1:* Macroprudential policy seeks to increase the **resilience** of the financial system to aggregate shocks (IMF, 2013).
  - by **building buffers** that help maintain the ability of the financial system to provide credit to the economy under adverse conditions
- Increased resilience can protect against **a range** of shocks: it can help the system
  - weather **domestic** economic shocks
  - withstand a **bust in asset prices**, or a sharp depreciation of the **exchange rate**
  - that might arise from a **reversal of capital flows**

Macroprudential Policy: Objectives

- *Intermediate objective No. 2:* Macroprudential policy seeks to **contain the build-up** of systemic vulnerabilities over time (IMF, 2013).
  - by reducing procyclical **feedback** between **asset prices** and **credit**, and containing unsustainable increases in **leverage** and **volatile funding**
- A build-up of risk can arise in a purely **domestic setting**, but for **open economies** can also be driven by
  - **global financial conditions**
  - surges of **capital inflows** that can contribute to an increase in domestic asset prices, credit, leverage and volatile funding

Desirable Features of a Framework

- Countercyclical
- Symmetry between boom and bust phases of financial cycles
- System-wide focus
- Long horizon
- Holistic approach

Systemic Risk

Two externalities are central to systemic risk:

- The dynamics of the financial system and the real economy reinforce each other, increasing the amplitude of booms and busts (**pro-cyclicality**) → **TIME DIMENSION**

- Joint failures of institutions resulting from **common exposures** → **CROSS-SECTIONAL DIMENSION**

Dimensions of Systemic Risk

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(How aggregate risk evolves over time)

- Financial cycles: pro-cyclicality and macro-financial linkages
  - Process of amplifying feedback between financial sector and real economy
- Policy question: how to dampen pro-cyclicality?

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- Connectedness: Common exposures across institutions leading to externalities
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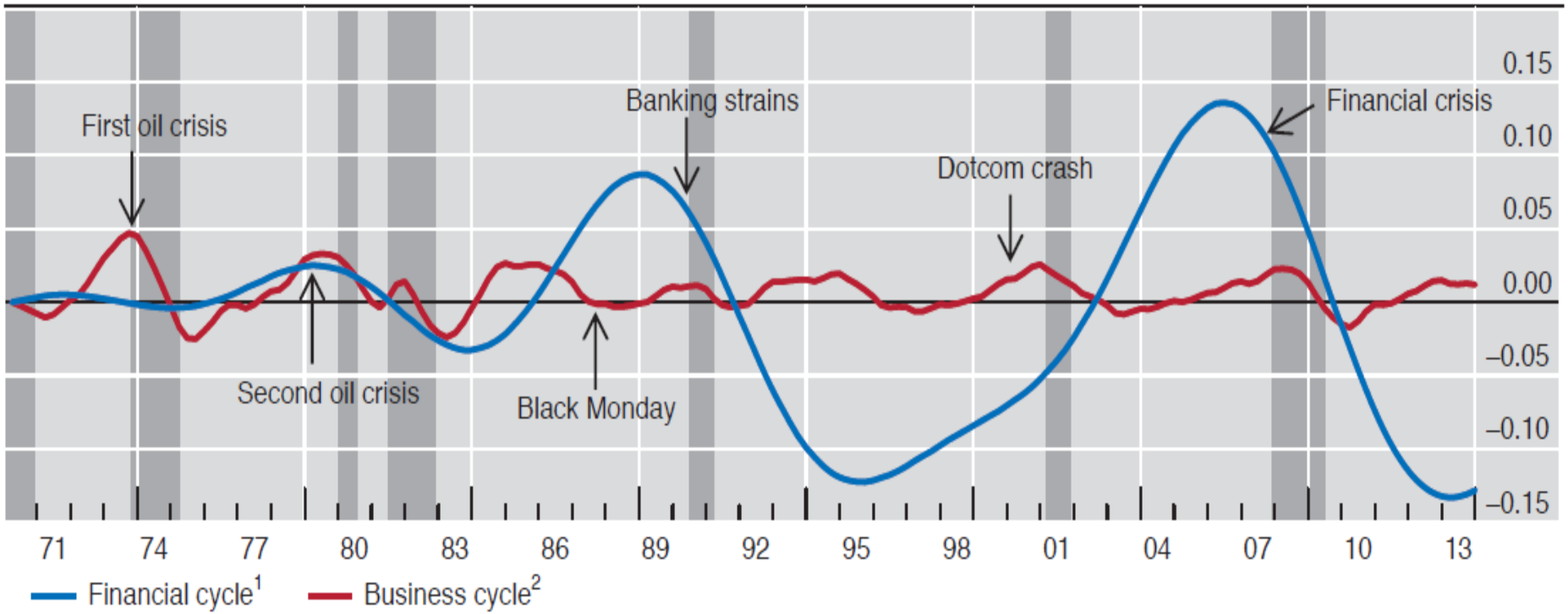
- Policy question: how to limit joint failures of institutions that represent a significant portion of the financial system?

Financial Risk Cycles and Business Cycles



[1] The financial cycle as measured by frequency-based (bandpass) filters capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices. [2] The business cycle as measured by a frequency-based (bandpass) filter capturing fluctuations in real GDP over a period from one to eight years.

Source: BIS Annual Report, 2014 and Borio (2012).

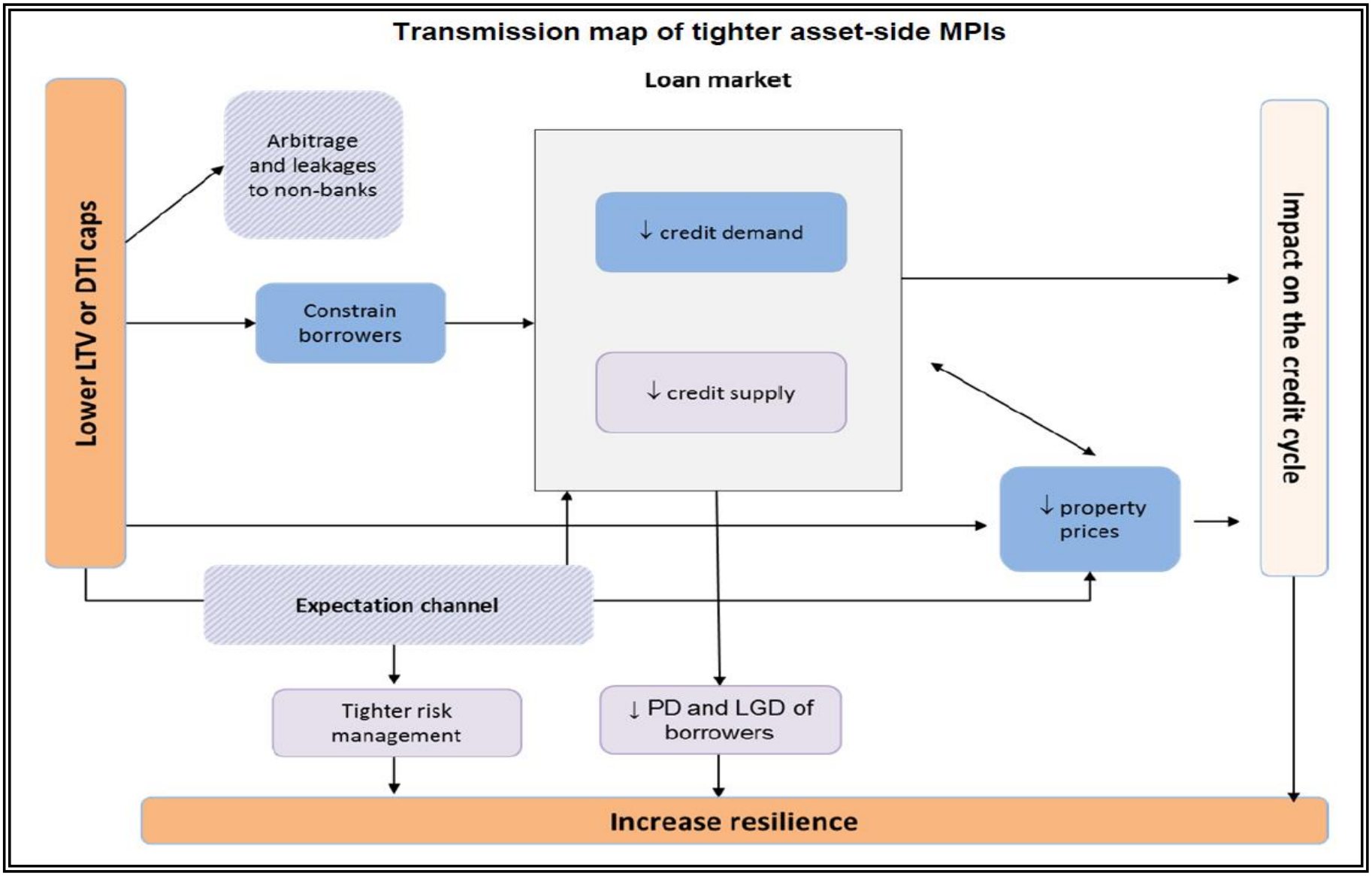
Managing the Financial Cycle

- Why do we want to manage the Financial Cycle?
  - Busts of financial cycles go hand-in-hand with balance sheet recessions → **VERY COSTLY**

- But, setting policy without regard to the financial cycle can be costly → political economy considerations

- Can central banks meet two objectives (price stability and financial stability) with one tool (interest rates)?
  - **Role for macroprudential policies**

Transmission of MPM Measures



Source: CGFS, December 2012.

Macro versus Macroprudential Policies

Macro versus Micro Prudential Policies

	Macroprudential	Microprudential
Proximate objective	Limit financial system wide distress	Limit distress of individual institutions
Ultimate objective	Avoid output (GDP) costs linked to financial instability	Consumer (investor/depositor) protection
Characterization of risk	Endogenous ("Collective Behavior")	Exogenous ("Individual Behavior")
Correlations and common exposures across institutions	Important	Secondary
Calibration of prudential controls	Contribution to system-wide risk; top-down (common exposures)	Risks of individual institution; bottom-up (individual exposures)
Likelihood of failure of individual institutions	Maybe different	Same

Based on Borio (2009). The two perspectives are intentionally stylized. They are intended to highlight two orientations that inevitably coexist in current prudential frameworks.

Key Elements – It's hard to differentiate between Micro and Macro Prudential

- **Significant overlap between macro & micro policies**
  - Blurred delineation between the micro and macro-prudential
  - Have intertwined objectives (albeit from a different angle: limiting *systemic* risk for macro and *firm-specific* risk for micro)
  - Often conducted by similar institution
  - Use similar instruments

- **Main differences**
  - Perimeter of application
  - Broader toolkit for macro-prudential
  - More transparency from macro-prudential regarding risks identified: better communication

- **Frameworks at various stages of development**
  - Micro-prudential already has a set of international standards (e.g. Basel III)
  - Not internationally agreed framework yet for macro-prudential (policies, institutions, instruments)
  - Clearer mandate and powers for micro-prudential authorities; macro-prudential catching up
  - Policies should be seen as "complement", not "substitute", so macro-prudential should address gaps or correct unintended consequences of micro-prudential actions

Findings – The implementation of Macro-prudential and Micro-prudential can lead to conflicts

- **Risks of tensions between macro & micro policies**
  - Policies designed to enhance the stability of an individual institution may have negative effects at the system level (e.g. deleveraging)
  - Untimely implementation of systemic buffers can make individual firms more fragile
  - Timeliness: when to build/reduce buffers?
  - Micro-prudential regulators often do macro-prudential(especially when no explicit macro-prudential framework)
  - Interaction between Pillar 2 (supervisory powers) and macro-prudential
  - Other examples
    - Liquidity requirements (macro-prudential favors a broader definition of liquidity)
    - Diversity (macro-prudential favors a more diversified financial sector than micro-prudential that encourages convergence in business profile and risk practices)
    - Micro-prudential forbearance
- **How to better align the macro-prudential and micro-prudential?**
  - Improve formulation and coordination of mandates (e.g. via cross-membership)
  - Improve exchange of information and views
  - Strengthen institutional arrangements and clarify hierarchy between objectives

Micro-Prudential Toolkit

- A set of risk-based quantitative instruments to establish capital and liquidity requirements for individual institutions

- Effective supervisory powers over institutions (e.g., licensing, governance, risk management, sanctions, and powers to take corrective actions)

Macro-Prudential Toolkit

- Prudential instruments constructed to have an impact on the pro-cyclicality of the financial system (e.g., countercyclical capital buffers) or on the contribution of a financial institution to systemic risk (e.g., Systemically Important Financial Institution surcharges)
- Prudential instruments to address a buildup of systemic risk in specific segments of the market (such as loan-to-value ratios) and instruments aimed at constraining general or specific leverage in nonfinancial sectors (such as debt-to-income ratios)
- Tools to address systemic liquidity concerns

Overlap of Micro-Macro Prudential Toolkits

Instrument	Micro	Macro
Minimum Capital Requirements for Individual Institution	×	
Capital Risk Weights	×	×
Pillar 2 Capital Requirements	×	×
Countercyclical Capital Buffer		×
Capital Conservation Buffer	×	
Systemic Capital Surcharge		×
Dynamic Provisioning	×	×
Leverage Ratio	×	×
Large Exposure Limits	×	×
Loan-to-Value Limits	×	×
Debt-to-Income Limits	×	×
Foreign Exchange Limits	×	×
Liquidity Requirements	×	×
Risk Management Standards	×	
Licensing Standards	×	

Complementarities between Micro and Macro Prudential Supervision

- During downturns counter cyclical macro-prudential policies can be softened uniformly across banks which may keep insolvent banks alive, generating counterparty fears but micro-prudential policies can address this
- Countercyclical capital buffer, released during downturn may be encourage risk taking ex-ante but micro-prudential policies can implement tough minimum standards ex-ante to address tail risks at the individual institution level

Challenges Related to Coordination

- Information sharing, especially provision of soft information
- Assessment of risks
- Timing and calibration of interventions
- Implementation, separation of decision making and control of instruments
- Joint communication
- Importance of applying “macro” perspective to microprudential supervision of banks to assist in premptively addressing systemic risk;
- GFC lesson: in case of conflict, macroprudential policy should be favored without the prejudice to individual stability of financial institutions;
- Complementarity, consultation and prioritization of objectives should guide operational implementation of MaPP with monetary, fiscal and microprudential policies;

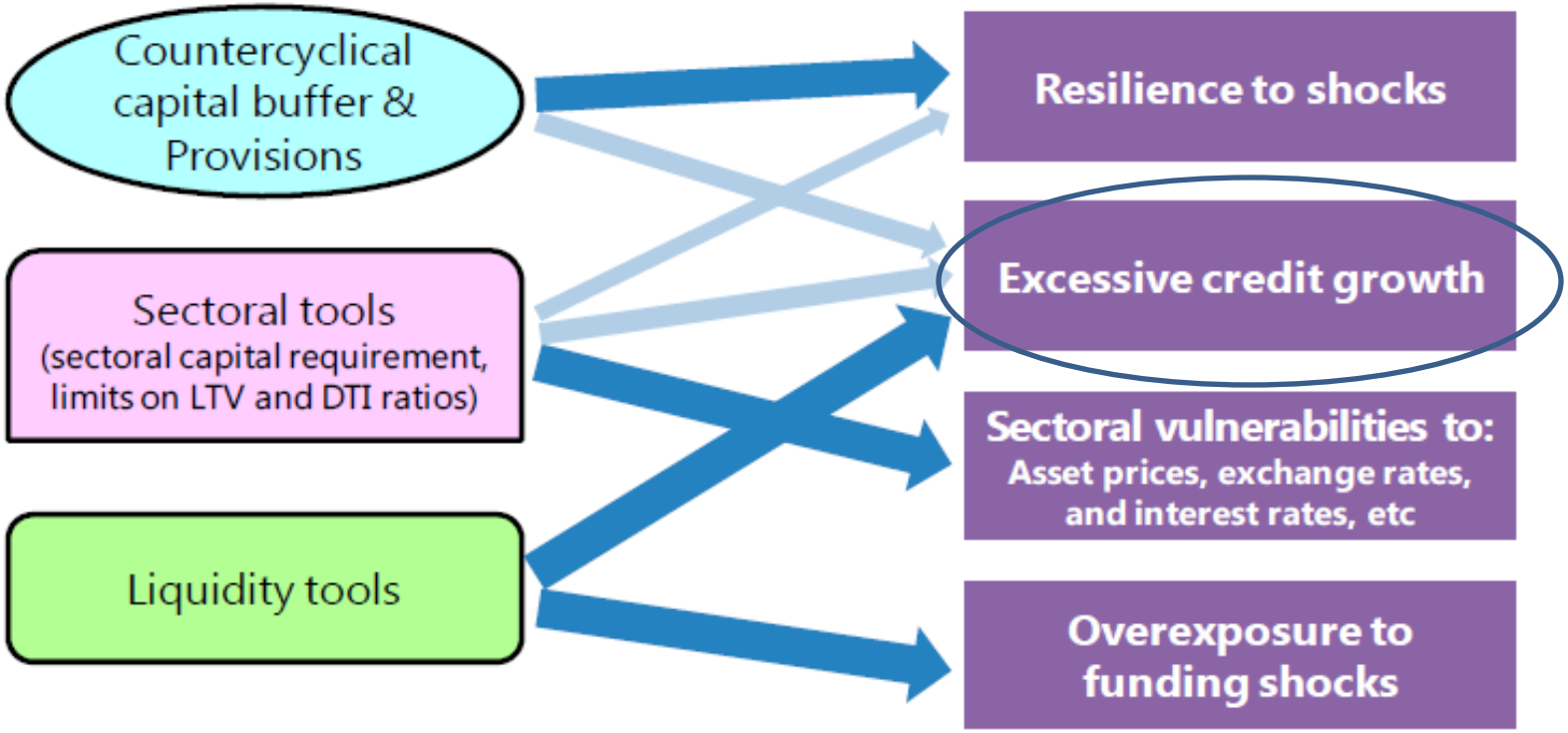
Implementing Prudential Policy

Switzerland Case study

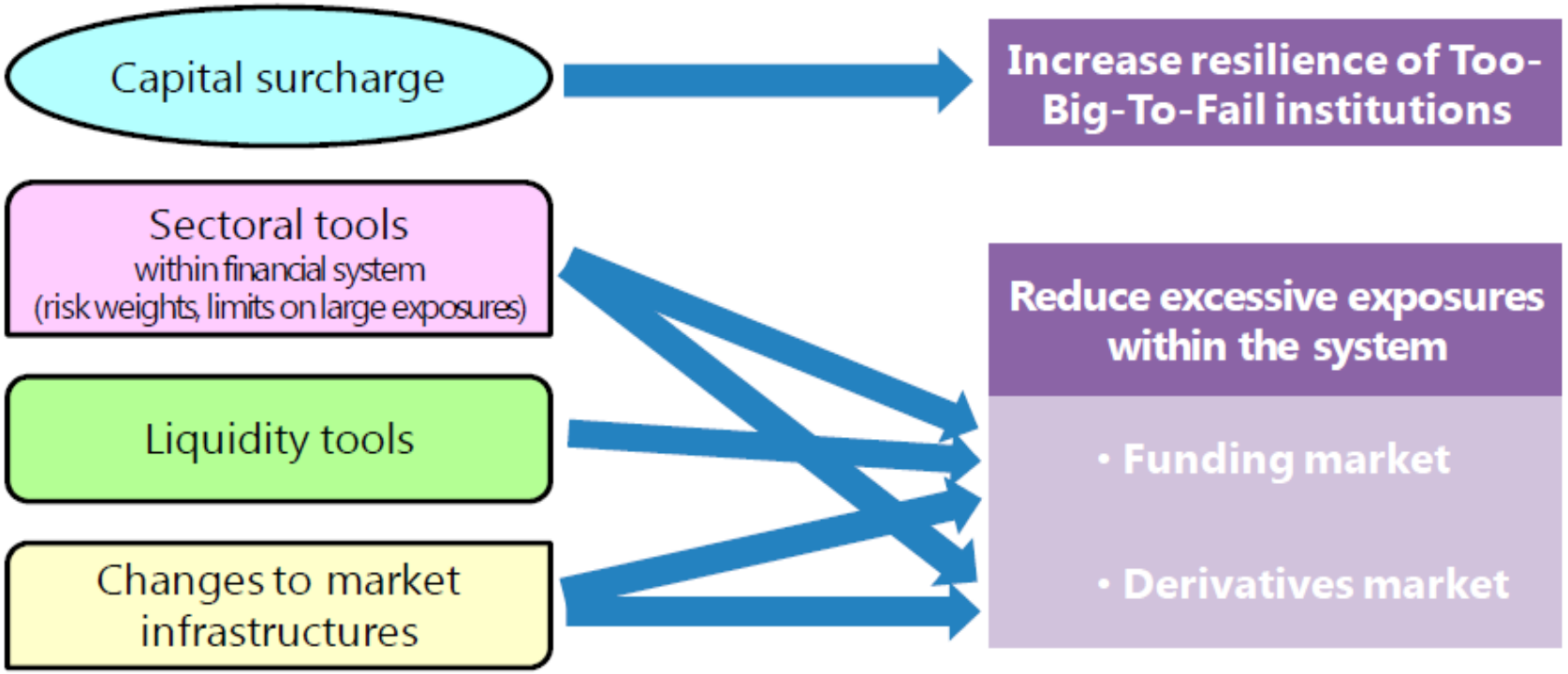
- FINMA is the micro-regulator and FINMA/SNB are collaboratively (with clear division of responsibility) a macro regulator
- Structural MPM instruments (e.g. systemic risk of individual institutions – capital surcharge) is under FINMA but SNB must also be involved for LOLR
- SNB is in charge of cyclical dimension of systemic risk (e.g. countercyclical capital buffer)
- High degree of coordination and consultation

Macroprudential Instruments

Time Dimension: Mapping Tools with Objectives



Cross Section: Mapping Tools with Objectives



Broad-based (Capital) Tools

Tools	Definition	Purpose/Transmission
Capital conservation buffer	Time-invariant buffer on top of the minimum capital requirement	• Increases banking sector resilience to shocks • Resilience channel: less risk to system • Credit supply channel: higher capital may lead to lower credit supply during transition
Counter-cyclical capital buffers	Time-variant buffer on top of the minimum capital requirement, aimed at forcing banks to hold higher capital during booms	• Increases banking sector resilience to shocks, and reduce pro-cyclicality • Credit supply channel: higher capital requirements during booms would reduce banks' desire to lend excessively
Dynamic provisioning	Force banks to recognize potential losses earlier in the credit cycle by holding provisions based on "through the cycle" expected losses	• Reduces pro-cyclicality • Credit supply channel: higher provisioning ex-ante reduces incentives to lend excessively during booms.
Capital surcharge	Higher capital charge for SIFIs	• Increases resilience of too-big-to-fail banks • Resilience channel: less risk to system • Credit supply channel: higher capital would lead to lower credit supply

Household Sector Tools

Tools	Definition	Purpose/Transmission
Sectoral capital requirement	Forces lenders to hold extra capital against their household exposures, in order to protect against unexpected losses	•Increases banking sector resilience to shocks •Credit supply channel: increasing funding costs and lending rates can reduce credit supply
Limits on loan-to-value (LTV) ratios	Imposes a limit on the size of collateralized loans relative to the appraised value of an asset (e.g. a house and or vehicle)	• Credit demand: reducing loan demand • Expectations: leading households to revise down their expectations of future asset price increases • Resilience: bolstering borrowers and lenders' resilience to asset price shocks • Anti-default: reducing borrowers' incentive to default strategically
Caps on debt service-to-income (DSTI) ratios	Restricts the size of debt service payments to a fixed fraction of household incomes	• Credit demand and expectations channels similar to LTV • Differences: - Enhancing borrowers' resilience to interest rate and income shocks - Functions as an automatic stabilizer when house price growth exceeds income growth

Corporate Sector Tools

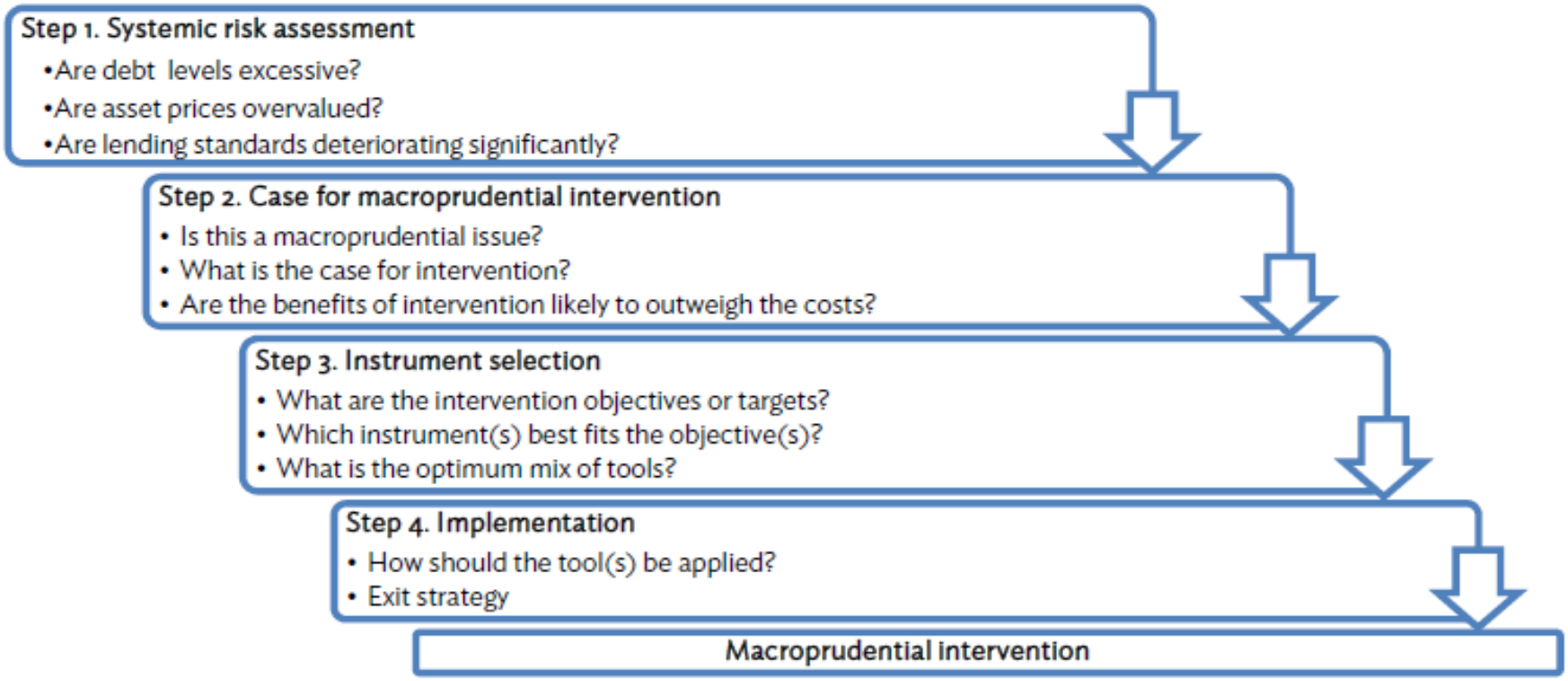
Tools	Examples	Purpose/Transmission
Tools affecting broad corporate credit	• Risk weights on corporate loans • Corporate credit growth speed limits	• Increase resilience of banks, increase relative funding costs and lending rates relative to other credit categories • Directly control the growth of credit to corporate sector
Tools to address foreign exchange risks	• Risk weights on FX corporate loans •Speed limits on FX corporate loans	• Increase the resilience of banks, increase relative funding costs of FX loans and lending rates relative to other credit categories •Directly control the growth of FX credit to corporate sector
Tools to address risks from commercial real estate lending	In addition to risk weights and speed limits: • Loan-to-value (LTV) ratio • Debt-service coverage (DSC) ratios	• Reduce demand for credit by constraining credit to CRE market to only those new borrowers that satisfy eligibility conditions • Similar as for households

Liquidity Tools

Liquidity tools	Definition / purpose	Examples
Liquidity buffer requirement	Ensures holding of stock of high quality liquid assets (HQLA) to cover outflows during a stressed period	Liquidity Coverage Ratio (LCR), Liquid asset ratio (LAR)
Stable funding requirement	Ensures holding of stable liabilities to fund illiquid assets	Net Stable Funding Ratio (NSFR), Core funding ratio (New Zealand), Loan-to-deposit (LTD) ratio (Korea)
Liquidity charge	Reduces reliance on non-core funding	Levy on non-core liabilities (Korea)
Reserve requirement (RR)	Ensures reserve holding and affects provision of credit	Turkey, LatAm
Tools to control FX funding	Reduce reliance on FX funding	Differentiated RR on FX (Turkey), LCR by currency (Sweden)

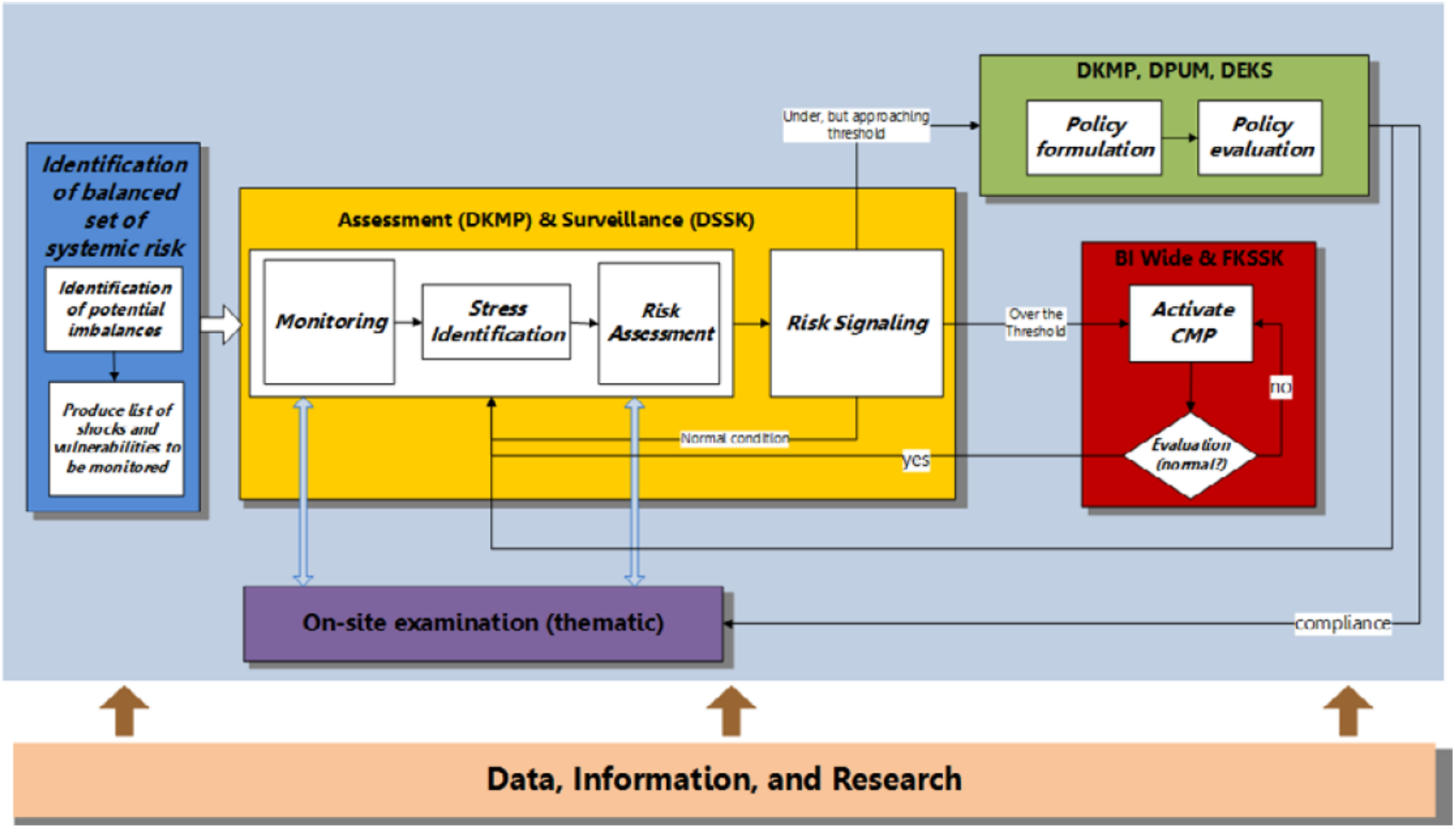
Operationalizing Macroprudential Policies

Steps in Macroprudential Policymaking



Source: Rogers, Lamorna. 2013. "A New Approach to Macro-Prudential Policy for New Zealand." *Reserve Bank of New Zealand Bulletin* 76 (3).

Indonesia: Macroprudential Policy Framework



Source: BIS, 2017.

Implementing Prudential Policy

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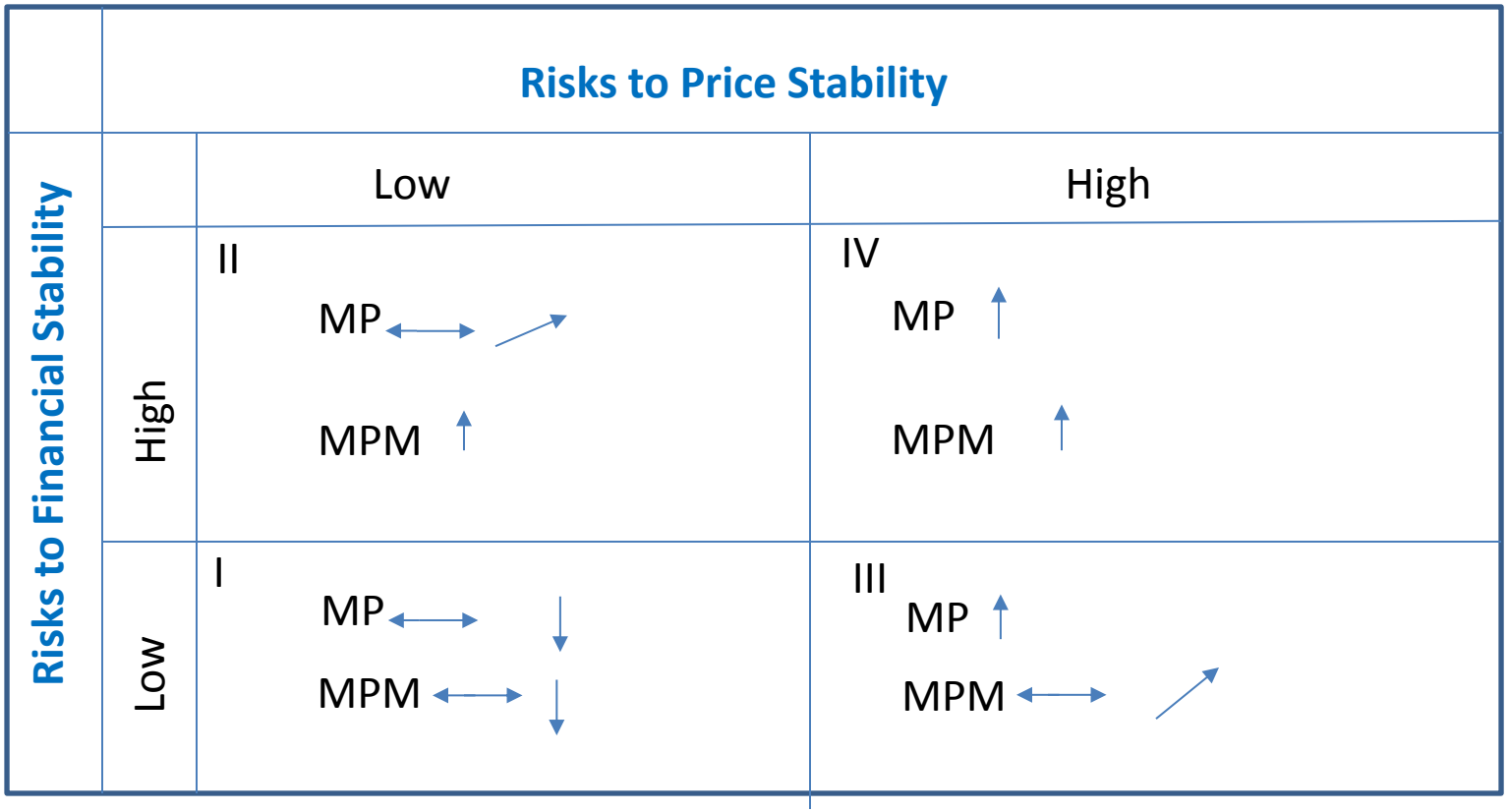
- High degree of coordination and consultation

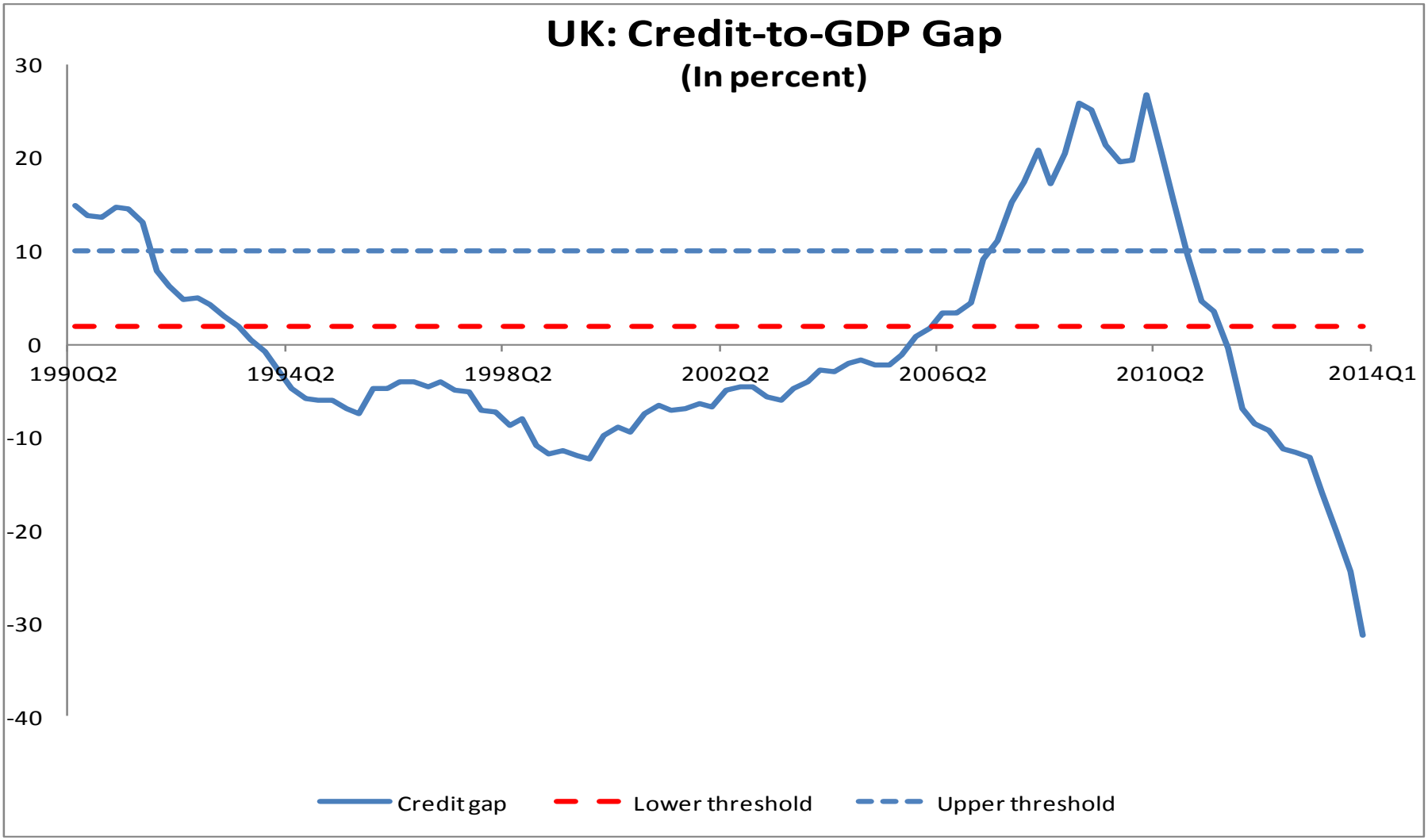
Implementing Macroprudential Policies in Coordination with Monetary Policy



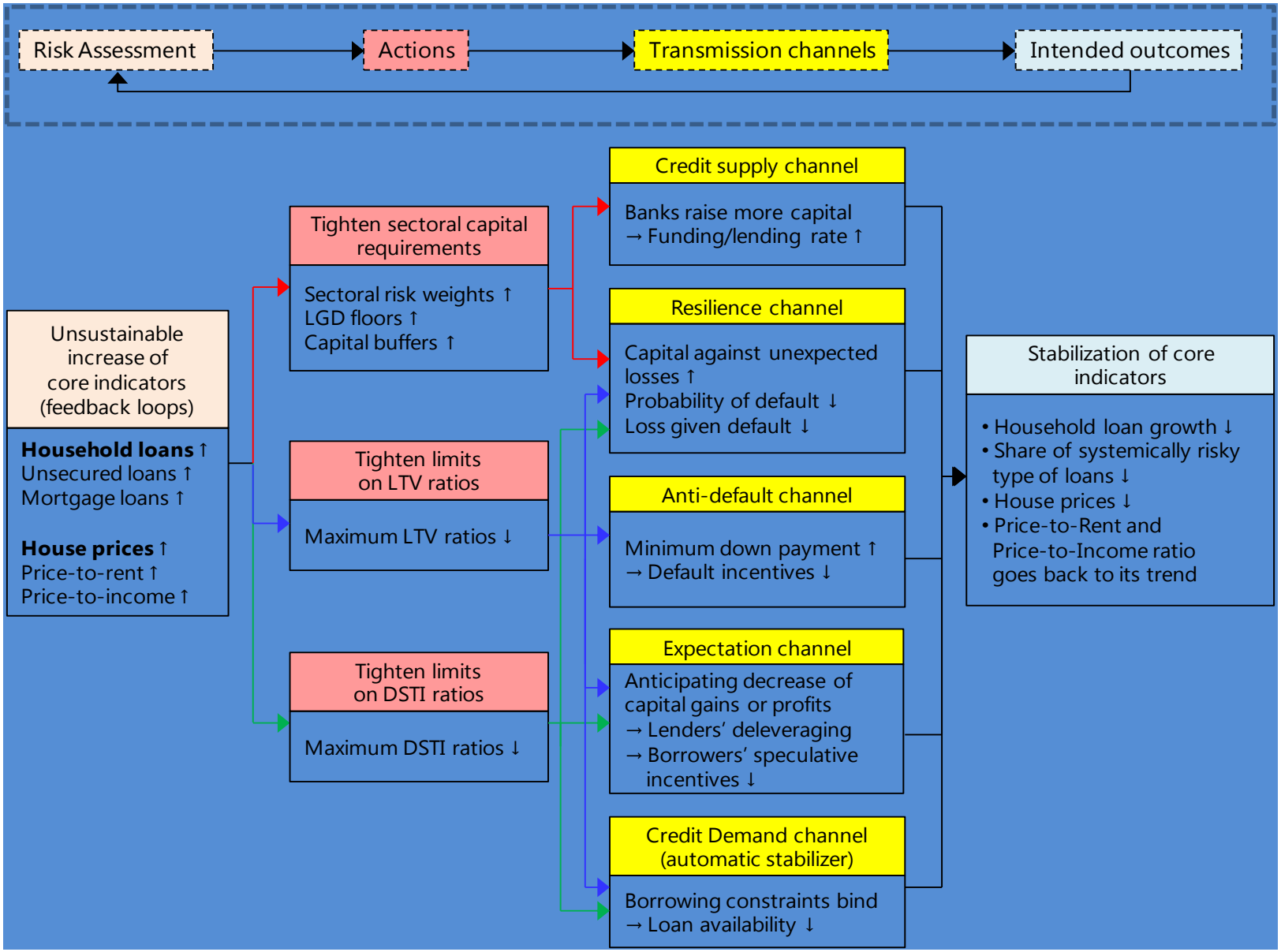
Activating Macroprudential Policies

- The Bank of England suggests using rules as a "rough guide" and discretion when necessary… but how to define "rough"?
  - Goodhart (2011) recommends using three sets of indicators:
    - (1) Rate of credit expansion
    - (2) Increases in property prices
    - (3) Growth of sectoral and economy-wide leverage
  - When at least two indicators are growing at a pace that is significantly faster than average, the macroprudential policy authority should take action or explain in public why it has not done so
- This leaves open the question of what constitutes excessive growth in the different indicators and also, importantly, what exactly is meant by "policy action"

Operationalizing Macroprudential Policies Implementation/Calibration (CCB)

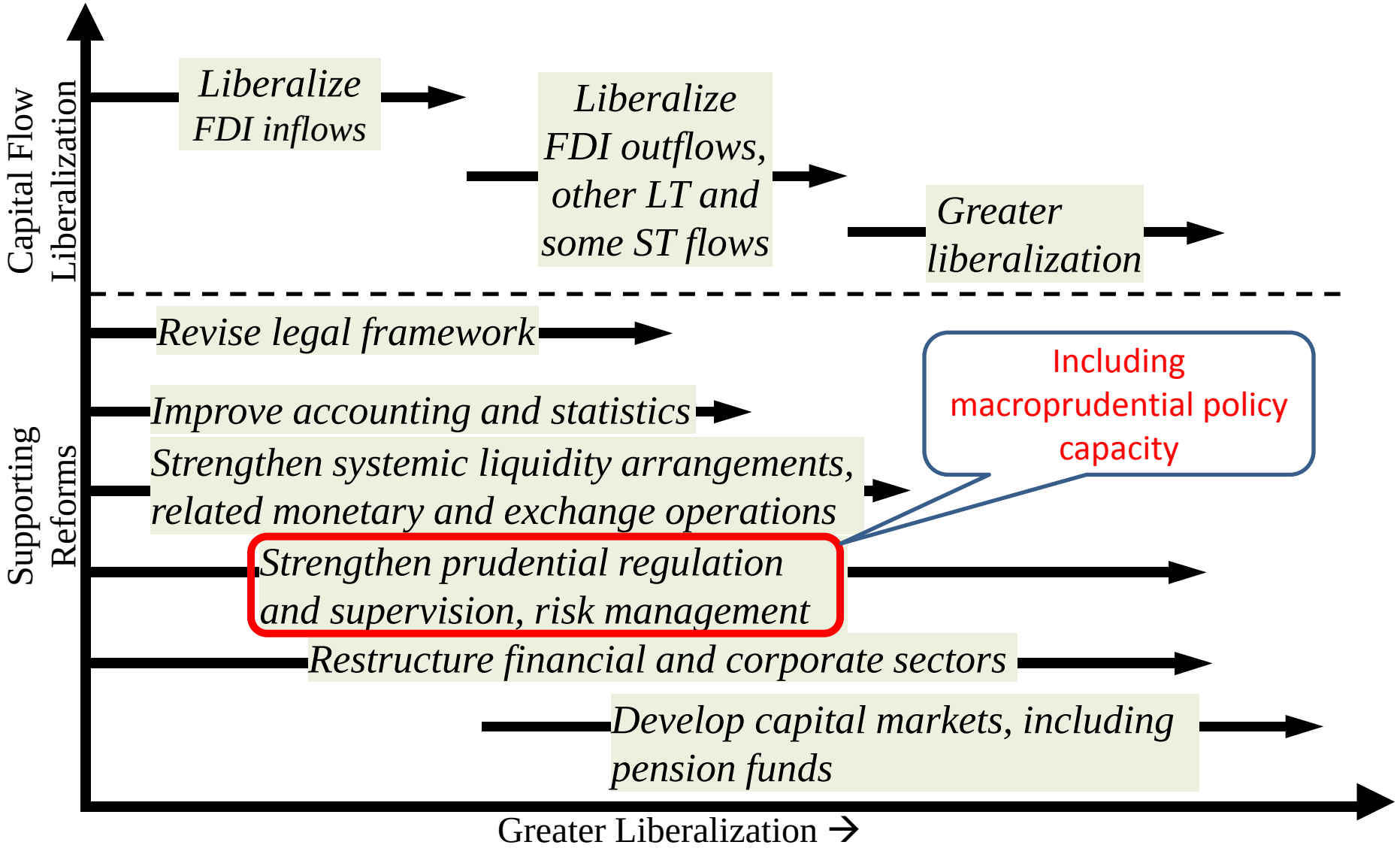


Transmission Mechanisms



Capital Flow Management (CFM) and Macroprudential Policy Management (MPM)

The Integrated Approach to Capital Account Liberalization (including MAPP)



What is the Role of Macroprudential Policy in the Process of Capital Flow Liberalization

- Greater capital flow liberalization should be supported by a progressive strengthening of capacity to deploy macroprudential tools.
  - along the sequence of steps envisaged under the integrated approach.
    - in particular, in the context of the liberalization of banking and portfolio debt flows
- The capacity to deploy tools effectively requires adequate institutional arrangements and toolkits, as well as information to assess risks and calibrate policy tools appropriately.
- Where supervisory capacity or relevant data to operationalize macroprudential policy are lacking, this would argue for caution with further liberalization.

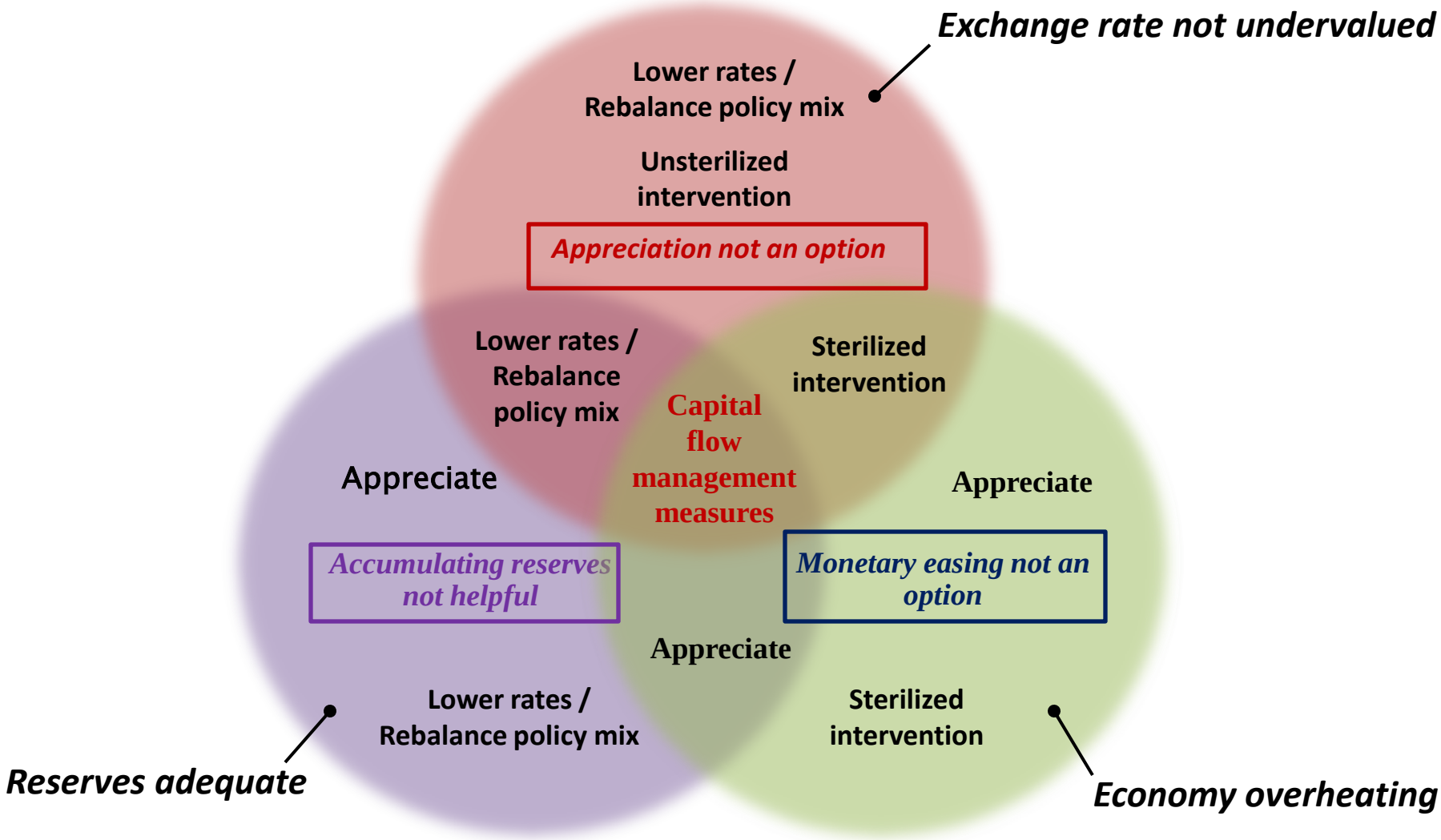
Addressing Capital Flow Surges: Capital Flow Measures

- Capital flow surges can generally be managed through macroeconomic policies
  - lowering of interest rates in the absence of overheating pressures or asset price inflation;
  - allowing the currency to strengthen if it is not overvalued;
  - Building foreign reserves if they are not adequate;
- In certain instances, CFM measures can be appropriate;
  - room for macro adjustment is limited;
  - when macro adjustments take time to take effect;
  - inflow surges have financial instability consequences;
- MAP and CFM have different objectives;
  - CFMs are designed to limit capital flows by influencing the size and composition;
  - MAP are designed to address systemic risk not limited to capital flows;

CFMs Appropriate Under Certain Circumstances

- Appropriate macro conditions are in place
  - *Exchange rate is not undervalued*
  - *Reserves are more than adequate*
  - *Overheating/inflation concerns preclude monetary easing*
  - *Fiscal policy is not pro-cyclical*
- CFMs could complement fiscal tightening plans that are already in place, given lags in macroeconomic impact
- CFMs are no substitutes for right macroeconomic policies

Framework for Policy Responses to Capital Flows



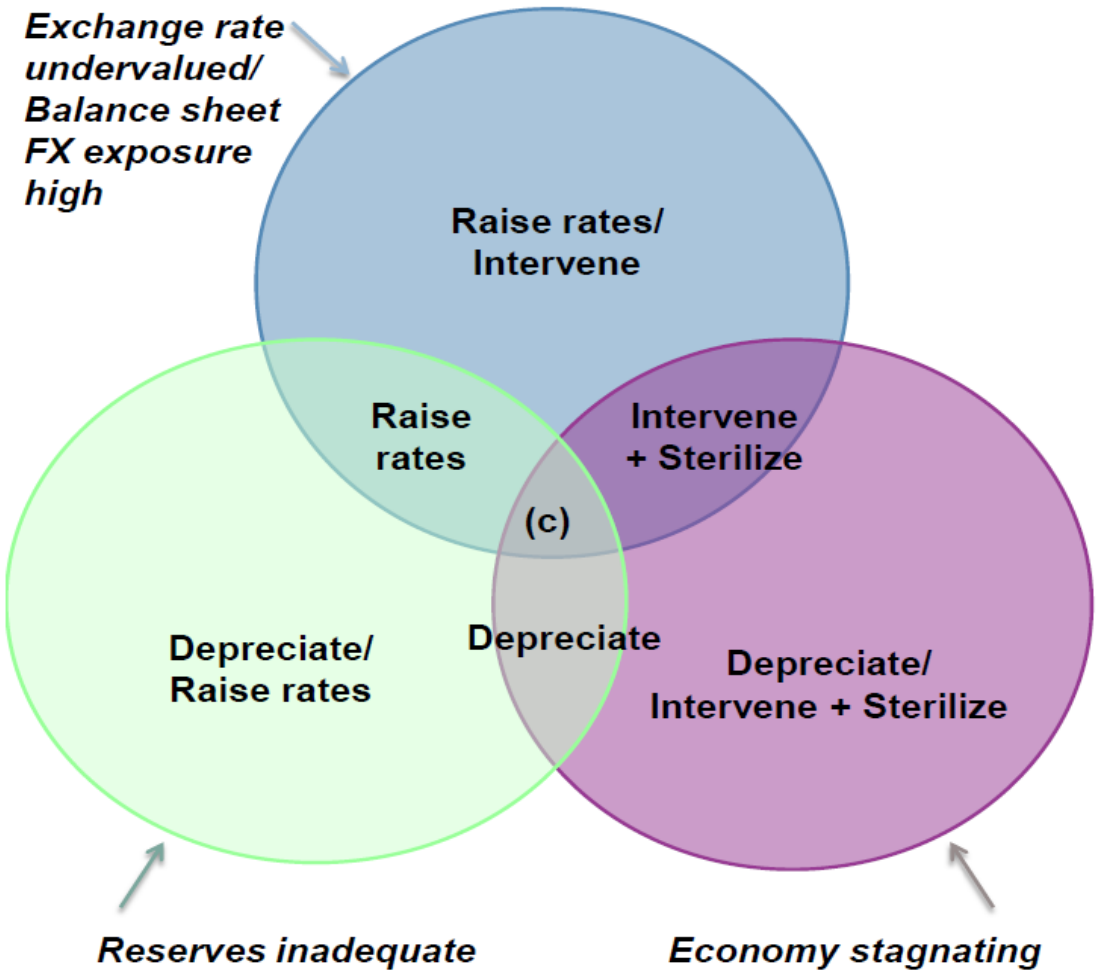
Source: IMF.

Managing Capital Outflows (1)

- Some outflows are natural course of openness and policy action is not needed (outflows as part of investment opportunities; financial integration)
- Robust policy frameworks, strengthened balance sheets, sound institutions, and deep financial markets can help withstand shocks
- Triggers for outflows: vulnerabilities subject to global risk sentiment and liquidity (trade and financial channel)
- Impact on credit, interest rates, exchange rates, output
- When should CFMs be used? Crisis or imminent crisis; judgment is involved; [currency collapse, debt sustainability pressures, corporate and financial stress, sharp interest rate increases, and output declines]

Managing Capital Outflows (2)

The diagram does not prescribe or take a view on the appropriate combination of the three policies– only on circumstances under which each might be appropriate.



Each circle represents cases where the relevant condition is met. For example, the top circle ("Exchange rate undervalued") represents cases where the exchange rate is assessed to be undervalued. The intersection of all three circles (the area marked "c") reflects cases where the exchange rate is undervalued, reserves are judged to be inadequate, and the economy is stagnating. A country in (c) is likely to be in crisis or imminent crisis.

In such cases of limited policy flexibility, as represented by the intersection of all three circles, alternative options, including official financing (e.g., UFR) and, in crisis or imminent crisis, introducing temporary outflow CFMs and/or easing existing inflow CFMs can be useful to support, and not substitute for, the needed macroeconomic adjustment.

In crisis circumstances, **financial stability considerations** can also warrant CFMs to provide breathing space while fundamental policy adjustment is implemented.

Managing Capital Outflows (3)

- Macro policy response first:
  - exchange rate should act as a shock absorber – some depreciation if the exchange rate is not undervalued, but ensure that there is not too much volatility of the exchange rate
  - Foreign exchange intervention so that reserves do not fall below the adequacy level, Unsterilized intervention if the monetary conditions are too loose and/or the intervention is under a fixed exchange rate regime
  - Adjusting monetary policy to tighten if the pass-through effect is strong and inflationary pressures build up
  - Fiscal policy measures should be based on public debt sustainability and cyclical considerations; if fiscal space is eroding, fiscal tightening could restore policy credibility;
- Take into consideration: financial stability risks (e.g. balance sheet risks)
- Need to have judgment in assessing the policy mix;

Managing Capital Outflows (4)

- CFMs can be used in crisis like situations as part of a broad package of policy measures;
- CFMs on outflows, like for inflows, should be temporary, transparent, and non-discriminatory;
- Unlike targeted CFMs on inflows, CFMs on outflows need to be comprehensive and adjusted on an ongoing basis in order to avoid circumvention and maintain effectiveness;
- CFMs should avoid getting into external payment arrears or default (especially on sovereign debt);

Macroprudential Measures vs Capital Flow Measures

- **MPMs**
  primarily prudential tools to limit systemic risk (IMF 2013, 2014, IMF-FSB, BIS 2016)

- Aim to (i) build resilience, (ii) contain build-up of systemic risk over time
- Can help limit systemic risk from capital flows even when not designed to limit capital flows
- Policy approach should be well calibrated to contain systemic vulnerabilities based on an assessment of systemic risk
- Prudential tools are precautionary by nature
- A broad range of MPMs may be needed to attain objectives

- **CFMs**
  tools designed to limit capital flows (IMF 2012, 2016)

- The IV considers a broad macro policy package to handle capital flows
- CFMs should not substitute for warranted macroeconomic policy adjustment
- CFMs can be appropriate in certain circumstances
- CFMs should be transparent, targeted, generally temporary, and non-discriminatory
- CFMs on inflows only in capital flow surges
- CFMs on outflows only in (imminent) crisis situations

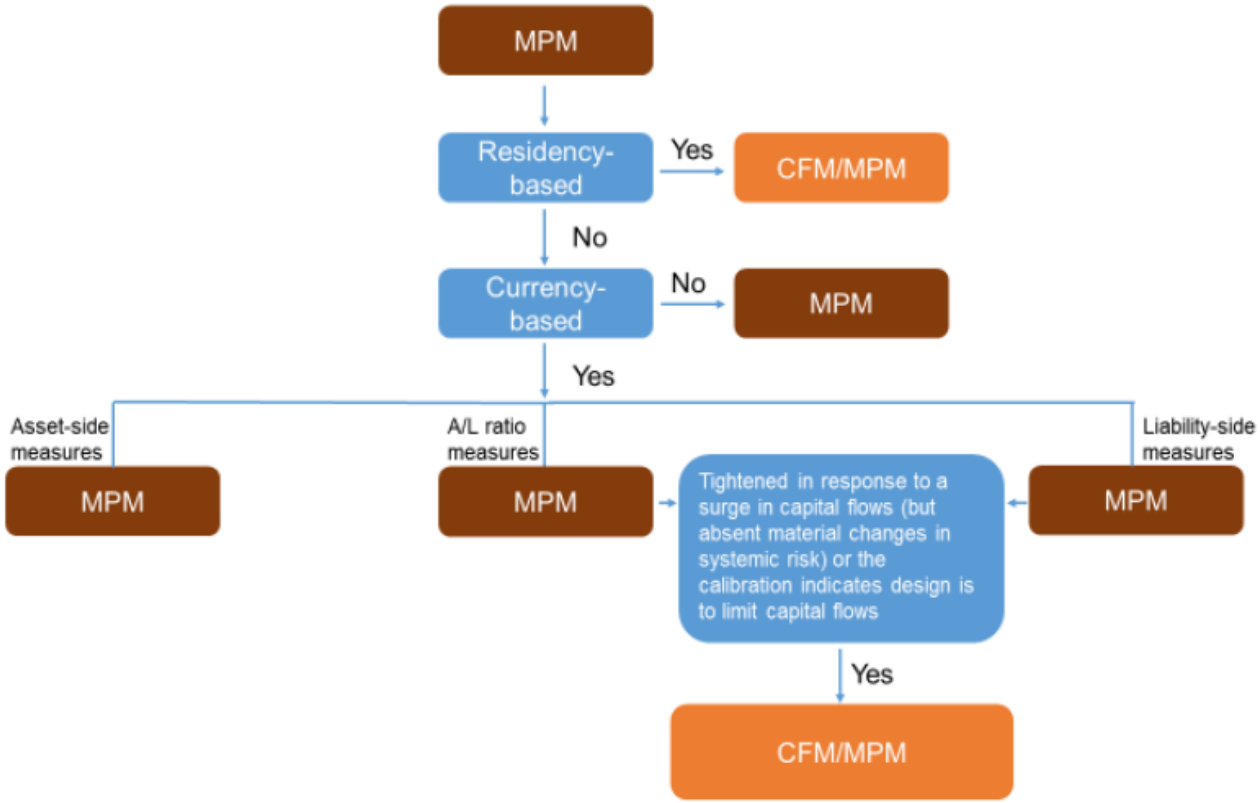
Distinguishing Between MPMs and CFMs

- For a measure to be assessed as an MPM it needs to be geared towards containing systemic risk.
- This hinges on two conditions:
  1. the identification of a potential **source of systemic risk** that needs to be addressed;
  2. the identification of a **path of transmission** of the measure along which the measure can reasonably be expected to contribute to a reduction in systemic risk
- All relevant information should be considered to help guide the determination of whether an MPM is also a CFM, i.e. a measure designed to limit capital flows
  - Context (e.g., whether the measure was adopted during a surge),
  - Calibration of the measure (e.g. scope and intensity),
  - Other country-specific circumstances
- Thus seemingly similar measures in different countries could be assessed differently and a measure that is initially an MPM may become a CFM/MPM

Distinguishing Between MPMs and CFMs

- A MPM can be put in place **pre-emptively** before an inflow surge occurs or **permanently** to limit systemic risk.
  - Can also be tightened in response to increases in risk (e.g., in the context of a surge).
- A CFM/MPM may be useful to limit systemic financial risks stemming from a **capital flow surge**, provided that
  - They are not used as a substitute for necessary macroeconomic adjustment
  - They are the most effective, efficient, and direct, and the least distortive
  - They seek to treat residents and nonresidents in an even-handed manner
- A CFM/MPM may be **maintained** until after the capital flow surge abates, but their usefulness relative to their costs needs to be evaluated on an ongoing basis
  - A key part of the assessment is whether there are alternative measures to address the systemic risk that are not designed to limit capital flows

A Flow Chart Guide to Assess CFM/MPM



Source: IMF (2017), "Increasing resilience to large and volatile capital flows.

Inflows into the Government Bond Market

Is this a MPM or CFM?
Is it appropriate?

- Circumstances:
  - Capital inflows into country A are limited relative to historical averages, but they are nevertheless pushing down bond yields as the market is rather illiquid and flows are weakening the effects of monetary policy tightening on long-term interest rates
  - The exchange rate is a bit overvalued, the economy is overheating, fiscal policy is neutral, monetary policy has been tightened, and FX interventions have resulted in more than adequate FX reserves
  - The financial system is well protected with prudential measures
- Policy response:
  - A special one-year, 40 percent reserve requirement on portfolio flows into the government bond market is introduced to safeguard adequate transmission of monetary policy and thereby macroeconomic stability

Stamp Duty on Property Transactions by Non-residents

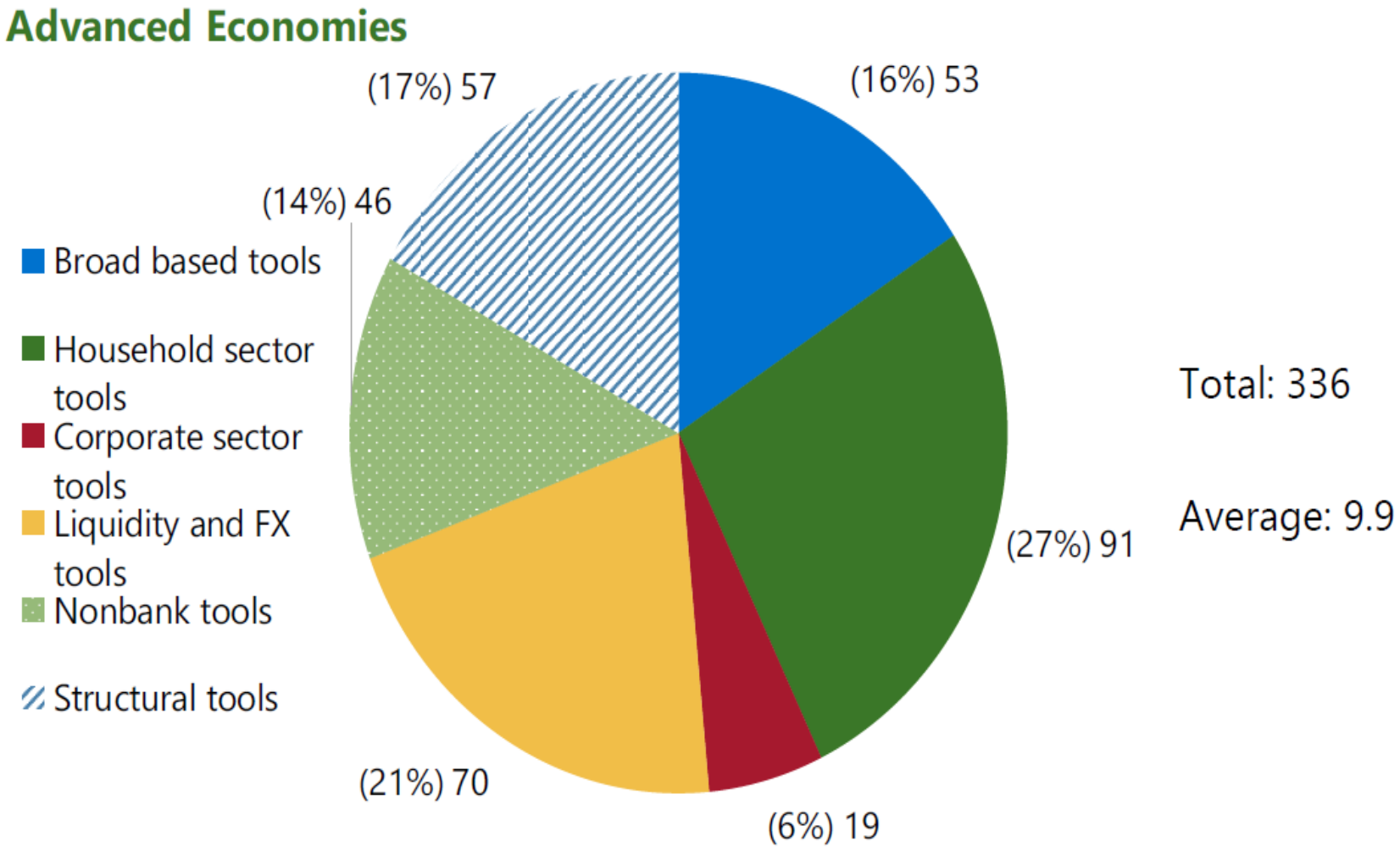
Is this a MPM or CFM?
Is it appropriate?

- Circumstances:
  - Country B faces a capital inflow surge especially to the property market amid ample global liquidity conditions
  - The exchange rate is fairly valued, the economy is overheating, macroeconomic policy settings are appropriate
  - International reserves are above adequate levels
  - The financial system is well protected with prudential measures, but house prices have recently risen rather rapidly relative to income levels
- Policy response:
  - A stamp duty on property transactions by nonresidents is introduced amid concerns over housing affordability, in particular young households´ capacity to become home owners

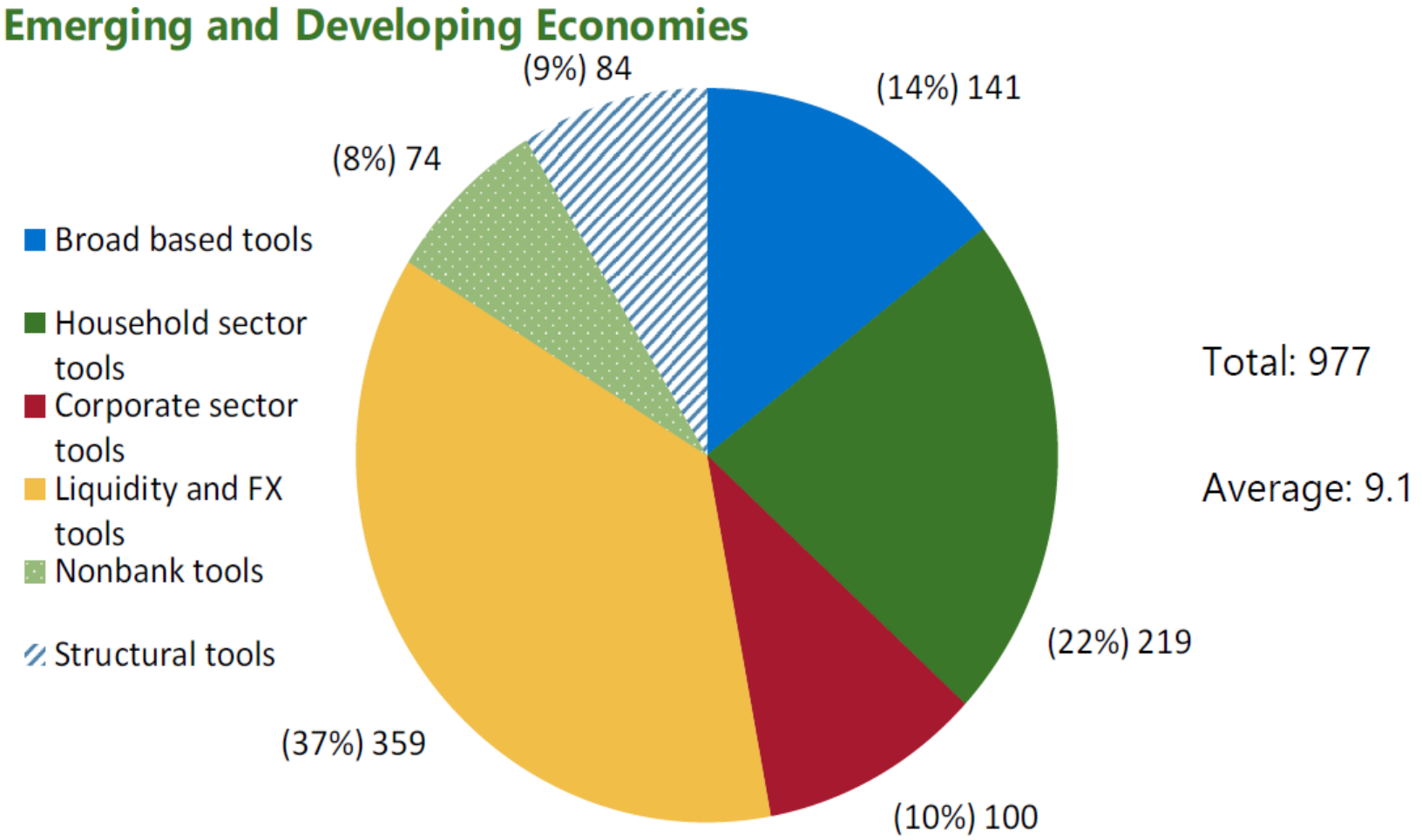
IMF MPM Survey

The IMF has started to construct a new macroprudential policy database based on a survey of its membership.[2] The objective of the survey, which will be conducted every year, is to compile a global database cataloguing macroprudential measures taken by countries and over time. The first vintage of the database is now available, and records country responses received by the end of February 2018.

IMF MPM Survey

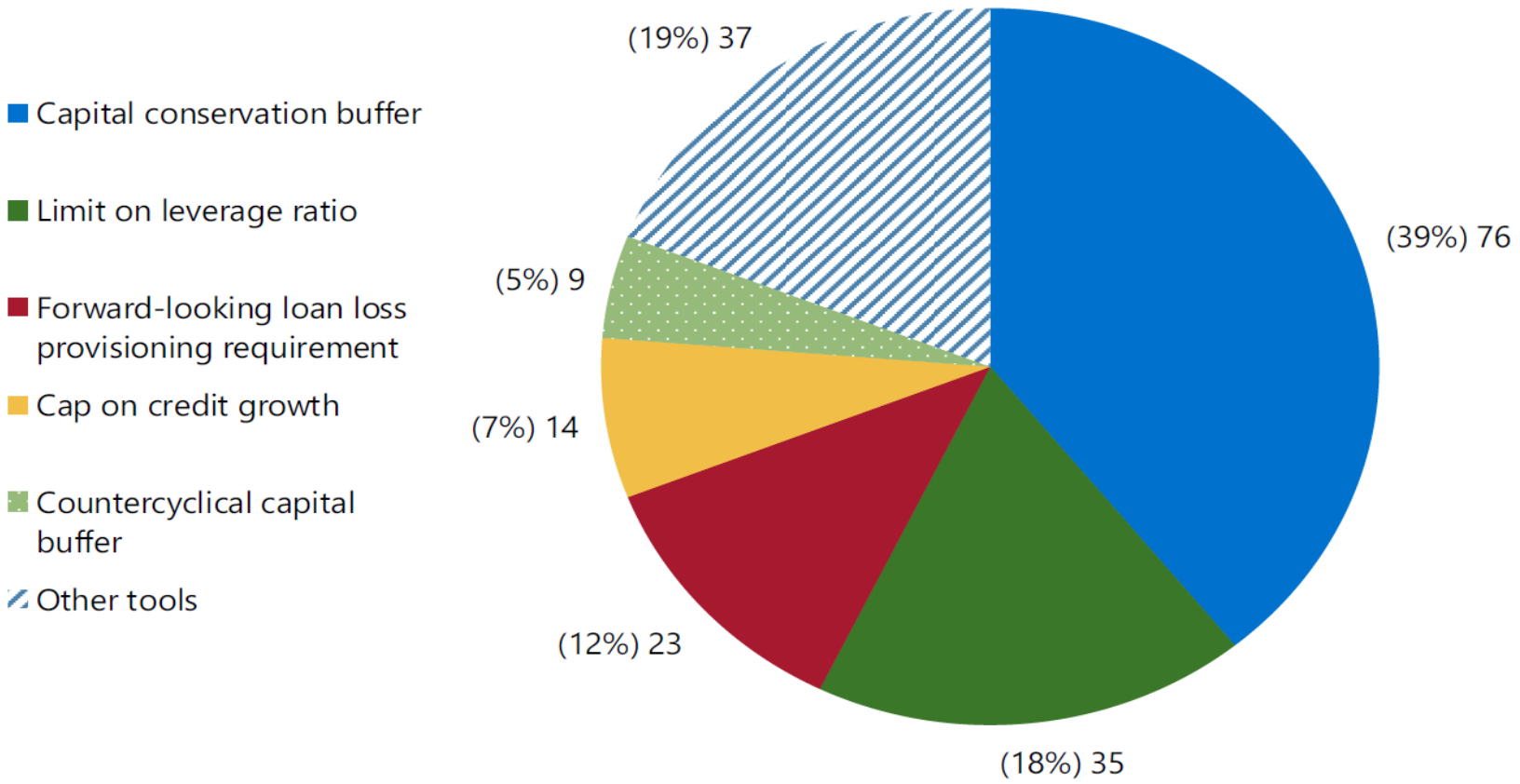


IMF MPM Survey



IMF MPM Survey

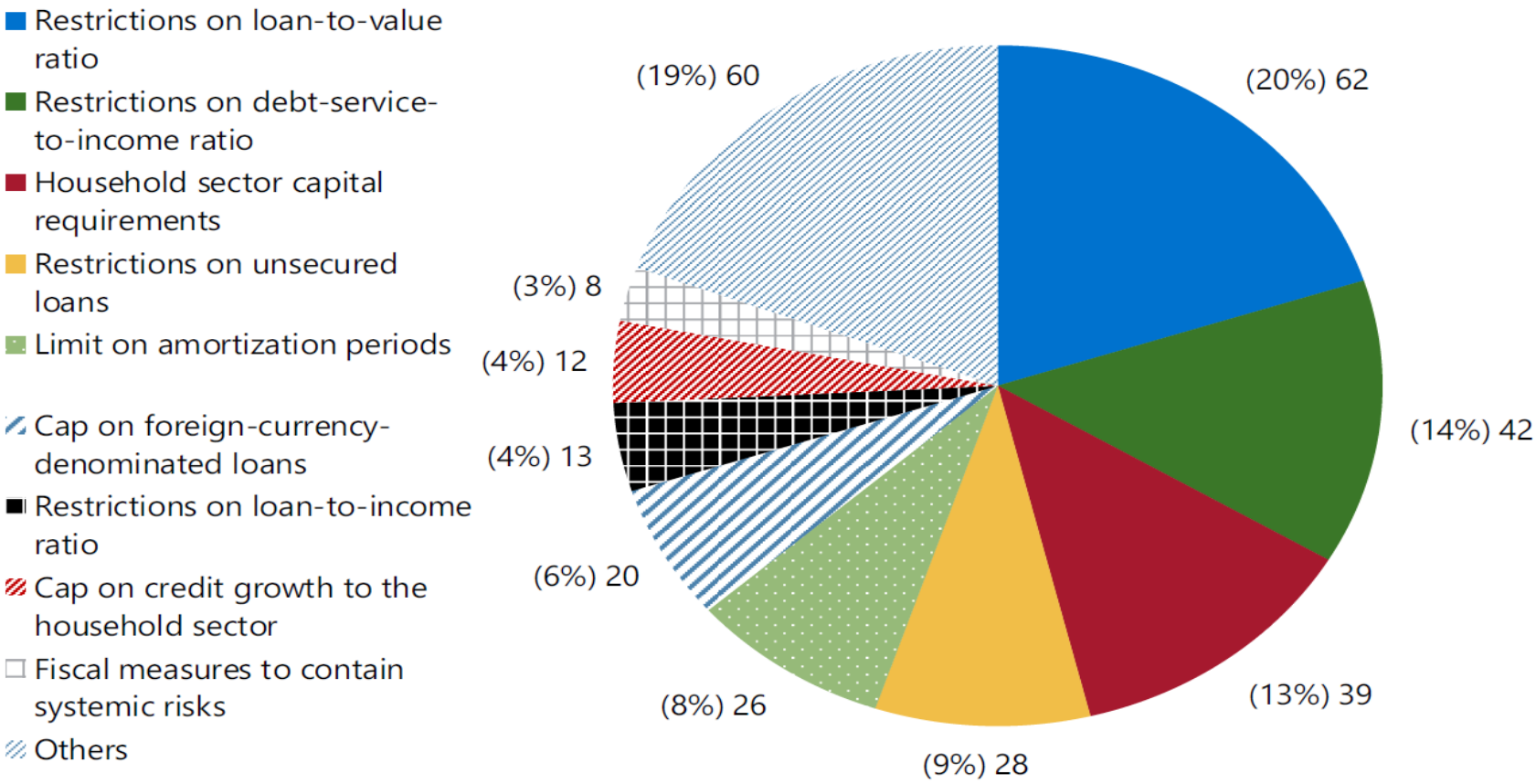
Number of Broad based Tools 1/



1/Numbers denote frequency of measures reported; percentages denote the share among total measures reported.

IMF MPM Survey

Number of Household Sector Tools 1/



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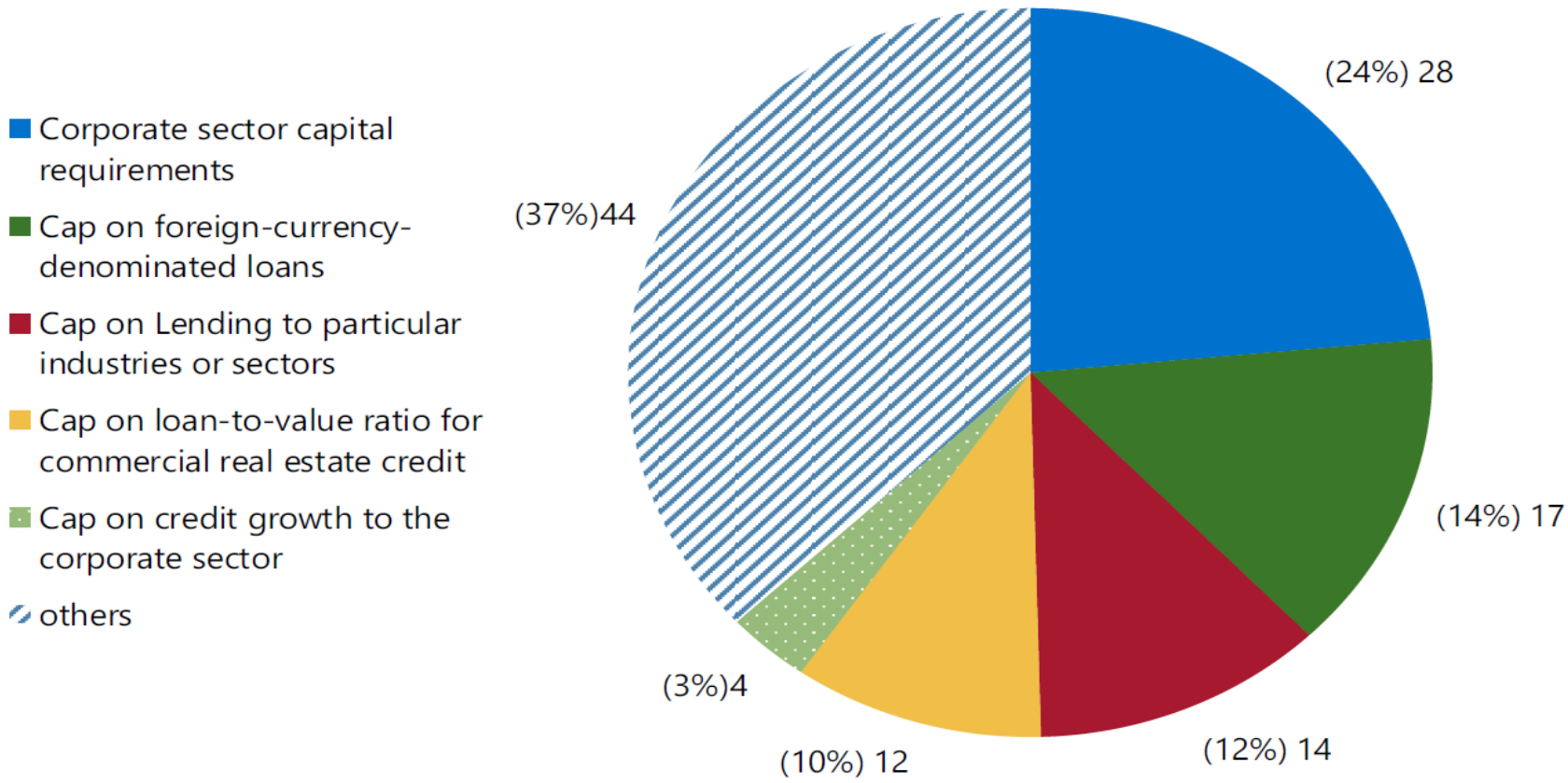
IMF MPM Survey

Number of Corporate Sector Tools 1/



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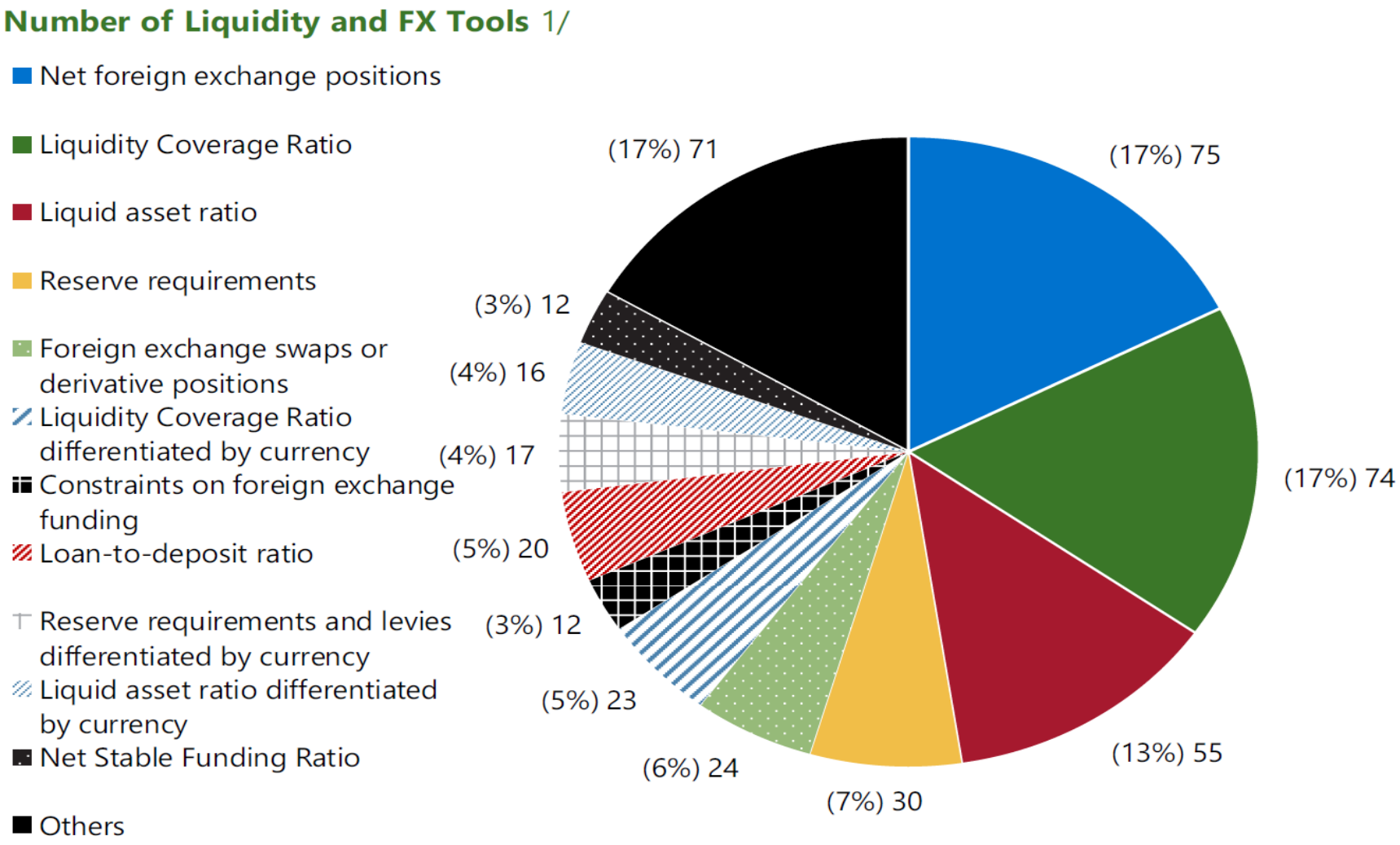

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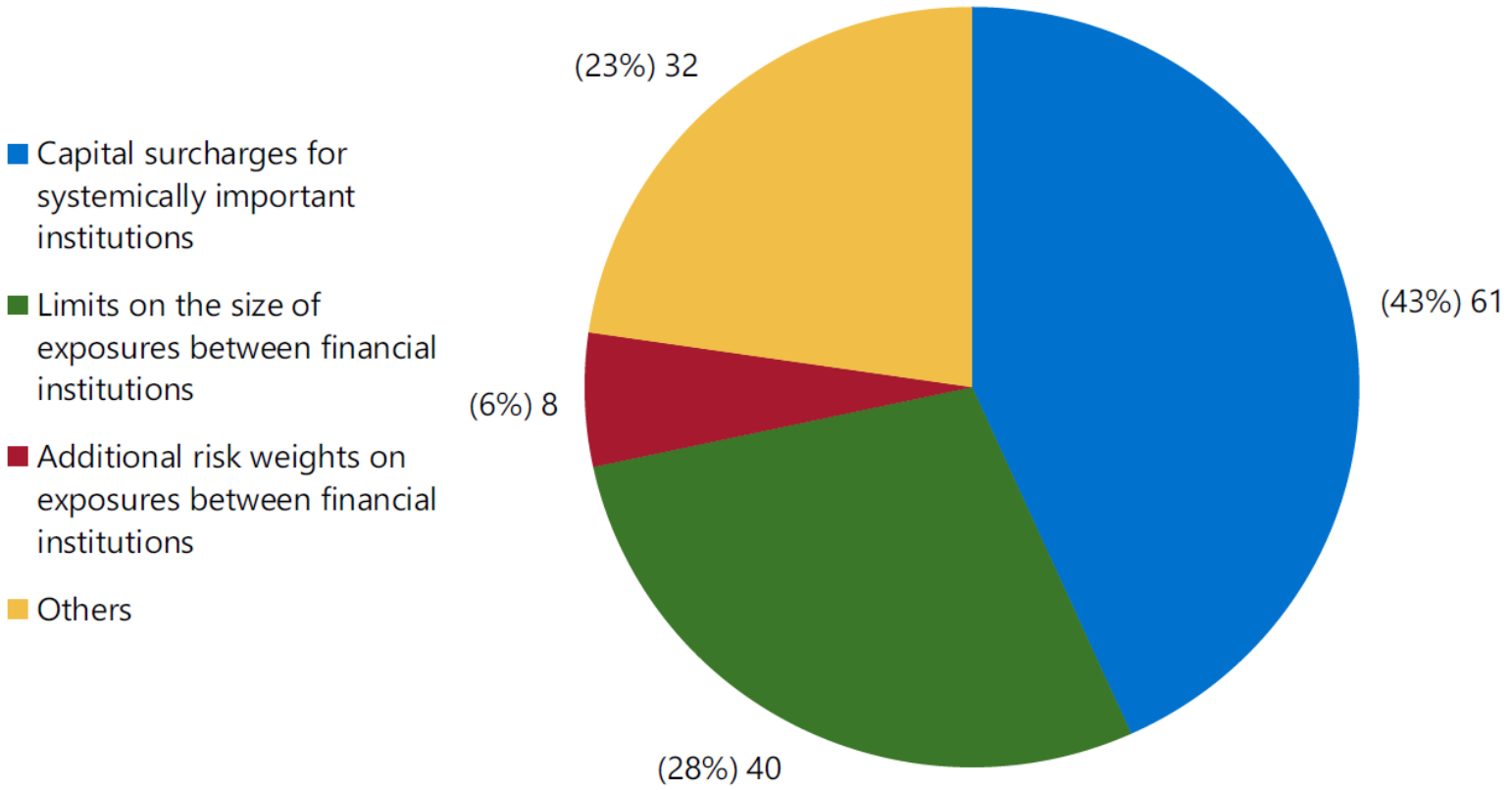
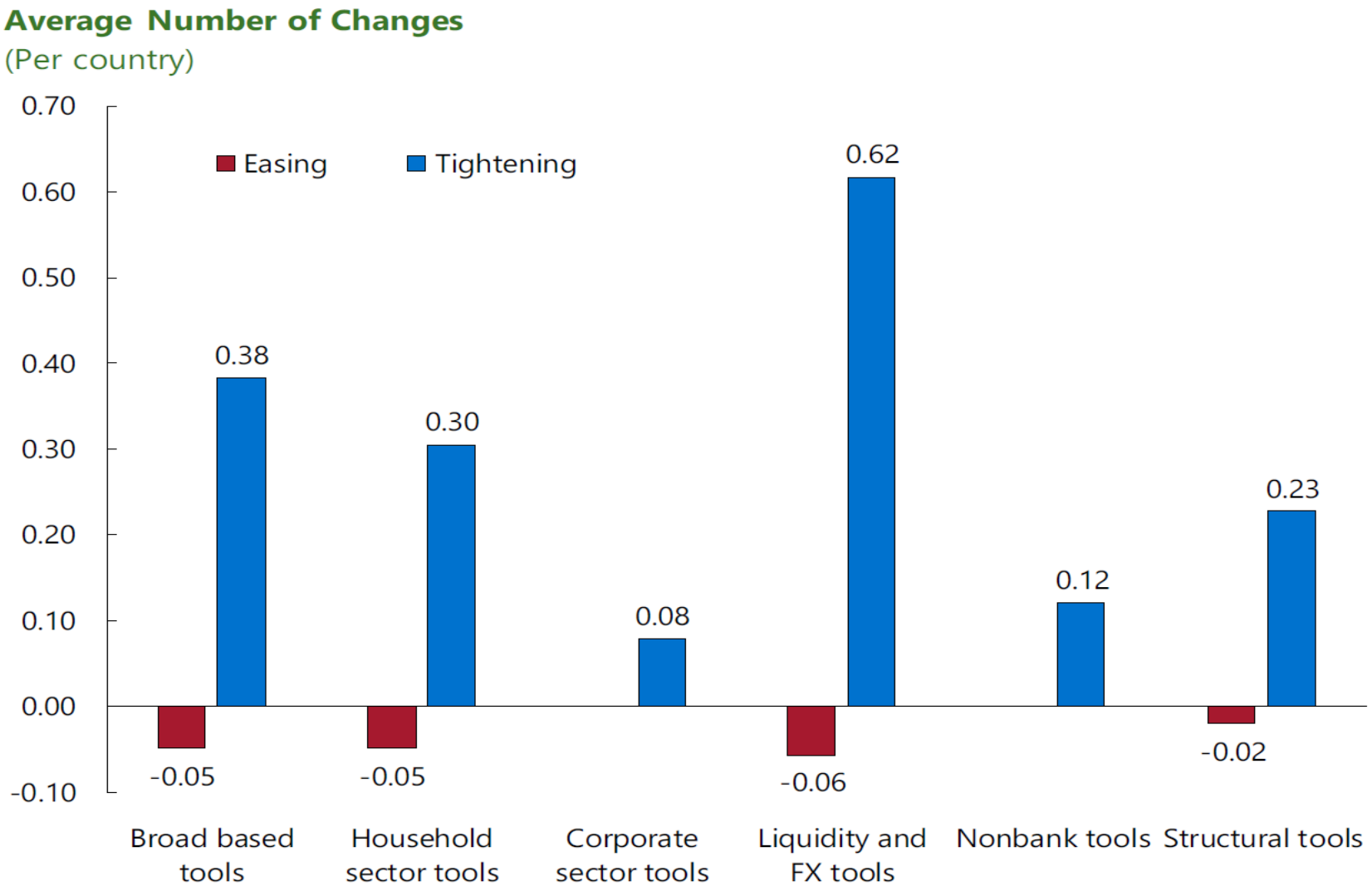
IMF MPM Survey

Number of Structural Tools 1/



1/Numbers denote frequency of measures reported; percentages denote the share among total measures reported.

IMF MPM Survey



Conclusion

- Macroprudential frameworks should be more holistic, comprehensive and balanced to ensure macro-financial stability;
- Alongside micro-oriented financial regulation and supervision, MPM framework should also encompass monetary, fiscal and structural policies;
- Monetary and macroprudential authorities need to take into account each other's actions when making decisions;
- Ultimate goal would be to have the various policies work alongside each other to ensure macroeconomic and financial stability while raising long-term sustainable growth;
- Clear communication of macroprudential policy action is essential for building credibility;

Two Questions

- How well can policymakers detect the buildup of systemic risk?
  - Timely use of macroprudential tools depends upon the ability to discern the accumulation and magnitude of systemic risk
  - Measurement challenges arise because defining systemic risk is hard ("tail events" involve a multiplicity of sources), because risk is endogenous, and because it is arise in different ways in the future
- Will they be able to apply the tools when needed?
  - Because of the political economy of macroprudential regulation, authorities may face strong pressures to delay or tone down the measures

Macroprudential Indicators

Stephan Danninger and Mangal Goswami

Seminar on Macroprudential Supervision

IMF – South Asia Training and Technical Assistance Center
APEC Financial Regulators Training Initiative
Bangkok, 16-19 July 2018

Presentation Outline

1. **Credit Booms and Financial Crises**
2. **Financial Sector Vulnerability Indicators**
3. **Financial Vulnerability Index (FVI)**
4. **Mapping to Macroprudential Indicators**
5. **Conclusion**

Credit Booms and Financial Crises

- Credit booms seem necessary (but not sufficient) condition for a subsequent financial crisis
  - Most financial crises are preceded by a credit boom
  - But only one-fifth of credit boom episodes end up in a financial crisis
- Increase in NPLs usually follows periods of **rapid credit growth**
  - Associated with aftermath of financial liberalization or reversal of capital flows
- Difficult to determine when credit growth is “excessive” and/or will lead to crisis

Credit Growth: The Good and the Bad

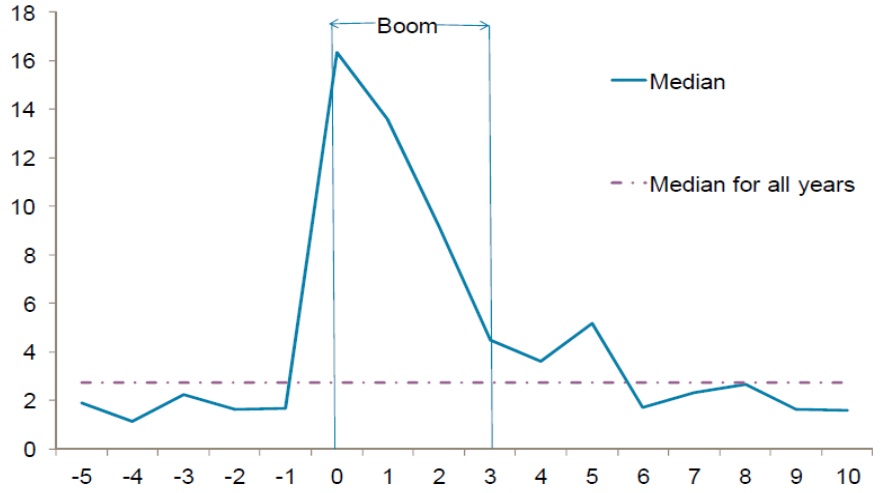
- Credit growth is “good” for access to finance and financial deepening
- Credit growth positively associated with economic performance
  - One percentage point increase in the credit-to-GDP ratio in normal times amount to improvements in the GDP forecasts by about 0.2 percent on a 4-6 quarter-ahead horizon
- But “excessive” credit growth may lead to subsequent financial crises
  - The same increase will reduce the GDP forecast by about 1 percent (on the same forecast horizon) in times of “large distress.” (Arregui, et al. (2013))

What is a Credit Boom?

- No consensus in the literature
- Generally, a deviation from some measure of trend growth
- Alternative measures of credit growth
  - Credit growth (%), Credit/GDP, Δ(Credit/GDP), Credit/GDP relative to HP trend or over a moving average of 4-5 years.
  - Include not just bank credit, also non-bank financial intermediaries and corporate bonds/notes.
- For advanced economies, credit-to-GDP gaps are valuable early warning indicators for systemic banking crises (Drehmann (2012))

Credit Boom Identification: Example

Figure 1. A Typical Credit Boom
(Growth rate of credit-to-GDP ratio around boom episodes)



Sources: IMF *International Financial Statistics*; staff calculations.

Credit boom = Growth of 20+ percent, or 10+ percent and deviation from trend>1.5σ
Source: Dell'Ariccia, Igan, Laeven and Tong (2012).

Financial Sector Vulnerability Indicators

- Simple Indicators
  - Credit Growth
  - Asset Prices
  - Leverage
  - Others

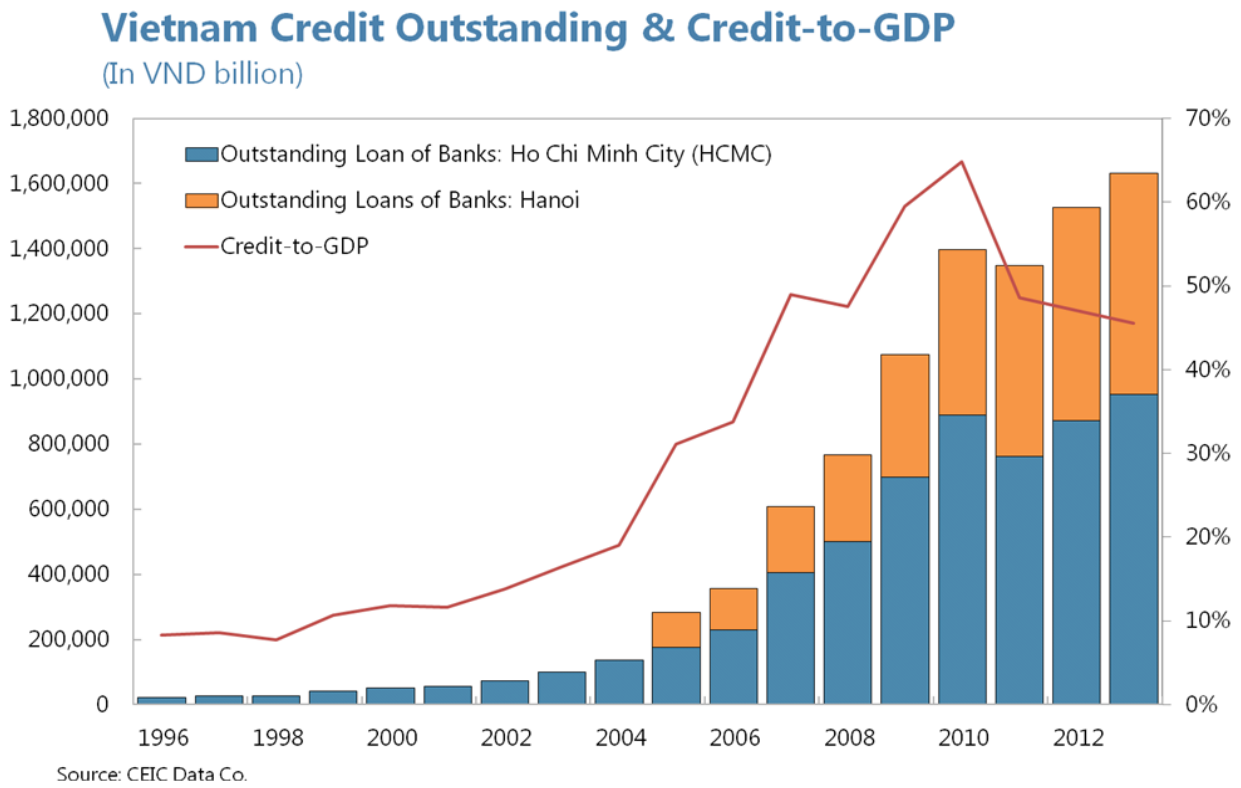
Simple Indicators: Measure of Credit

- **Measure of credit**: Credit growth (%), Credit/GDP, Δ(Credit/GDP), Credit/GDP relative to HP trend or over a moving average of 4-5 years

- Include not just bank credit, also non-bank financial intermediaries and corporate bonds/notes.

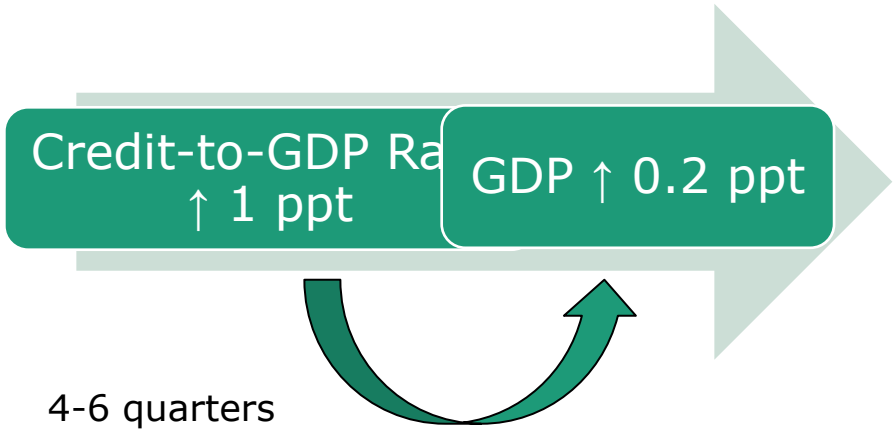
- **Credit-to-GDP gaps** can be valuable early warning indicators for systemic banking crises.

Vietnam: Credit and Credit to GDP



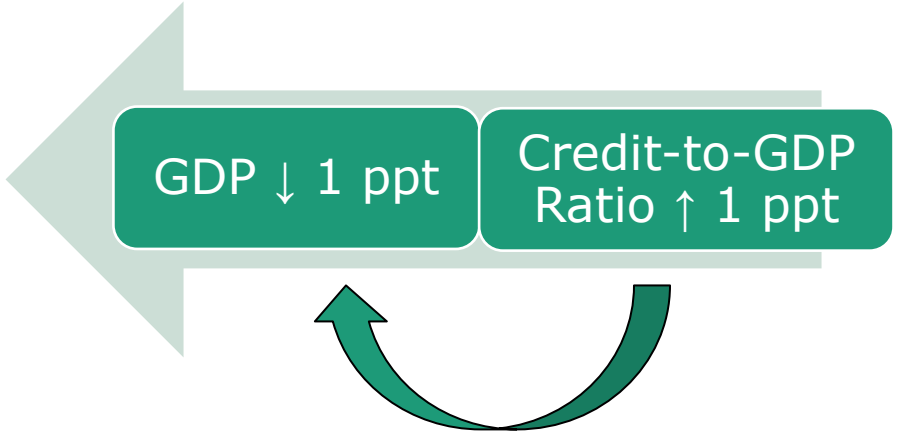
Credit in “Normal” Times

- Credit growth is “good” for more access and deepening.
  - Rule of thumb: a 1-percentage point increase in the **credit-to-GDP ratio** in normal times amount to improvements in the GDP forecasts by about 0.2 percentage point on a 4-6 quarter-ahead horizon.



Credit Booms and Crises

- But some credit booms are associated with future financial crises.
  - The same increase in the credit-to-GDP ratio will reduce the GDP forecast by about 1 percent (on the same forecast horizon) in times of "large distress" (Arregui, et al. (2013)).



Indicators for Credit (Quantity)

Indicators	Interpretations
Credit-to-GDP gap (Credit/GDP relative to HP trend) Credit growth (%) Credit/GDP Δ(Credit/GDP) Credit/GDP over a moving average of 4-5 years	If high, on alert. • Ideally, include not just bank credit, also non-bank financial intermediaries and corporate bonds/notes. • Credit-to-GDP gap may be misleading if frequent structural shifts or not enough data. • Credit/GDP may be volatile if GDP is volatile.

Indicators for Credit (Price, Quality)

Indicators	Interpretations
Credit spreads / Lending spreads	If low, credit boom likely. If volatilities of spreads are low, it may be a turning point of a boom. About the price of credit.
Lending standard (from credit conditions survey)	If loose, credit boom likely. (Check advertisements like “No-doc loans” and “Easy credit terms.”)
Term premium	For advanced economies, if low or negative, it may indicate a downturn. Also about the price of credit.

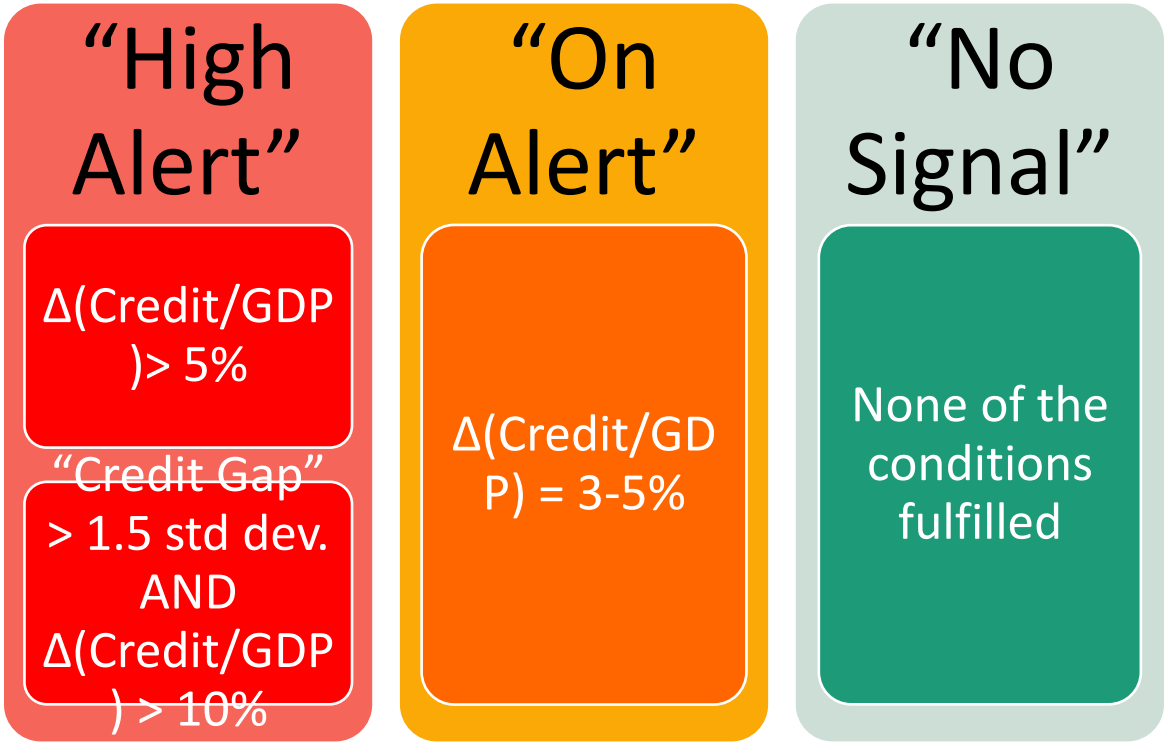
List of Indicators on Credit: "Price" or "Quality" Side (cont.)

Indicators	Interpretations
Non-performing loan ratio and its change	If high, on alert. About the quality of credit.
Sectoral distribution of credit	Concentration may be risky.
Composition in terms of currencies	Careful about large inflow. Currency composition can be useful to check currency risks.

Also Useful to Check:

- **Sectoral distribution of credit**: Concentration may be risky.
- **Length of the boom**: Longer booms are more dangerous.
- **Lending standards** from credit conditions survey and advertisements like “no-doc loans” and “easy credit terms.”

Some Thresholds



Examples of Thresholds

Year 1			Year 2			Year-on-year change
Credit (A)	GDP (B)	Credit/ GDP (C)=A/B	Credit (D)	GDP (E)	Credit/ GDP (F)=D/E	ΔCredit/ GDP (G)=F-C
10	**100**	**0.10 OR 10 percent**	**20**	**110**	**0.18 OR 18 percent**	**8 ppt**
10	**100**	**0.10 OR 10 percent**	**15**	**110**	**0.13 OR 13 percent**	**3 ppt**
10	**100**	**0.10 OR 10 percent**	**11**	**110**	**0.10 OR 10 percent**	**0 ppt**

The "Smell Test" for Detecting Potential Vulnerabilities

Potential Questions to Ask About the Build-up of Vulnerabilities

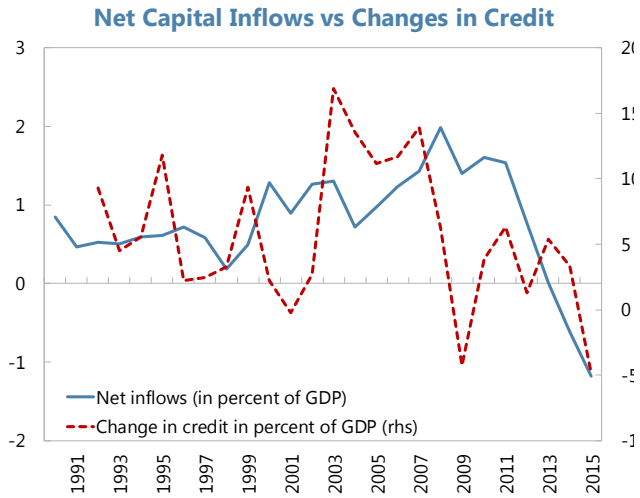
- Are there signs of speculative behavior?
- Are particular asset classes heavily advertized or discussed in the media?
- Are banks taking large positions where profits continuously exceed measured risks?
- Are there relatively new products with large market shares, and have they been increasingly rapidly?
- Are lending standards weakening?
- Are profit margins decreasing?
- Is competition increasing from the shadow banking sector?

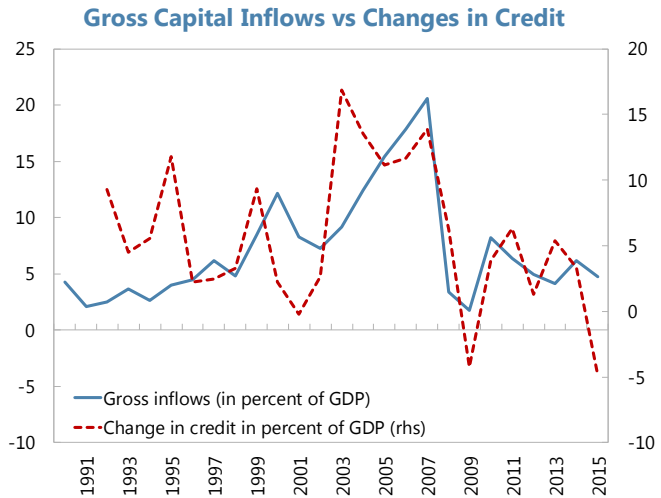
Source: CGFS Papers No 48, 2012, Operationalising the Selection and Application of Macroprudential Instruments.

External Sector Vulnerabilities

- Large **current account deficits** may not be sustainable.
- Real issue is how are current account deficits financed?
  - If short–term private capital inflows, less likely to be sustainable
  - Low reserve coverage implies inability to keep exchange rate stable (or fixed)
  - Relying on FX loans and other FX-denominated debt highly problematic

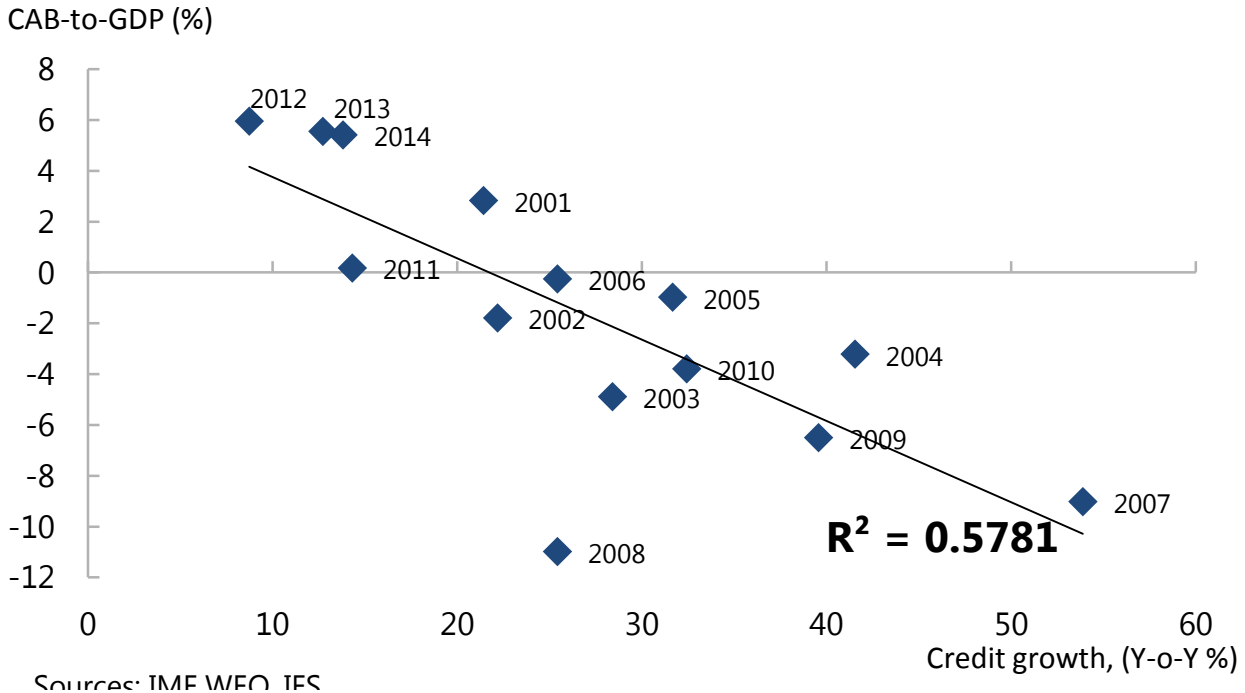
Capital Flows and Credit Growth





Vietnam: Credit and Current Account

Current Account Balance & Credit Growth



Sources: IMF WEO, IFS

Effects on Credit Growth and Asset Prices

- Capital inflow surges may fund credit booms
- Surges dominated by debt (especially bank) inflows more likely to end in financial crises than other inflow surges (Calderon and Kubota, 2012)
- Inflow surges can exert upward pressure on asset prices
- Increases in asset prices magnify credit booms via financial accelerator effects
- Portfolio debt flows depress yields and lead to risk-taking incentives
- But weaker effect on credit growth for portfolio equity flows and weak or negative effects from FDI flows

Leverage

- Conceptually, liabilities as a share of asset.
- Convention: “Leverage ratio” is equity/assets. “Levered 20-to-1” means equity/assets=1/20.
- Measuring is difficult, especially as innovative instruments for taking risks become more prevalent.
- Accounting measures may not be sufficient but still necessary as a first look.

Leverage

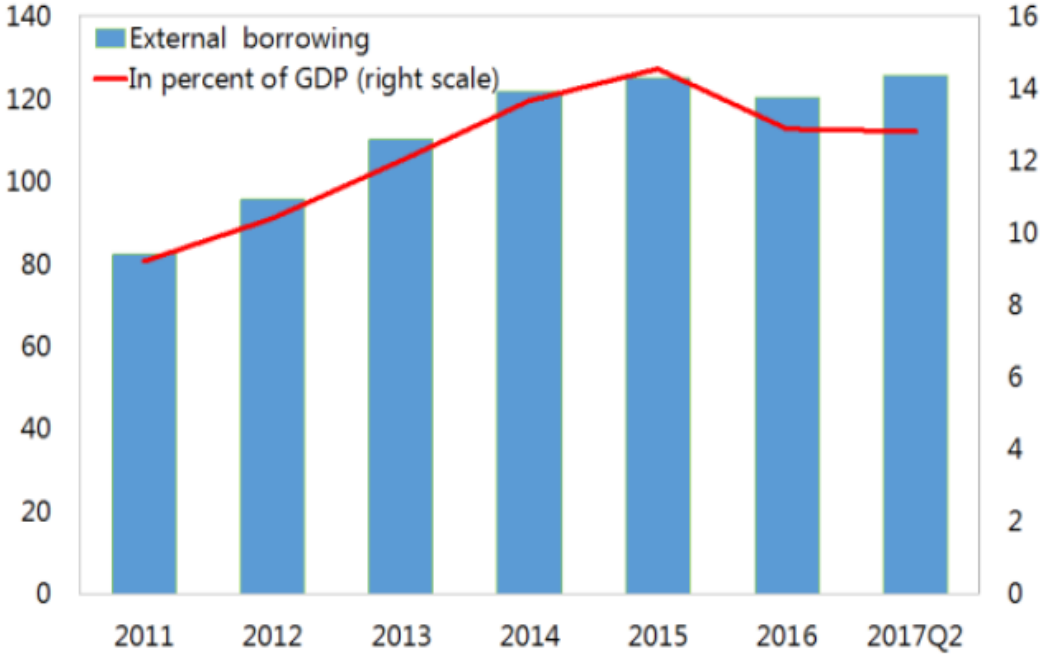
		Emerging Market Economies									
		CHN	BRA	IND	ZAF	TUR	MEX	RUS	SAU	ARG	IDN
General Government	2006	25	66	77	31	45	38	10	26	70	36
	2016	44	78	70	52	28	58	16	13	54	28
Households	2006	11	14	10	39	9	12	8	12	4	11
	2016	44	23	10	35	18	16	16	15	6	17
Nonfinancial Corporations	2006	105	39	38	33	27	14	32	28	20	14
	2016	165	44	45	37	67	28	52	50	12	23
Total	**2006**	**142**	**118**	**125**	**104**	**81**	**64**	**49**	**66**	**93**	**61**
	2016	**254**	**145**	**125**	**124**	**113**	**103**	**84**	**78**	**73**	**68**

Source: IMF: Global Financial Stability Report, October 2017.

Leverage: Indonesia Corporate Sector

Corporate External Debt

(In billions of U.S. dollar and in percent of GDP)



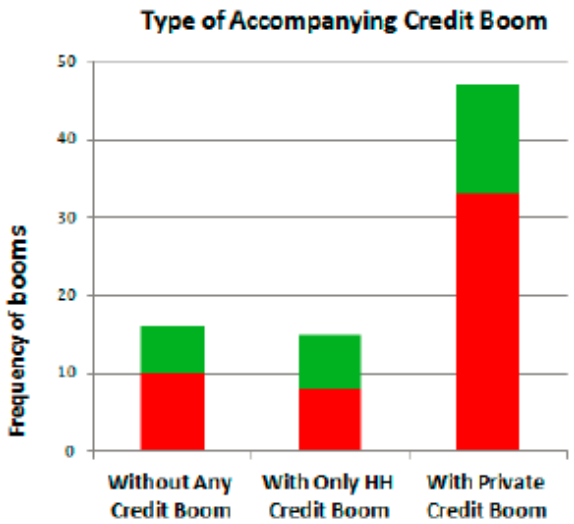
Sources: CEIC Data Co. Ltd.; and IMF staff estimates.

Corporate external debt stabilized in 2016-17, after rising rapidly in previous years

House Prices and Mortgage Credit

- Houses and mortgages represent a large share of household balance sheets
- Houses and real estate serve as collateral for households and companies
  - Increases household and firms' leverage
- Mortgages also account for a large share of financial sector activities

House Booms
Can we tell Good versus Bad? (cont.)



- Source: Cerutti et al. (2015) SDN/15/12.
- For credit (house) boom, the following two should be satisfied:

  (i) the real growth rate of credit (house prices) is greater than 10 (5) percent, or two standard deviations of the country-specific distribution of credit (house prices) real growth rates in a given quarter

  (ii) the real growth rate of credit (house prices) is above 10 (5) percent or one standard deviation of the country-specific distribution of credit (house prices) real growth rates for a period of at least two years.
- "Bad" house booms are the ones ending up with recessions.

Note: The total number of booms that can be identified as good or bad is 78.
1/ 33 house price boom episodes (out of 78) are shown since funding model characteristics are availabe only since 2000.

House Booms
Can we tell Good versus Bad? (cont.)

- Two findings from the previous figure:
  - A lot of house booms are accompanied by (private) **credit booms**.
  - When accompanied by credit booms, house booms are more likely to be "bad" (i.e., ending up with recessions).
- Literature suggest that housing booms that go "bad" are typically accompanied by **rapid increase in leverage of households and financial intermediaries**.

House Prices

- The fundamental value of real estate is the discounted value of the rents or services that are expected to accrue to the owner over time.
- Broad measures, such as price-to-rent ratio and price-to-income ratio, provide a first pass. (But detailed analysis and judgment are needed.)
- IMF “Global Housing Watch”: http://www.imf.org/external/research/housing/index.htm

Factors Behind Asset Bubbles

- Monetary regime and credit conditions
  - Poorly designed monetary policy — for instance, interest rate policy without commitments to a steady long-run inflation rate—can lead to asset price bubbles.
  - Passive accommodation of booms by the banking system or monetary policy.
- Investor sentiment matters: periods of high growth often associated with under-pricing of risk.
- Misplaced expectations: e.g., investors' overconfidence ("Irrational Exuberance" Rob Schiller, 2000)

List of Indicators on Housing Prices

Indicators	Interpretations
Real house price deviation from trend (such as HP filter) **Real house price deviation from "fundamentals"**	If high, on alert. Note: The fundamental value of real estate is considered the discounted value of the rents or services that are expected to accrue to the owner over time. "Fundamentals" can be estimated with explanatory variables such as income, interest rates, credit growth, equity prices, and fraction of working age population.

List of Indicators on Housing Prices (cont.)

Indicators	Interpretations
Price-to-rent ratio **Price-to-income ratio**	If high (compared to historical averages or country periods considered to be boom periods that later ended in busts), on alert.
Loan-to-value ratio	If high, on alert.
Household debt or debt service to income ratio	If high, on alert.
Growth rate of new loans (as opposed to rollovers of existing ones)	If high, on alert.

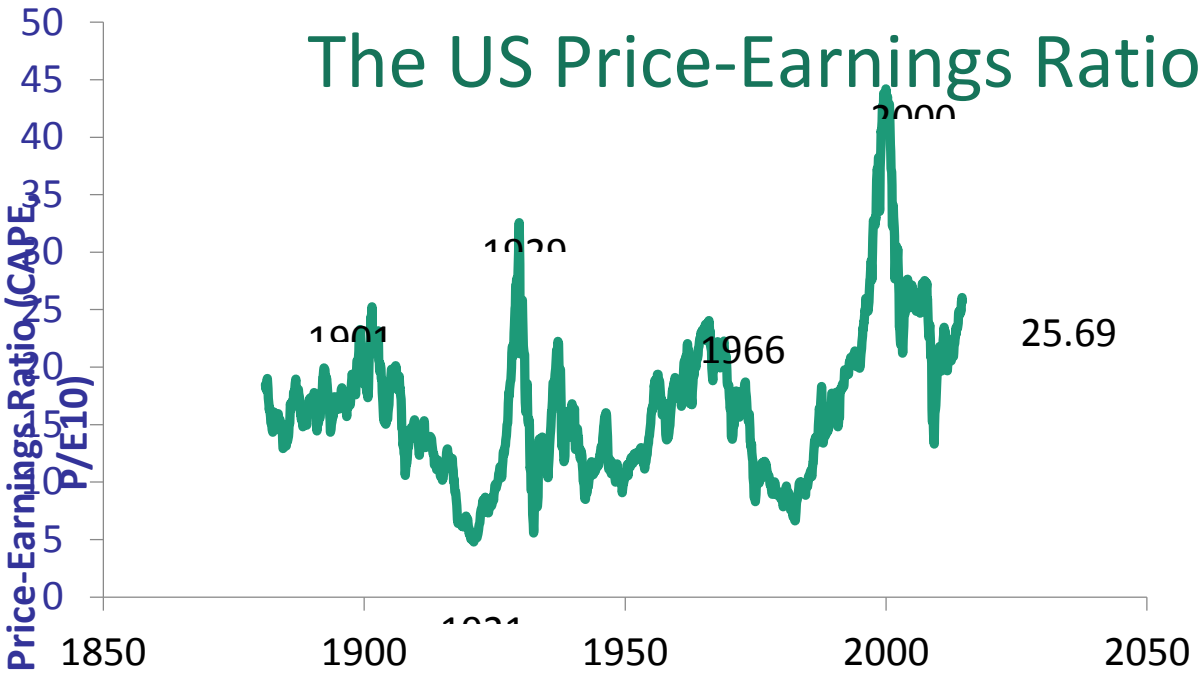
List of Indicators on Housing Prices (cont.)

Indicators	Interpretations
Number of multiple mortgage loans (2nd and 3rd homes)	If high, on alert.
Share of variable-rate mortgages **Share of subprime loans**	If high, on alert.
Housing construction activities / GDP	Measure of construction “boom”.

Identifying Equity Bubbles

- Direct, Simple Approach (time trend)
- Price-earnings (P/E) ratio: Often used to assess deviations from fundamentals.
- Gordon's formula based on "Dividend Discount Model" (dividend yield + dividend growth = risk-free interest rate + risk premium):
  - If historical risk premium > implied risk premium, it may indicate the existence of a bubble.
- Fundamental macro analysis: times series analysis using the behavior of P/E ratio; and a relationship between dividends, prices, and returns

The Movement of the P/E Ratio



List of Indicators on Equity Prices

Indicators	Interpretations
Equity prices growth	If high, on alert.
Real equity price deviation from trend (such as HP filter)	If high, on alert. If higher than 60%, it tends to suggest a future crisis. (Borio (2009).)
Real equity price deviation from "fundamentals"	If high, on alert. Some macro variables (GDP growth, etc.) and stock market variables (dividend payments, etc.) may be used as explanatory variables. Or, a **dividend discount model** (equity price = discounted dividends) may be used.
Price/Earnings	If high, on alert.

Funding/Liquidity

- Leverage is linked to solvency risks, but funding/liquidity is linked to liquidity risks.

- Maturity and currency mismatches are key to quantifying liquidity risks.

List of Indicators on Funding/Liquidity

Indicators	Interpretations
Liquid assets to short-term liabilities (for banks)	If low, on alert.
Deposit/loan ratio (DTL) (for banks)	If low, on alert. Deposits are considered as a stable source of funding. DTL<85% implies “high alert.” 85%<DTL<100% implies “on alert.”
Wholesale funding measures such as non-core liabilities / total (for banks)	If high, on alert. Wholesale financing is considered unstable source of funding.

List of Indicators on Funding/Liquidity (cont.)

Indicators	Interpretations
FX denominated liabilities / total (for banks)	If high, on alert. If FX%>40%, high alert. If 25%<FX%<40%, on alert.
Interest coverage ratio (for corporates): Earnings before interests and taxes as a ratio to interest payments.	If low, on alert. If <1, then firm is in arrears on its interest payments.

Financial Soundness Indicators

FSIs (http://fsi.imf.org) are indicators compiled to monitor the health and soundness of financial institutions and markets, as well as their corporate and household counterparts, including

- Aggregated information on financial institutions
- Aggregated information of major clients of financial institutions (corporate and households)
- Indicators of key developments in markets the financial institutions operate in

FSI categories and Objectives

- Key categories and roles of FSIs
  - Monitor financial sector ***exposures*** and ***vulnerabilities*** arising from credit, liquidity, and market risk
  - Assess the ***capacity*** of the financial sector to ***absorb losses***, as measured by capital adequacy and profitability
  - Assess the ***conditions of nonfinancial sectors*** that are counterparts to financial institutions (leading indicators)
- Primary purpose of financial sector FSIs
  - Identify key risk exposures
  - Monitor the soundness and vulnerability of the financial sector
- Primary purpose of the non-financial sectors FSIs
  - Detect a deterioration in soundness at an early stage
  - Asses indirect sources of risk to the financial system

Financial Soundness Indicators

Core FSIs

Capital Adequacy

- Capital (tier I plus tier 2) to risk-weighted assets

Asset Quality

- NPLs to total loans
- (NPLs net of provisions) to capital
- Sector exposure concentrations

Earnings and Profitability

- Return on Equity (ROE)
- Return on Assets (ROA)
- Interest margins to gross income
- Non-interest expenses to income

Liquidity

- Liquid asset ratio
- Liquid assets to short term liabilities

Market Risk

- Duration of assets and liabilities
- Net open position in FX to capital

Encouraged FSIs

Deposit-taking Institutions

- Capital to assets (leverage ratio)
- Gross derivatives positions
- Financial trading income to total income

Market Liquidity

- Average bid-ask spread
- Average daily turnover ratio

Non-bank Financial Institutions

- Non-bank FI Assets to total financial system assets
- Assets to GDP

Corporate sector

- Leverage ratio; Corporate ROE;
- Corporate FX exposure to equity

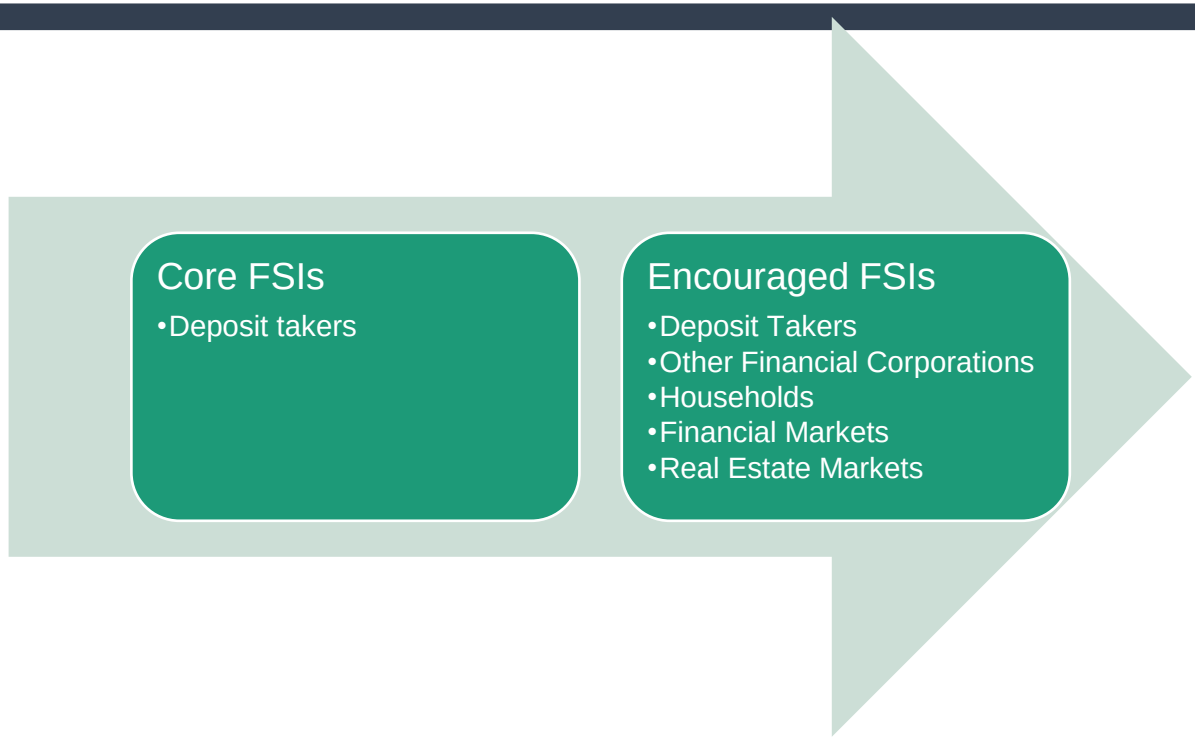
Real estate markets

- Real estate prices; Residential or commercial RE loans to total loans

Households

- Household debt/GDP; HH debt service and principal payment to income

Financial Soundness Indicators

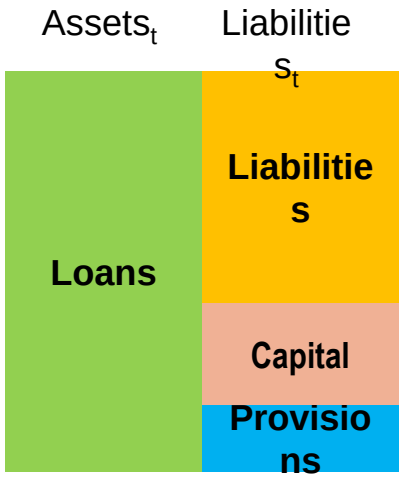


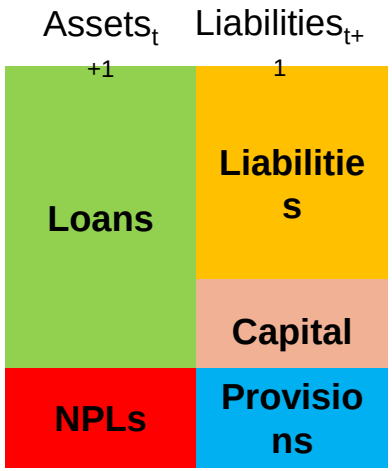
Core FSI

Focus	Indicator
Capital Adequacy	Regulatory capital to risk-weighted assets Regulatory Tier 1 capital to risk-weighted assets Nonperforming loans net of provisions to capital
Asset quality	Nonperforming loans to total gross loans Sectoral distribution of loans
Earnings and profitability	Return on assets Return on equity Interest margin to gross income Non-interest expenses to gross income

Bank Capital and Non-Performing Loans

- Provisions are a buffer against expected losses
- Capital is required as a buffer against unexpected losses
- Capital adequacy indicators measure the extent to which a banking system is able to withstand shocks or absorb losses, e.g. from large NPLs





Core FSI: Signaling Properties for the Banking System

Indicator	What do they measure	Signaling properties
Capital Adequacy	• Banks' capital cushion size to address expected or unexpected losses	• **Excessively low** levels of this ratio points to potential defaults and can be a forerunner of a banking crisis
Growth in Bank Credit **Bank Leverage Ratios** **NPLs** **Risk Premia**	• Riskiness of the banking sector	• **Very rapid** loan growth has often accompanied declining loan standards/greater risk • **Excessively high** loan losses, leverage ratios, and risk premia can foreshadow a banking crisis • Loan losses/GDP can measure cost of a banking crisis for economy
Sectoral/Regional Concentration, Systemic Focus	• Concentration or diversification of banks' lending strategy	• Proxy for speed of propagation of shocks in the economy

Core FSI Thresholds

Financial Soundness Indicators	Advanced Countries	Developing Countries
Capital Adequacy		
Regulatory Capital to Risk-Weighted Assets (Total Capital/RWA)	> 10.5%	> 12%
Regulatory Tier 1 Capital to Risk-Weighted Assets (Tier 1/RWA)	> 6%	Usually higher
Non-Performing Loans Net of Provisions to Capital (NPLs less Provisions/Total Capital)	<100%, could write-off all NPLs and remain solvent	
Asset Quality		
Nonperforming Loans to Total Gross Loans (NPLs/Total Loans before Provisions)	< 3%	< 5-9%
Sectoral Distribution of Loans to Total Loans	Identify concentration of risks in sectors and regions	
Earnings and Profitability		
Return on Assets (Net Income/Average Total Assets)	> 0.5%	
Return on Equity (Net Income/Average Total Equity)	10-20%	
Interest Margin to Gross Income	<60-70% indicates high non-intermediation business	
Non-Interest Expenses to Gross Income (Efficiency Ratio)	<60%	
Liquidity		
Liquid Assets to Total Assets	No "correct" number, but 10-30% commonly seen	
Liquid Assets to Short-Term Liabilities	No established standard	
Sensitivity to Market Risk		
Net Open Position in Foreign Exchange to Capital	< 20-25%, may be a prudential standard	

Encouraged FSIs

Sector	Indicator
	Capital to asset
	Large exposures to capital
	Geographical distribution of loans
	Gross asset position in financial derivatives to capital
	Gross liability position in financial derivatives to capital
	Trading income to total income
	Personnel expenses to non-interest expenses
	Spread between reference lending and deposit rates
	Spread between highest and lowest interbank rate
	Customer deposits to total (non-interbank) loans
	Foreign-currency denominated loans to total loans
	Foreign-currency denominated liabilities to total liabilities
	Net open position in equities to capital

Encouraged FSIs (contd.)

Sector	Indicator
Other financial Corporations	Assets to total financial system assets Assets to gross domestic product
Non-financial corporations	Total debt to equity, return on equity Earnings to interest and principal expenses Net foreign exchange exposure to equity Number of applications for protection from creditors
Households	Household debt to GDP Household debt service and principal payments to income
Financial markets	Average bid-ask spread in the securities market Average daily turnover ratio in the securities market
Real estate	Residential real estate prices Commercial real estate prices Residential real estate loans to total loans

FSIs for Corporate Sector

The corporate sector is typically exposed to shocks that affect its future cash flow and value of collateral—such as:

- Falls in asset prices
- Increases in interest rates
- A slowdown in growth

Prolonged distress in the corporate sector negatively affects firms' repayment capacity and creditworthiness, and will result in a worsening of bank asset quality and ultimately in higher nonperforming loans (NPLs).

Measures of corporate health include:

- Leverage
- Cash Flow Adequacy
- Profitability
- Foreign currency exposure

FSIs for Corporate Sector: Signaling Properties

Indicator	What do they measure	Signaling properties
Total Debt to Equity	Corporations' leverage	Excessively high levels may signal difficulties in meeting debt obligations
Earnings to Interest and Principal Expenses	Corporations' ability to meet payment obligations relying on internal resources	Excessively low levels of liquidity may signal inability to meet debt obligations
Net Foreign Exchange Exposure to Equity	Currency mismatch	High levels of this ratio may signal difficulties in the corporate sector arising from adverse currency moves
Corporate Defaults	Insolvencies in the corporate sector	High values can signal future problems in the banking sector, if insufficiently provisioned

FSIs for Household Sector

- Banks are exposed to the household sector (e.g. housing loans)
- Household consumption behavior has a strong effect on banks' main credit customers (corporate sector)
- Household asset allocation decisions have important implications for bank liabilities (customer deposits) and asset prices
- The vulnerability of households may be assessed through data on:
  - Household debt to GDP
  - Household debt service and principal payments to income
- Financial institutions' vulnerability to households may be assessed through data on credit outstanding to the sector

Vietnam FSIs

Vietnam Financial Soundness Indicators								
	2008	2009	2010	2011	2012	2013	2014	2015
Regulatory Capital to Risk-Weighted Assets	13.88	12.03	11.33	12.9	11.85	13.38	11.83	12.77
Regulatory Tier 1 Capital to Risk-Weighted Assets	13.74	11.89	10.41	11.89	12.86	12.07	10.58	10.14
Non-performing Loans Net of Provisions to Capital	7.92	6.91	7.29	10.17	14.77	12.84	14.17	11.02
Non-performing Loans to Total Gross Loans	2.15	1.8	2.09	2.79	3.44	3.11	2.94	2.34
Sectoral Distribution of Total Loans: Residents	100	100	100	100	100	100	100	100
Sectoral Distribution of Total Loans: Deposit-takers	3.6	4.07	3.94	6.12	10.56	8.58	8.2	5.42
Sectoral Distribution of Total Loans: Nonfinancial corporations	96.4	95.93	96.06	93.88	89.44	91.42	91.8	94.58
Return on Assets	1.38	1.61	1.55	1.49	0.79	0.55	0.28	0.45
Return on Equity	15.34	18.37	17.74	16.36	8.18	5.75	3.23	5.4
Interest Margin to Gross Income	69.06	67.34	71.96	79.3	79.63	73.42	69.44	74.36
Non-interest Expenses to Gross Income	45.56	48.22	47.03	48.08	55.62	55.13	56.71	55.81
Liquid Assets to Total Assets (Liquid Asset Ratio)	31.6	28.4	29.03	13.3	13.41	12.96	15.51	13.25
Capital to Assets	8.97	8.6	8.87	9.3	9.93	9.54	8.77	8.26
Gross Asset Position in Financial Derivatives to Capital	0.47	0.34	0.17	0.53	0.16	0.14	0.08	0.16
Gross Liability Position in Financial Derivatives to Capital	0.01	0.42	3.16	0.09	0.06	0.08	0.26	6.27
Trading Income to Total Income	9.21	9.8	4.98	2.66	0.67	5.5	6.7	2.98
Personnel Expenses to Non-interest Expenses	94.29	92.79	91.58	88.47	89.64	89.89	84.49	87.16
Customer Deposits to Total (Non-interbank) Loans	111.32	102.72	101.76	100.51	111.74	122.45	128.02	125.5
Foreign-Currency-Denominated Loans to Total Loans	21.87	16.49	11.41	9.53	8.01	13.39	13.39	10.47
Commercial Real Estate Loans to Total Loans			10.67	7.78	7.48	7.9	8.54	9.19

Other Indicators

- IMF (2011) (http://www.imf.org/External/Pubs/FT/GFSR/2011/02/) finds the following:
  - (i) Increases in the credit-to-GDP ratio above 3 percentage points, year-on-year, could serve as early warning signals one to two years before the financial crisis.
  - (ii) Credit-to-deposit ratios higher than 120 percent are associated with crises within the next year.
  - (iii) House prices, on average, tend to rise by 10 to 12 percent for two years before financial sector stress emerges.
  - (iv) Trade balance, capital adequacy, yield curve, …

Question to You

- Which factors associated with credit growth are critical to assess the associated financial risks?

a. The speed of credit growth
b. The duration of the rapid credit growth episode
c. The composition of credit in terms of currencies
d. The volume of credit to GDP
e. Other factors

Financial Vulnerability Index (FVI)

Financial Vulnerability Index

- Assesses risks associated with the financial sector
- Uses a minimal amount of financial sector data in order to capture more economies/countries
- Makes use of Financial Soundness Indicators (FSIs)

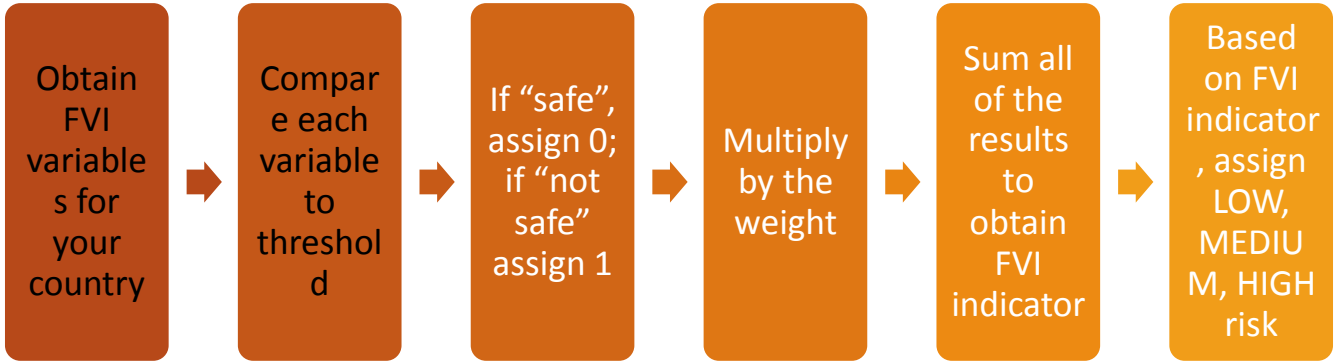
Conclusion:
Financial Sector Vulnerability Indicators

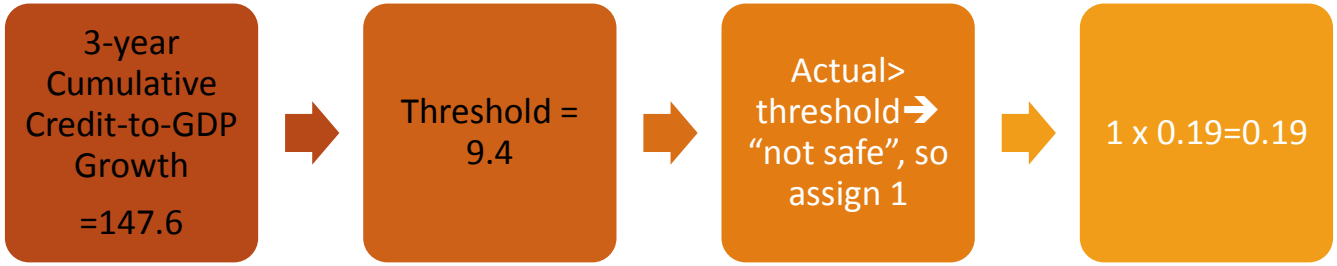
- The general health of the financial sector (broadly defined) is relevant
  - FSIs are helpful, mostly for EMs and low-income countries
  - Building more FSIs that are useful for advanced and more complex economies (e.g., liability-side measures)
  - Market intelligence is important to gauge future development (including data collection)
- We continue to work on ways of testing the accuracy and "early"-ness of these various indicators

Calculating the FVI

Variable	Direction to be Safe	Threshold	Weight
Capital Adequacy Ratio (percent)	>	12.3	0.22
Return on Assets (percent)	>	0.2	0.11
Loan-to-Deposit Ratio (percent)	<	110	0.22
3-year Cumulative Credit-to-GDP Growth	<	9.4	0.19
Foreign Liabilities (percent of domestic credit)	<	14.7	0.26

Steps in Calculating the FVI





FVI Thresholds

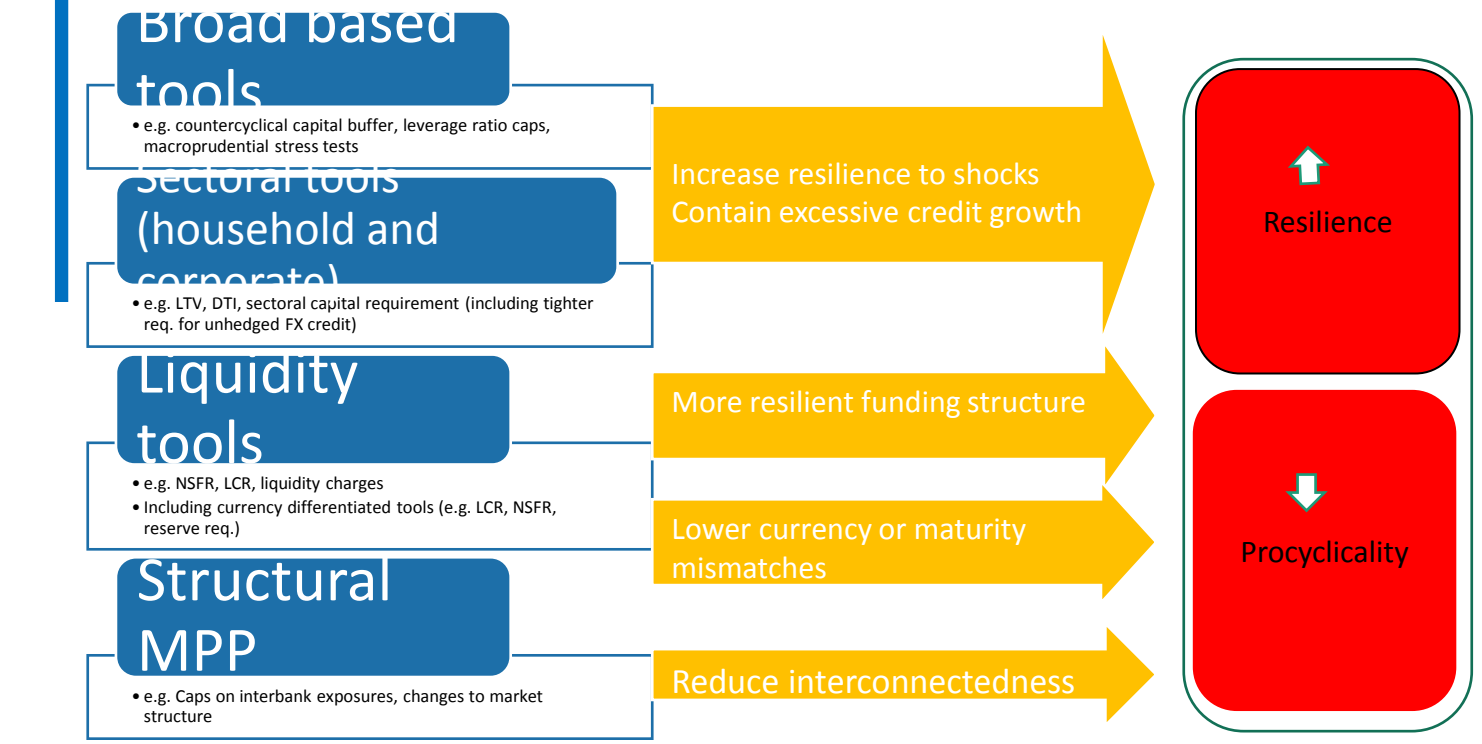
Examples of High, Medium, and Low Risks		
FVI Indicator	FVI Threshold	Risk Assessment
0.60	**FVI > 0.45**	**HIGH**
0.35	**0.3 < FVI < 0.45**	**MEDIUM**
0.15	**FVI < 0.3**	**LOW**

CLMV Macro Financial Vulnerabilities

- Are the CLMV countries vulnerable to an adverse growth shock? [Think GDVI!]
  - The main spillover channel from AE and EM is trade, but increasingly via investments flows (FDI), remittances, and aid
- Are there financial sector vulnerabilities in CLMV countries? [Think FVI!] Are these related to other vulnerabilities?
  - Current account balances, public debt, fiscal deficits, institutions..
- Significant financial development in CLMV countries in recent years, bringing new risks to financial systems
- Foreign liabilities are on the rise!
  - Foreign investors are investing in domestic capital markets (banks), governments have undertaken sovereign bond issues in international capital markets…

Mapping Instruments to Indicators

Mapping Instruments with Indicators



Mapping Instruments with Indicators

(Time Dimension)

Instruments	Core Indicators	Additional Indicators
Broad-based (capital) tools	• Credit/GDP gap	• Growth in credit/GDP • Credit growth • Asset price deviations from LT trends • Low volatility/spreads in financial markets • DSTI ratios • Leverage on individual loans or at the asset level • Increasing wholesale funding ratio • Weakening exports and resulting CA deficits
Household tools	• Household loan growth • Increasing house prices (nominal and real) • House price-to-rent ratio • House price-to-disposable income ratio • Increasing share of HH loans to total loans	• Increasing house prices by region and by types of properties • Deteriorating lending standards • High LTV ratio • High loan-to-income (LTI) ratio • High DSTI ratio • Share of FX loans and interest only loans

Mapping Instruments with Indicators

(Time Dimension)

Instruments	Core Indicators	Additional Indicators
Corporate tools	• Corporate loan growth • Increasing share of corporate loans to total loans •Increasing commercial property prices (nominal and real) • Increasing commercial real estate credit • Increasing share of FX loans	• Increasing corporate leverage (debt/equity ratio) • Corporate credit gap • Increasing debt service ratio • Deteriorating lending standards • Increasing average DSTIs on commercial real estate loans • Increasing average LTVs on commercial real estate loans • Share of FX loans and extent of natural hedges
Liquidity tools	• Increasing loan-to-deposit (LTD) ratio • Increasing share of noncore funding to total liabilities	• Decreasing share of liquid assets • Worsening maturity mismatches • Increasing securities issuance • Increasing unsecured funding • Increasing FX positions • Increasing gross capital inflows

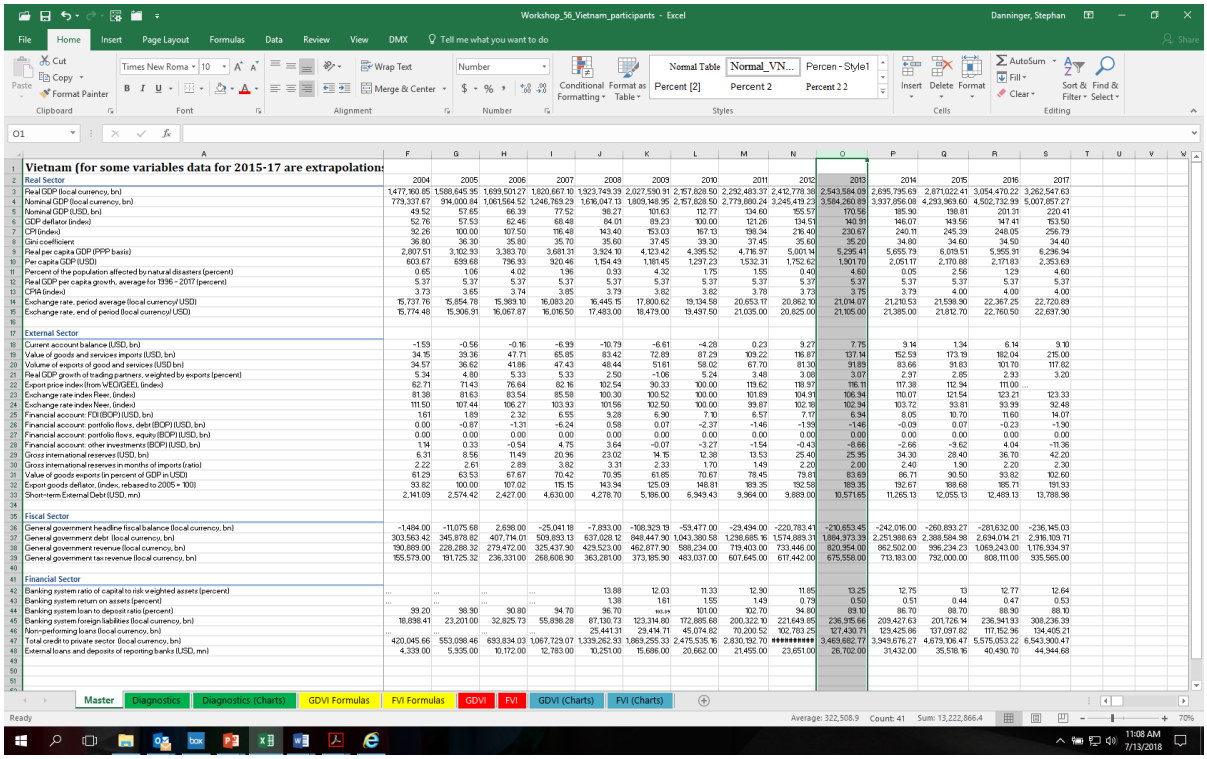
Conclusion: Main Messages

- Financial sectors are complicated, but a good place to start is with **credit measures**
- **Housing and credit** are important joint indicators in countries most advanced and emerging market countries
  - ➢ We have some rules of thumb for thresholds, both individually and jointly
- **External sector indicators** can provide additional evidence of vulnerabilities
- **Financial soundness indicators** are also important, but data are harder to come by

Workshop 5-6:
Calculating indicators of financial sector vulnerabilities

The purpose of this exercise is compute a Growth Decline Vulnerability Index (GDVI) and a Financial Vulnerability Index (FVI) for Vietnam using data up to 2017 and discuss its results.

Background information: All data needed for this workshop are in the Excel file *Workshop_56_Vietnam_participants.xlsm*. The worksheet has 9 Tabs.



Master tab (white):	source data
Diagnostic tabs (green):	data and charts of individual indicators
GDVI and FVI Formula tabs (yellow)	summary of formulas used in calculations
GDVI and FVI tabs (red):	calculation of composite vulnerability indices
GDVI and FVI charts (blue)	charts of composite vulnerability indices

You are to complete three tasks:

1. Inspect and discuss charts 1-10 in the *Diagnostics (chart)* tab. Discuss and answer the following two questions. (i) How do you assess vulnerabilities in Vietnam's external, fiscal, and financial sectors? (ii) Have vulnerabilities remained the same, risen, or softened?

2. For the GDVI complete the calculations highlighted in the blue cells in the *GDVI* tab. To complete the task please inspect first the formulas in for the individual cells in the GDVI formula tab. Once complete, inspect and discuss the results depicted in the GD*VI* charts tab.

   Please discuss: Have growth vulnerabilities increased in Vietnam? Which sectors are contributing to the changes?

3. For the FVI complete the calculations highlighted in the blue cells in the *FVI* tab. To complete the task please inspect first the formulas in for the individual cells in the FVI formula tab. Once complete, inspect and discuss the results depicted in the *FVI* charts tab.

   Please discuss: Have financial vulnerabilities increased in Vietnam? Which factors have contributed to assessment?

Macro Financial Linkages: Workshop

Stephan Danninger

Seminar on Macroprudential Supervision

IMF – South Asia Training and Technical Assistance Center
APEC Financial Regulators Training Initiative
Bangkok, 16-19 July 2018

Growth Decline Vulnerability Index (GDVI)

Growth Decline Vulnerability Index

- Assesses the likelihood of a sharp growth decline due to external shocks based on various vulnerability indicators
- Uses the signaling approach and relies on predictive power in the selection of indicators
- Aims to minimize the combined percentage of missed crisis and false alarms

GDVI Methodology: Summary

- Identify episodes of external shocks and growth crisis
- Indicators selected from a large set of variables that have played a role in past growth crises
- Thresholds
  - Estimated from a sample of growth crises from 1990-2009
  - Candidate events are selected from large drops in real GDP per capita
  - …resulting in 163 unique events
  - Minimize the sum of missed crises (Type 1) and false alarms (Type 2) .
  - Minimizing the sum of all misclassification errors results in an overall H threshold of 0.4
- Weights: Indicator weights are proportional to the signal-to-noise ratio and sum to 1 for each sector. Sectoral weights based on judgment

Identify External Shock Episodes

External Demand

Terms of Trade

FDI

Aid

Remittances

Natural Disasters

Shock== annual change of variable falls within bottom 10th percentile of the country-specific distribution

Identify Growth Crisis Episodes

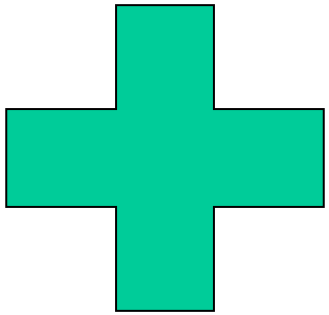
Two conditions must hold

Identify external shock episodes

Calculate post-shock 2 year average level of real GDP (A)

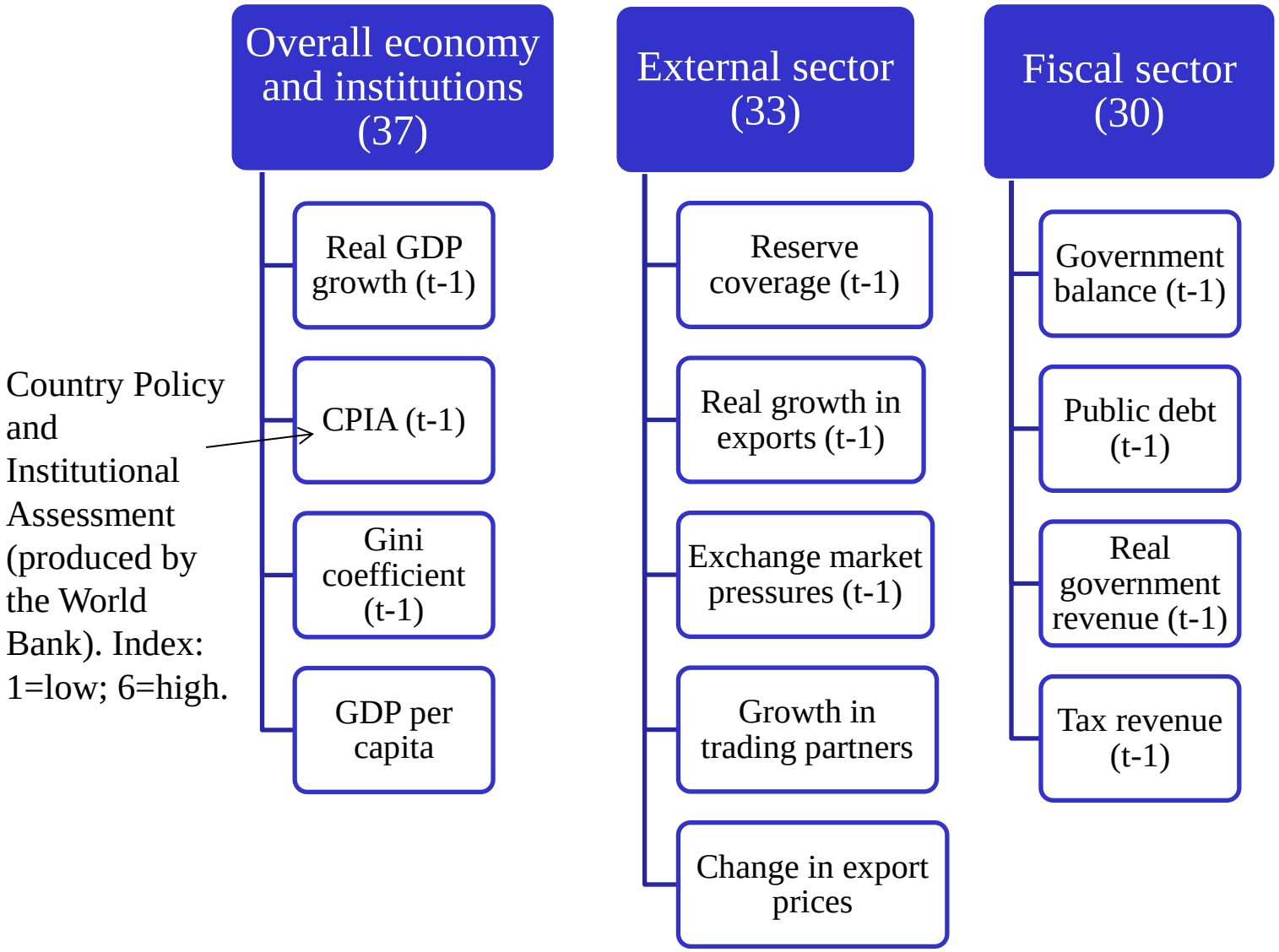
Calculate pre-shock 3-year average level of real GDP (B)

Is A<B? If yes, GROWTH CRISIS

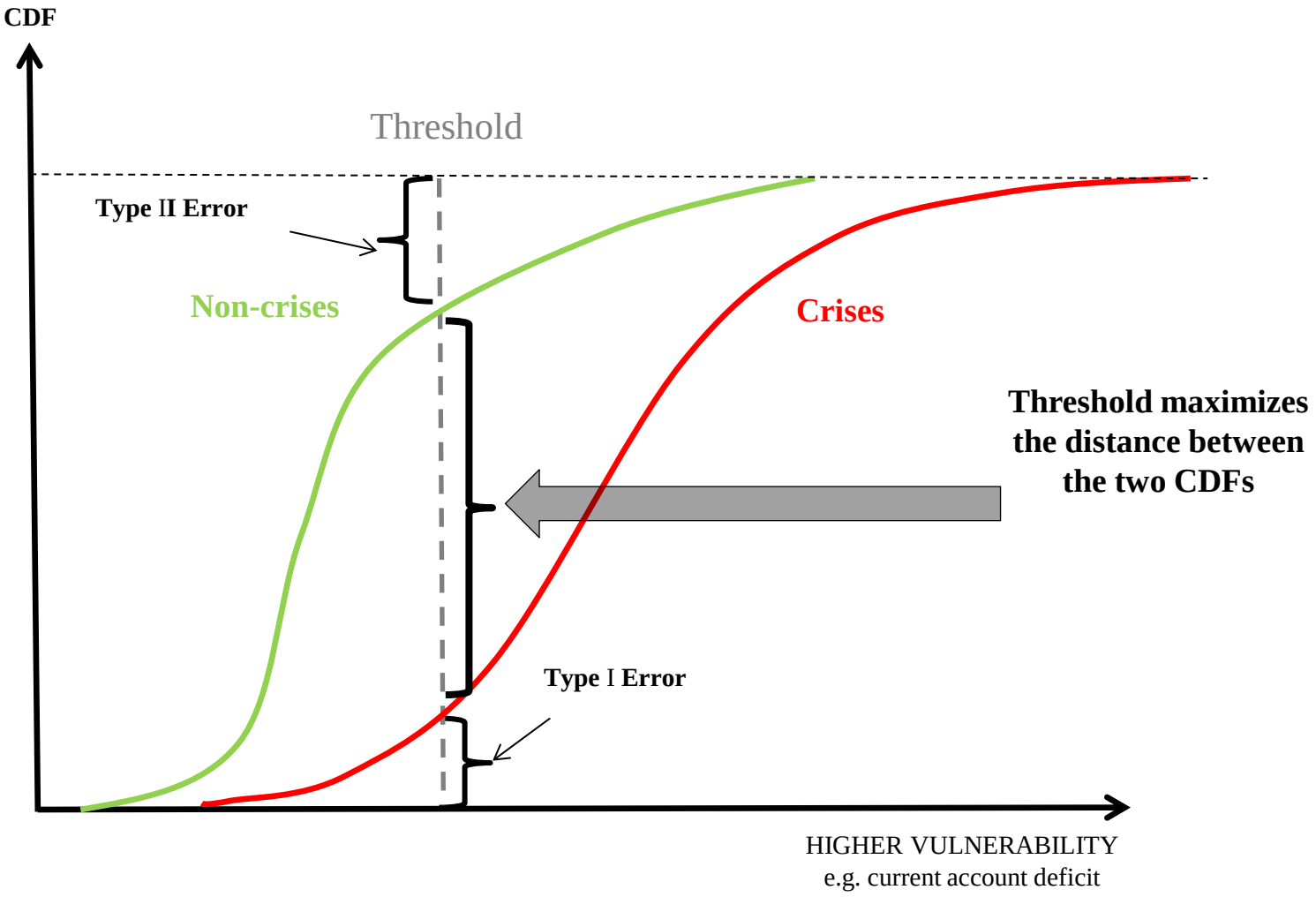


Growth of real GDP < 0 in year of the external shock

Select the Indicators



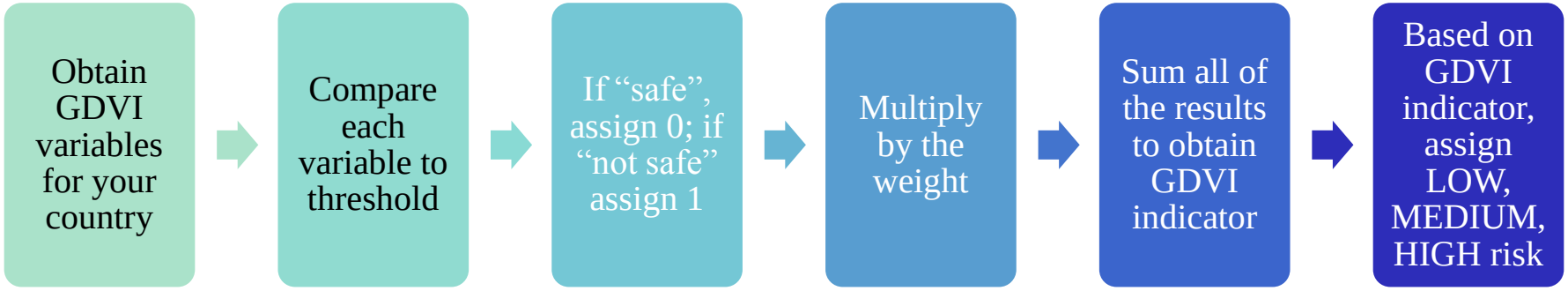
Select the Threshold (Minimize Likelihood of Errors)



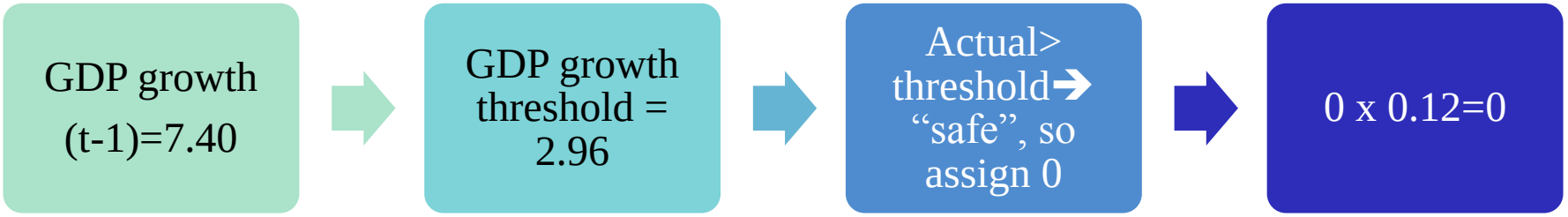
Putting It All Together: GDVI

Variable	Direction to be Safe	Threshold	Type I Error	Type II Error	Weight
Overall economy and institutions					***0.37***
Real GDP growth (t-1)	>	2.96	0.25	0.27	0.12
CPIA (t-1)	>	3.00	0.49	0.20	0.07
Gini coefficient (t-1)	<	44.95	0.24	0.38	0.10
Real per capital GDP growth (sample avg)	>	1.04	0.29	0.40	0.07
% population affected by natural disasters	<	0.21	0.24	0.71	0.01
External sector					***0.33***
Reserve coverage (months of imports) (t-1)	>	2.30	0.45	0.30	0.09
Real export growth (goods+services) (t-1)	>	1.92	0.46	0.36	0.06
Exchange market pressures index (t-1)	<	0.54	0.40	0.38	0.08
Trading partner growth	>	0.48	0.40	0.42	0.06
Percent change in export prices	>	0.36	0.31	0.55	0.05
Fiscal sector					***0.30***
Fiscal balance (%GDP) (t-1)	>	-4.21	0.42	0.39	0.08
Public debt (%GDP) (t-1)	<	65.32	0.05	0.80	0.06
Real revenue (% change over 2 years) (t-1)	>	5.61	0.39	0.32	0.14
Tax revenue (%GDP) (t-1)	>	11.32	0.62	0.34	0.02

Steps in Calculating the GDVI



Example: Sri Lanka



GDVI Thresholds

Examples of High, Medium, and Low Risks		
GDVI Indicator	GDVI Threshold	Risk Assessment
0.60	**GDVI > 0.413**	**HIGH**
0.35	**0.26 < GDVI < 0.413**	**MEDIUM**
0.15	**GDVI < 0.26**	**LOW**

Financial Vulnerability Index (FVI)

Financial Vulnerability Index

- Assesses risks associated with the financial sector
- Similar methodology as GDVI (but fewer variables)
- Uses a minimal amount of financial sector data in order to capture more economies/countries
- Makes use of Financial Soundness Indicators (FSIs)

Financial Soundness Indicators

FSIs (http://fsi.imf.org) are indicators compiled to monitor the health and soundness of financial institutions and markets, as well as their corporate and household counterparts, including

- Aggregated information on financial institutions
- Aggregated information of major clients of financial institutions (corporate and households)
- Indicators of key developments in markets the financial institutions operate in

Financial Soundness Indicators

Core FSIs

Capital Adequacy

- Capital (tier I plus tier 2) to risk-weighted assets

Asset Quality

- NPLs to total loans
- (NPLs net of provisions) to capital
- Sector exposure concentrations

Earnings and Profitability

- Return on Equity (ROE)
- Return on Assets (ROA)
- Interest margins to gross income
- Non-interest expenses to income

Liquidity

- Liquid asset ratio
- Liquid assets to short term liabilities

Market Risk

- Duration of assets and liabilities
- Net open position in FX to capital

Encouraged FSIs

Deposit-taking Institutions

- Capital to assets (leverage ratio)
- Gross derivatives positions
- Financial trading income to total income

Market Liquidity

- Average bid-ask spread
- Average daily turnover ratio

Non-bank Financial Institutions

- Non-bank FI Assets to total financial system assets
- Assets to GDP

Corporate sector

- Leverage ratio; Corporate ROE;
- Corporate FX exposure to equity

Real estate markets

- Real estate prices; Residential or commercial RE loans to total loans

Households

- Household debt/GDP; HH debt service and principal payment to income

Calculating the FVI

Variable	Direction to be Safe	Threshold	Weight
Capital Adequacy Ratio (percent)	>	12.3	0.22
Return on Assets (percent)	>	0.2	0.11
Loan-to-Deposit Ratio (percent)	<	110	0.22
3-year Cumulative Credit-to-GDP Growth	<	9.4	0.19
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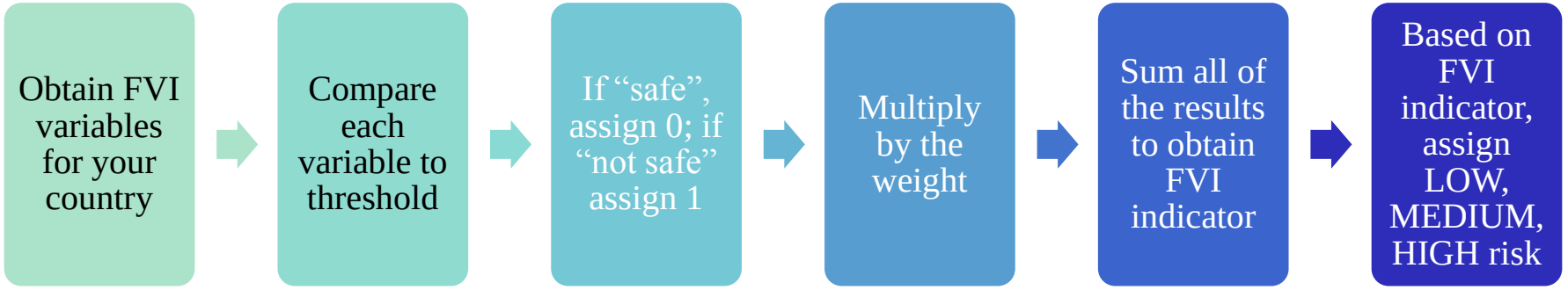
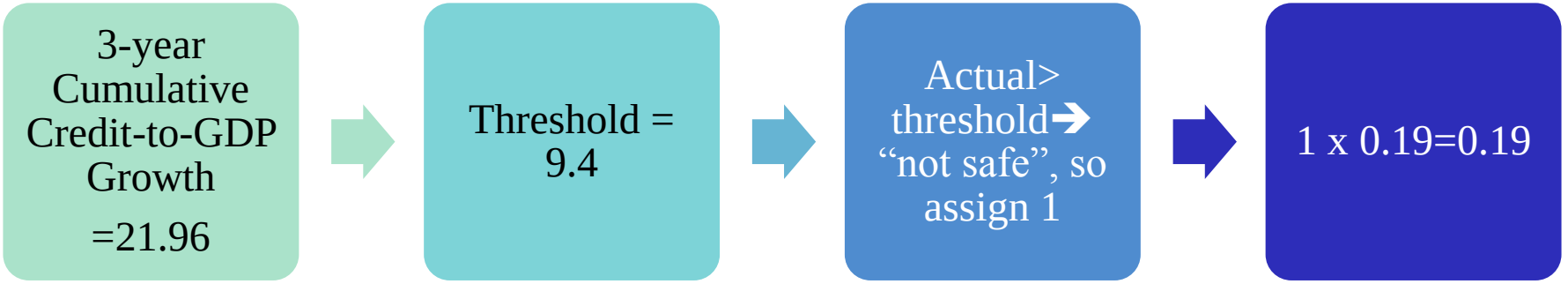
Steps in Calculating the FVI



Example: Nepal



FVI Thresholds

Examples of High, Medium, and Low Risks		
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0.60	**FVI > 0.45**	**HIGH**
0.35	**0.3 < FVI < 0.45**	**MEDIUM**
0.15	**FVI < 0.3**	**LOW**