Macro Prudential Policy: Case Studies

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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

MAP and CFMs to Address Capital Flows

- Higher risk weights on FX loans
- Limits on banks' FX exposures to total loans
- Fee on nonresidents' purchases of central bank paper
- Reserve requirements on nonresident deposits
- Tax on equity and bond inflows
- Reserve requirements on banks' short dollar positions
- Limits on banks' FX derivative positions
- Reserve requirements on FX deposits
- Minimum holding period on investments in central bank bills
- Levy on banks' non-deposit foreign liabilities
- Withholding tax on public sector bonds

Macroprudential & CFM Measures in ASEAN+3

The application of MPMs and CFMs in the ASEAN+3

- MPMs have been used extensively countries that experienced housing and credit booms and large capital flows
- Housing-related MPMs include LTV ratios ad housing taxes had been effective in addressing the systemic rises associated with rapid house price and credit growth.
- CFMs measures to limit excessive foreign borrowing including Unremunerated Reserve Requirements (URR) are most commonly used to mitigate the effects of inflows on domestic credit, bond yields and exchange rates

Asian Experience with Macro-Prudential Tools (1)

Objective	Tools	Examples
Manage Pro-cyclicality	Countercyclical provisioning	China; India
	Loan-to-value ratios	China; Hong Kong SAR; Indonesia; Japan; **Korea**; **Malaysia**; Philippines; Singapore; Thailand
	Debt-service-to-income ratios	China; Hong Kong SAR; **Korea**
	Tighter lending criteria	China; Hong Kong SAR; **Korea**; **Malaysia**; Philippines; Singapore; Thailand
	Credit limits	China; Hong Kong SAR; India
	Tighter supervision	China; Hong Kong SAR; India; **Korea**; **Malaysia**; Singapore
	Capital requirements	India; **Malaysia**
	Exposure limits on lending to specific sectors	**Korea**; **Malaysia**; Philippines; Singapore

Source*: Morgan (2013)*

Asian Experience with Macro-Prudential Tools (2)

Objective	Tools	Examples
Manage Systemic Risk	Capital surcharges for systemically important banks	China; India; Philippines; Singapore
	Liquidity and funding requirements	China; India; **Korea**; **Malaysia**; Philippines; Singapore; Thailand
	Loan-to-deposit requirements	China; **Korea**
	FX exposure limits	**Korea**; Philippines
	Limits on currency mismatches	India; **Malaysia**; Philippines

Source*: Morgan (2013)*

Indonesia

- Authorities have implemented CFMs since 2010 when capital inflows surged, complicating liquidity management and leading to excessive fluctuations in bond yield and exchange rate.
- A minimum holding period of 1 month was introduced on central bank bills (SBIs) for both domestic and foreign investors
- Limit on the daily balance of banks' short-term external debt to 30% of capital
- The reserve requirement on deposit accounts in foreign exchange was raised to 5% from 1%. In June 2011, the reserve requirement was raised to 8 percent
- Eased LTV for residential mortgages (measure for counter slowdown).

Thailand

- Since early 2000s capital inflow surges, rapid credit growth and asset price increases have posed challenges to financial stability
- Authorities created a Financial Stability Committee and implemented MPMs and CFMs
  - Unremunerated reserve requirements on short-term capital inflows
  - Withholding tax on foreign holdings of government bonds
- BOT also adopted credit-related and capital-related macroprudential policies to address systemic risks arising from real estate market
  - Capital requirements and LTV limits on high-value residential properties
  - Risk weights on high-value mortgages
  - Minimum income levels and minimum monthly loan repayments
  - Indirectly lead to housing market moderation and credit deceleration
- Capital inflow measures (e.g. reinstating a withholding tax on gains from public sector bonds) did not reduce inflows into the bond market as evidenced by the rising share of foreign holdings in LCY bonds

Philippines (1)

- Interaction between monetary policy and MaP is complementary.
- Low and stable inflation has fueled credit growth in the real estate sector – financial sector imbalances.
- Higher interest rates can increase debt servicing cost.
- Caps on loan-to-value ratios, general loan loss provisioning, single borrower limits, concentration limits, limits on open FX positions, asset cover for banks' FCDU liabilities, and liquidity measures.

Source: BIS (2017).

Philippines (2)

- (a) expanded reporting requirements for banks on their exposure to the property sector;
- (b) a requirement for all universal/commercial banks and thrift banks to submit a Quarterly Report on Residential Real Estate Loans (RRELs) granted by banks
- to provide information for the generation of a residential real estate price index (RREPI), which is a valuable tool in assessing real estate and credit market conditions;
- (c) the Real Estate Stress Test (REST) limit for real estate exposures

Source: BIS (2017).

Philippines (3)

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Source: BIS (2017).

Singapore

- MAS implemented MPMs/CFMs in the housing market
  - Imposing stamp duties at higher rate on non-residents and corporate entities
  - LTV ceilings, debt service-to-income limits and loan tenure restrictions
- Tightened incrementally in targeted fashion to reduce vulnerabilities arising from capital flows and credit growth
- A new additional buyer's stamp duty (ABSD) was imposed in 2013 on purchases of certain categories of residential property
- Measures have been effective in addressing riskier lending practices and moderating house price appreciation, thereby reducing systemic risks
- Now the issue is how/whether to unwind some of these measures with the slowdown in the economy.

Korea (1)

- The banking system has been heavily reliant on wholesale funding—including from abroad—and prone to the pro-cyclical building up of leverage that creates persistent vulnerabilities to changes in global funding conditions;

- Build-up of external liabilities are driven in part by speculative demand for currency forward contracts by the corporate sector on expectations of KRW appreciation;

- Following GFC, Korea experienced a "sudden stop" in capital flows (short-term external bank flows, outflows from local equity and bond markets);

- On shore banks and foreign bank branches were unable to roll-over maturing short-term external debt;

- Bank of Korean reacted promptly to provide FX liquidity by drawing on reserves and through the Fed swap lines;

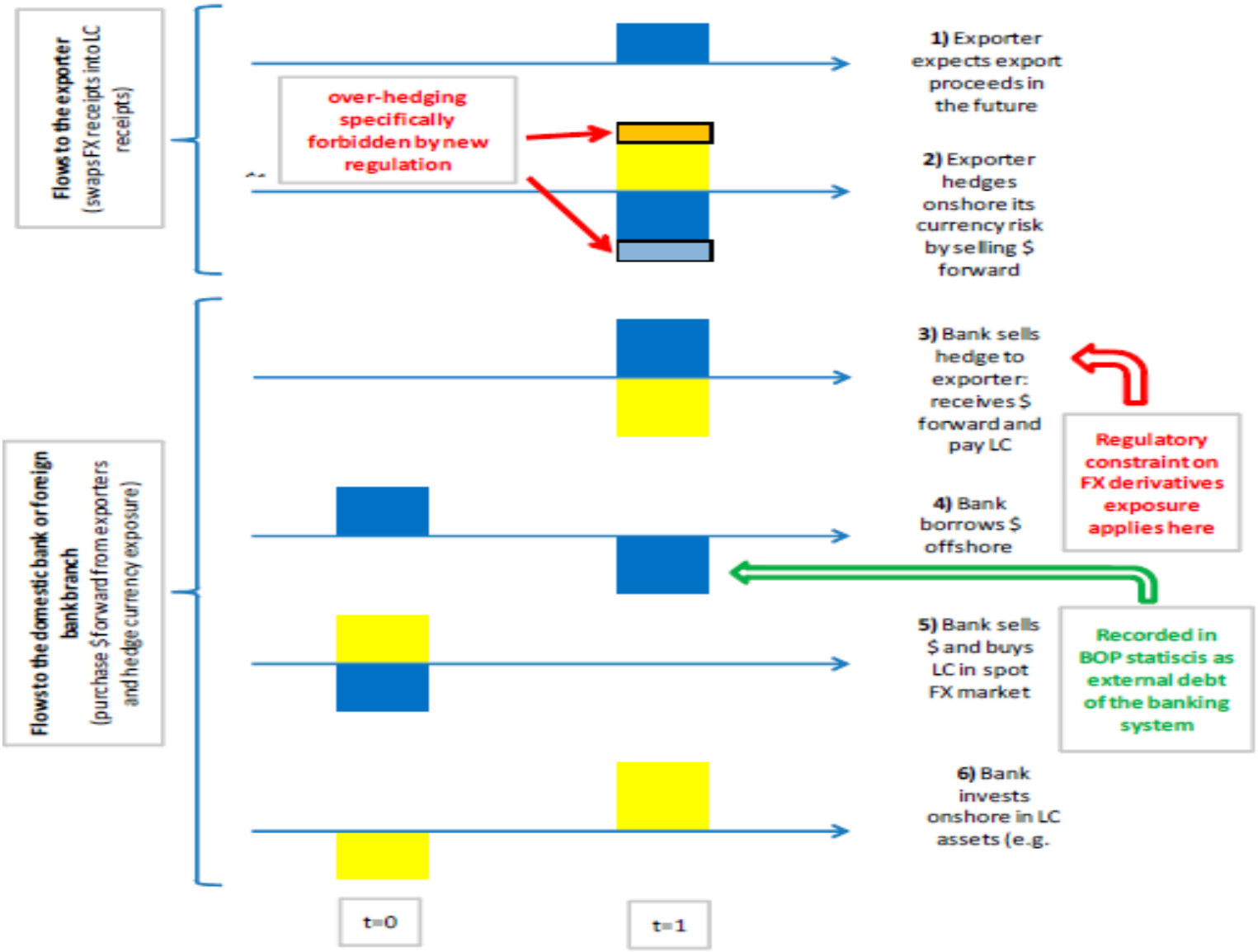
- Korean authorities also took longer term measures to reduce the vulnerability to capital flows.

Korea (2)

- Capped foreign exchange forward positions of banks relative to their equity capital (June 2010);
- Objective: to reduce banks' ST borrowing abroad (leverage) undertaken to hedge FX exposure in carry trades;
- Restoration of a 14% withholding tax on interest income on nonresident purchases of treasury and monetary stabilization bonds, leading to equal treatment for both foreign and domestic investors;

Korea (3)

Figure: FX Hedging by Exporters



Note: The horizontal line denotes the time line. Rectangles above (below) the line denote positive (negative) cash flows; rectangles in blue (yellow) denote payoffs in $ and local currency, respectively.

Korea MPM: Effectiveness?

- FX derivative positions and related short-term external borrowing have fallen as FX hedges become more expensive, but:
  - FX hedges move offshore
  - External inflows shift to other sectors

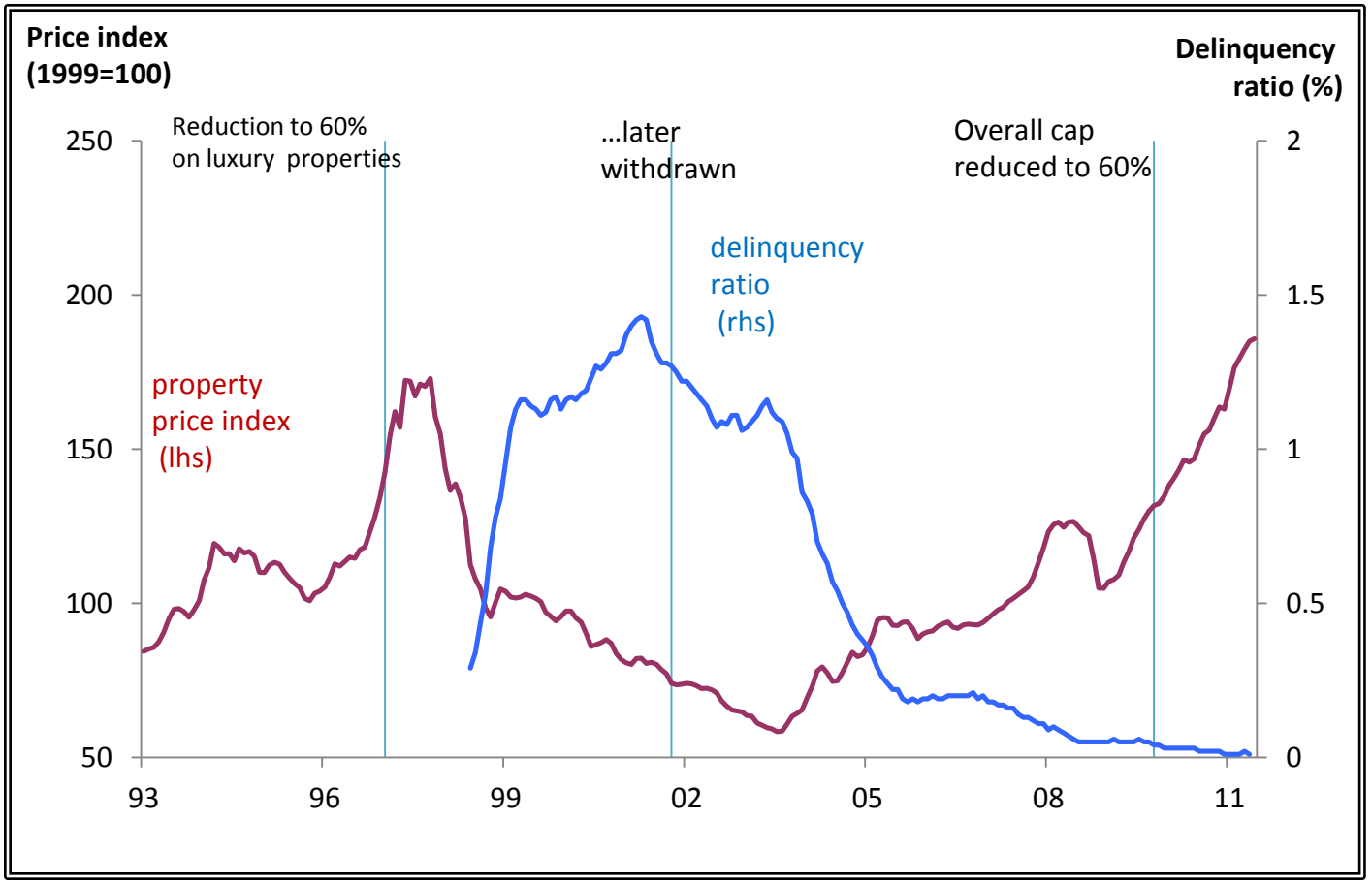
- The measures in Korea appear to have lengthened the maturity of capital inflows, thus helping to reduce maturity mismatches in the banking sector.

LTVs in Hong Kong SAR

- Hong Kong SAR is an interesting case of LTV use
  - Limited macroeconomic policies (fixed FX, small G)
  - Small, open, exposed to high volatility
  - Mortgages about 35% of bank loans
  - Real estate an important share of the economy
- A few tips on implementation of LTV policies
  - Complemented by DTI limit at 50-60%
  - LTV not statutory, but strong guidance
  - Historically actively managed in countercyclical fashion

Example Tools: LTVs and Margins

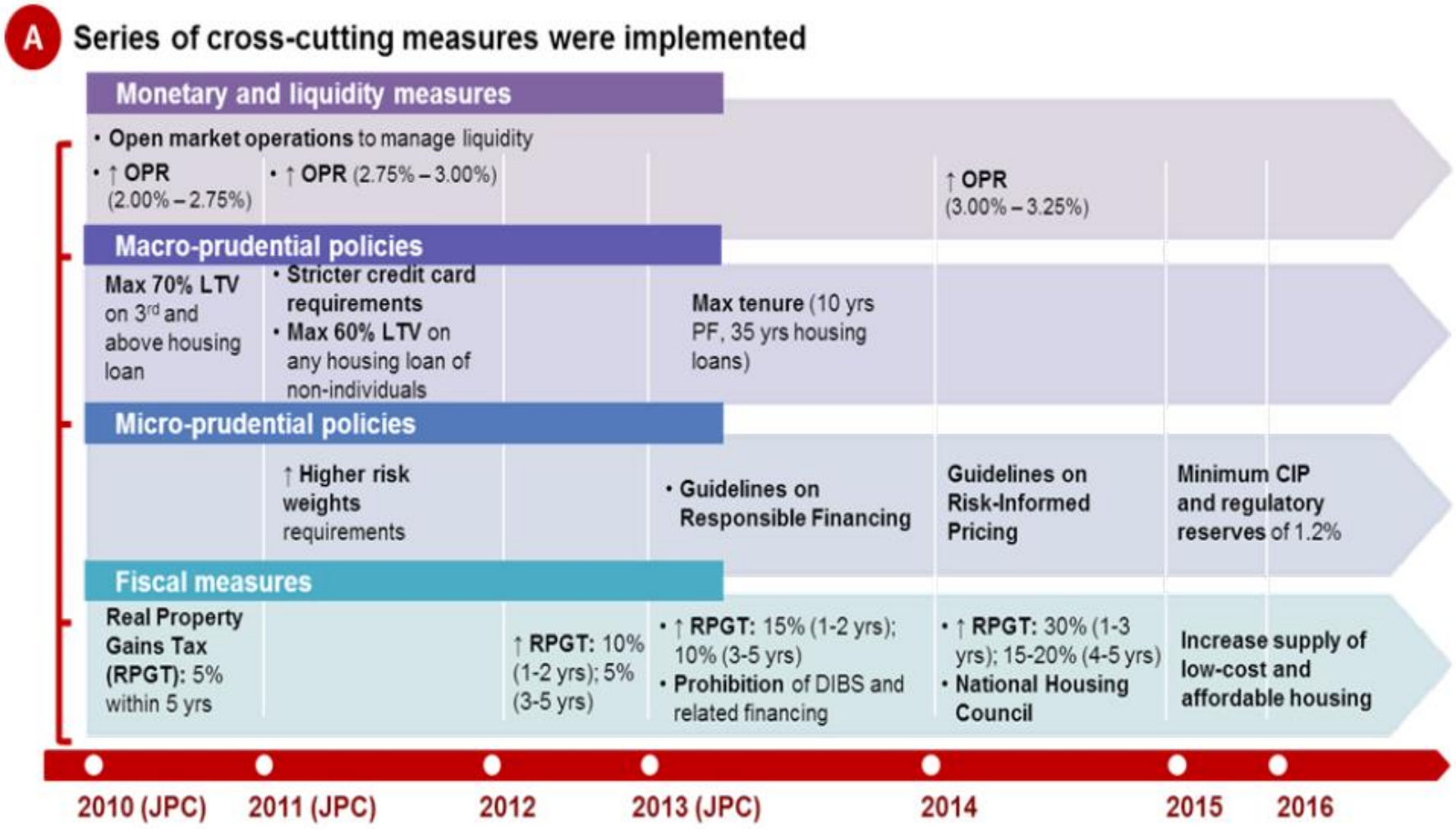
Loan-to-value restrictions and delinquencies in Hong Kong



Malaysia (1)

- Household debt has grown rapidly since 2008, and housing prices have outpaced income and rental growth
- MPMs were targeted at systemic risks
  - Increased capital gains taxes and LTV limits in third and subsequent mortgages
  - Restrictions on non-bank intermediaries
  - Prohibiting interest capitalization schemes such as the Developers Interest Bearing Schemes (DIBS)
- Complemented by efforts to improve financial literacy and strengthening risk managements by banks

Malaysia (2)



B Continuous emphasis on promoting financial literacy, enhancing consumer protection and putting in place mechanisms to assist distressed households

Source: BIS (2017).

Malaysia (3)

List of measures introduced by the central bank

Purpose	Introduced by the Central Bank of Malaysia	Nature of measure	Effective date
Promote responsible financial behaviour among borrowers and credit providers	Stricter credit card requirements: The minimum income eligibility for new cardholders is set at RM24,000 per annum with minimum age of 21 years; Cardholders earning ≤RM36,000 per annum can only hold credit cards from at most two issuers and the maximum credit limit extended to a cardholder shall not exceed twice monthly income per issuer	Macroprudential	Mar 2011
	Guidelines on Responsible Financing to promote prudent credit underwriting and affordability assessment (similar requirements extended to co-operatives and MBSB)	Microprudential	2012
Ensure prudent expansion of credit to households	Maximum financing tenure of 10 years for personal financing and 35 years for the purchase of residential and non-residential properties	Macroprudential	July 2013
	Prohibition on offering of pre-approved unsolicited personal financing products, and new personal financing products or variations to existing products must receive prior approval from the Bank	Macroprudential	July 2013

Source: BIS (2017).

Macro-Micro Prudential Measures by Bank Negara Malaysia

Purpose	Introduced by the Central Bank of Malaysia	Nature of measure	Effective date
Promote sustainable property market and curb speculative activities	Maximum loan-to-value ratio of 70% for the third and above outstanding housing loan for individuals and 60% for housing loans by non-individuals	Macroprudential	Nov 2010 and Dec 2011
	Prohibit financial institutions from financing new development projects and end-purchases of properties with elements of interest capitalisation schemes (ICS), including developer interest bearing schemes (DIBS) or any permutations thereof	Macroprudential	Nov 2013
Enhance financial institutions' capacity to manage rising exposures to households	Guidelines on Risk-Informed Pricing to ensure pricing of retail financing products commensurate with risks assumed	Microprudential	2014
	Minimum collective impairment provisions and regulatory reserves of 1.2% of total outstanding loans, net of individual impairment provisions, to further strengthen buffers against potential credit losses	Microprudential	2015

Source: BIS (2017).

Malaysia

Objective	Introduced by the government	Effective date
Curb speculative activities in the property market and promote affordable housing to ease upward pressure on house prices due to structural mismatch	Prohibit new property development projects with elements of ICS, including DIBS or any permutations thereof	Nov 2013
	Increased the floor for properties that can be purchased by non-residents from RM500,000 to RM1 million	2014
	Establishment of the National Housing Council to develop strategies and action plans in a holistic manner; coordinate legal aspects and property price mechanism; and ensure provision of homes in a more efficient and expeditious manner. The Council members comprise federal agencies, state governments, National Housing Dept, PR1MA, SPNB and the private sector.	2014
	Increase the supply of low cost and affordable housing My First Home Scheme (Cagamas Berhad) 1Malaysia People's Housing Programme (PR1MA) including a rent-to-own scheme MyHome programme People's Housing Programme (National Housing Dept) Various low and medium cost housing by Syarikat Perumahan Negara Berhad (SPNB) Youth Housing Scheme	On-going (incl. Budget 2015)
	50% stamp duty exemption on instruments of transfer and loan agreements for houses valued up to RM500,000	Up to end-2016

Source: BIS (2017).

Capital Flow Measures

- **Unremunerated reserve requirements (URR)** on capital inflows or FX transactions à la Chile were singled out as promising (Thailand, Nov. 2006- Mar. 2008; Brazil, 2011)
- **Entry tax** on capital inflows (Brazil, Oct. 2009; 2 percent on fixed-income and equity inflows)
- **Minimum holding periods** as a deterrent for capital in general
- **Withholding tax** on foreign investors' profits (Korea, effective from Jan. 2011)

Summary Table Measures with Effects on Capital flows

Measures with the potential effect of reducing net capital flows

Brazil	Tax on foreign inflows (Oct 2009), Tax on short term external borrowing (Mar 2011).
China	Net position limits on banks to restrict long yuan bets (May 2013).
Costa Rica	Tax on the transfer of profits abroad from domestic investment (Jan 2013).
Indonesia	Holding period on central bank notes (Jul 2010), Limits on banks' short term external borrowing (Jan 2011).
Israel	Reserve requirement on currency swaps and forwards (Mar 2011).
Korea	Limit on FX derivatives (Oct 2010), Withholding tax on interest income from non residents purchase of treasury and monetary stabilization bonds (Jan 2011).
Peru	Increase in reserve requirement on short term external borrowing (Feb 2010, May 2010).
	Increase in fees on nonresidents' purchase of central bank paper (2010).
Russia	Increase in reserve requirements on liabilities to non resident legal entities (Feb 2011).
Thailand	Restoration of a withholding tax on nonresidents interest income and capital gains on new purchases of state bonds (Oct 2010).
Ukraine	Reserve requirement on short term deposits and loans in foreign currency from nonresidents (Aug 2008)
	Measures that could reduce capital outflows
Argentina	Ban on local insurance companies investment abroad (Oct 2011).
	Surrender requirement for the proceeds from the settlement of foreign exchange transaction (Jan 2012).
	Approval requirement for residents purchase of external assets (Jul 2012)
Barbados	Foreign exchange surrender requirement (August 2011).
Croatia	Ban on the extension of short term loans to nonresidents (Jan 2010).
Cyprus	Limits and approval requirements for cash withdrawals and cross-border transactions (Mar 2013).
Ecuador	Tax on remittances abroad (Jan 2008).
Iceland	Regulations to limit the purchase of Fx and cross-border transactions (Oct 2009).
Ukraine	Holding period on nonresidents' transfer of profits and income (Nov 2008).
	Reserve requirement on Fx deposits (Aug 2008).
	Limits on cash withdrawals from foreign currency current account (Feb 2014)

CFM Measures

	Type of measures	Transactions affected
CFMs on inflows	Tax	Inflows to fixed income securities, stocks, margin deposits, derivative contracts, and FDI Payments of pre-paid credit cards, debit cards, travelers checks, and ATM cash withdrawal using credit cards Interest earned by nonresidents on fixed income assets issued by private sector entities Interest earned by nonresidents on treasury and monetary stabilization bonds Banks' non-deposit FX-denominated liabilities Nonresident gains on financial derivatives transactions with residents Interest earned and capital gains by nonresidents on new purchases of state bonds
	Limit	Long bets based on FX loan-to-deposit ratio of banks Daily balances of banks' short-term external debt as a share of capital Banks' FX derivatives
	Holding period	Central bank bonds
	Reserve requirement	FX deposit accounts Nonresidents' new FX swap transactions and forwards Liabilities to nonresidents New foreign purchases of central bank notes

CFM Measures

	Type of measures	Transactions affected
CFMs on outflows	Tax	FX purchases by banks
	Surrender/ repatriation requirement	Proceeds from exports All FX proceeds
	Reserve requirement	Purchases of FX forward contracts and other derivatives that require the purchase of FX on a future date
	Limit	Cash withdrawals from banks Purchases of FX for gifts and grants FX derivative transactions (non-deliverable forwards) Net foreign asset holdings of SOEs Maturity of commercial loans to nonresidents reduced to 90 days Non-trade-related international transfers by individuals Use of FX-denominated payment cards abroad Banks' daily FX purchases for own position Banks' long open FX positions
	Ban	Loans with a maturity of less than one year to nonresidents Transfer of funds or cash abroad Transfer of dividend payments FX derivative transactions by banks Early repayment of loans to nonresidents
	Approval requirement	Purchases of foreign banknotes
	Other	Dividend, interest, and payments from abroad required to be received in FX Requirement to use available FX balances for payments and transfers abroad before purchasing FX

Leakages and Arbitrage in Implementing Macroprudential Policies

- Tightening of a capital-based macroprudential policies may become ineffective, if banks, for example, reduce any voluntary buffers one-for-one
- Some of the reduction in bank credit will be taken up by non-bank intermediaries or internationally active banks that are not subject to the macroprudential policies
- Large borrowers in developed markets may be able to substitute bank credit with the issuance of bonds and similar instruments
- Cross-border sources of finance can be tapped quite easily by all borrowers, including households
- Banks may try to dampen the impact of policy changes by gaming internal models to generate lower risk-weighted assets

Using Reserve Requirements as MPI

- RR as a tool to limit the build up of systemic risk from global financial liquidity conditions
  - Targeted to address buildup of FX liabilities of banks
    - Has limited impact on FX liabilities of non bank financial institutions.
  - Designed to limit the increase of non-core liabilities.
    - Rapidly released in stress periods
    - RRs on foreign or domestic banks' borrowing can help contain systemic risks by improving the funding structure of the banking system is on liabilities.
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Using Reserve Requirements as MPI

- Central banks have used RRs on bank deposits and other bank liabilities in a countercyclical manner to address systemic risk.
  - The original conception of RRs as a liquidity and credit policy tool,
  - Their use with ***a macroprudential perspective*** is relatively new.
    - This contrasts with the long-held view that considered RRs (on deposits) a supplemental monetary policy tool for macroeconomic purposes (Goodfriend and Hargraves, 1983 or Feinman, 1993) or an integral component of a financially repressed economy (McKinnon, 1973).
  - Several countries dismantled RRs with the implementation of inflation-targeting frameworks once short-term interest rates became the main monetary policy instrument.

Using RR as MPI: Brazil

- Historically, RR have been very high and complex
- Used aggressively at end-2008:
  - Reduced mandatory RR to provide liquidity
  - Large banks obtained further reductions if they purchased assets from smaller banks (s.t. runs)
  - Also for new type of deposits with insurance fund
- In January 2011, new RR to limit banks' short US dollar positions
- The limit was then reduced in fall of 2012 and lifted in June 2013 following the depreciation of the real.

Using RR as MPI: Korea

- Also used RR in countercyclical fashion

- A new "twist" in December 2008: a one-off *remuneration of existing RR*, as a way to increase banking system capitalization (with immediate impact on balance sheet)

Using RR as MPI: Turkey

- RR on lira deposits increased from 5% to 13%
- RR on dollar deposits increased from 9% to 12% (from October 2010 to April 2011)
- Graduated scale according to maturity
- Remuneration on lira deposit halted in 2H2010
- In the context of a reduction in domestic interest rates, and implicit target on credit growth

(1942-2017)
BANK OF THAILAND

A Case Study on Macroprudential Policy in Thailand: Credit limits on Credit Card and Personal Loan

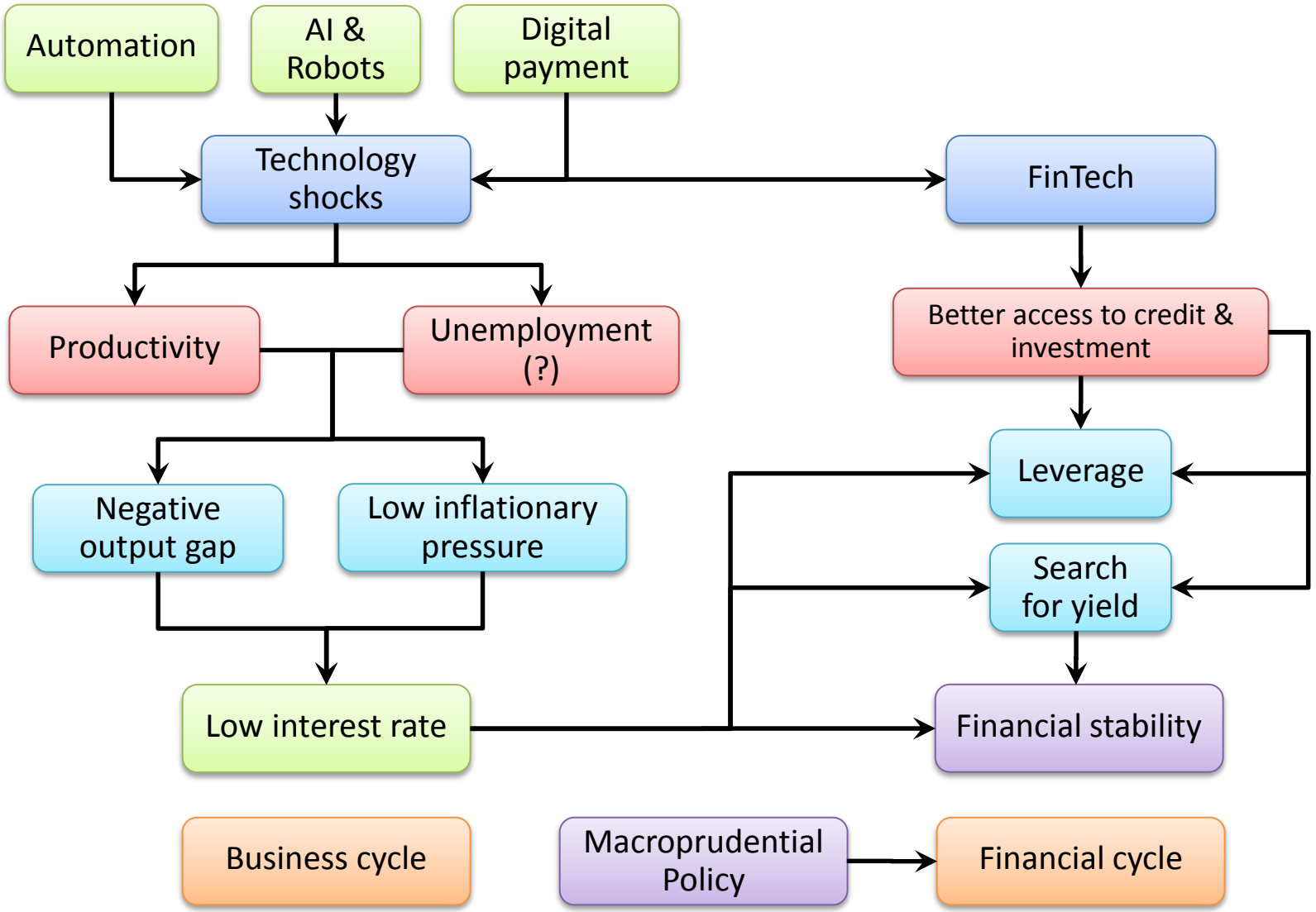
18 July 2018

Sra Chuenchoksan
Monetary Policy Department

Presentation outline

- **Why understanding macroprudential policy (MPM) is critical for the future of monetary policy?**
- **The BOT's sectoral framework in analyzing risks to financial stability**
- **A case study of macroprudential policy in Thailand**

A link between macroprudential policy and technological shocks



BANK OF THAILAND (1942-2017)

Many challenges ahead regarding MPM

- Macroprudential policy looks good on paper but gets mixed result in practice.
- Difficult to learn from other countries' experience due to specific context.
- To understand its effectiveness, one need to understand other fields of economic eg. game theory, behavioral economics etc.
- Fundamental questions:
  - When/timing to implement?
  - What types of macroprudential policy to use?
  - At what degree/severity should the rule be?
  - How binding the policy will be?
  - What are the loopholes/leakages/unintended consequences?
  - What does it mean when a measure is effective?

The BOT's sectoral framework in analyzing risks to financial stability

5 dimensions of risk metrics		
Key metrics	Dimension of risk	Example of Indicators
1. Level of leverage	Solvency risks	Debt to income Debt to GDP Debt to Assets
2. Speed of leverage	Dynamics of debt, quality of debt, underpricing of risk	Debt growth compared to trend or international benchmark. Conditional mean estimation
3. Debt serviceability	Liquidity risk, ability to service debt	NPL ratio, debt service ratio (DSR), interest coverage ratio (ICR).
4. Vulnerability to income shocks	Income profile and financial cushion	Source of income, debt at risk stress test (income shocks)
5. Vulnerability to funding and interest rate shocks	Debt maturity profile, type of interest and currency composition	Debt profile analysis (share of short-term and long-term debt, share of FX debt), stress test (interest shocks)

Conditional mean estimation

Concept: after controlling for fundamental factors ie. borrower's profile, collateral profile and contract profile, what is the trend in the pricing of risk compares to the past?

$$y_i = \alpha + \sum_t^T \gamma_t D_t + \sum_j \beta_j X_{ji} + \epsilon_i$$

Pricing of risk variable ie. LTV, DTI, interest rate

Time dummy for every period

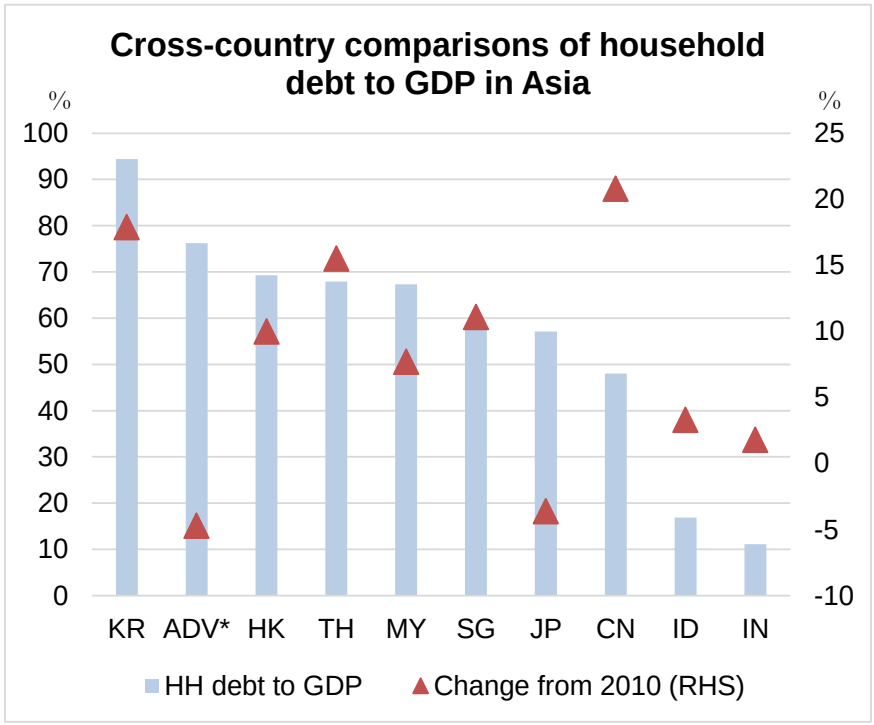
Fundamental factors

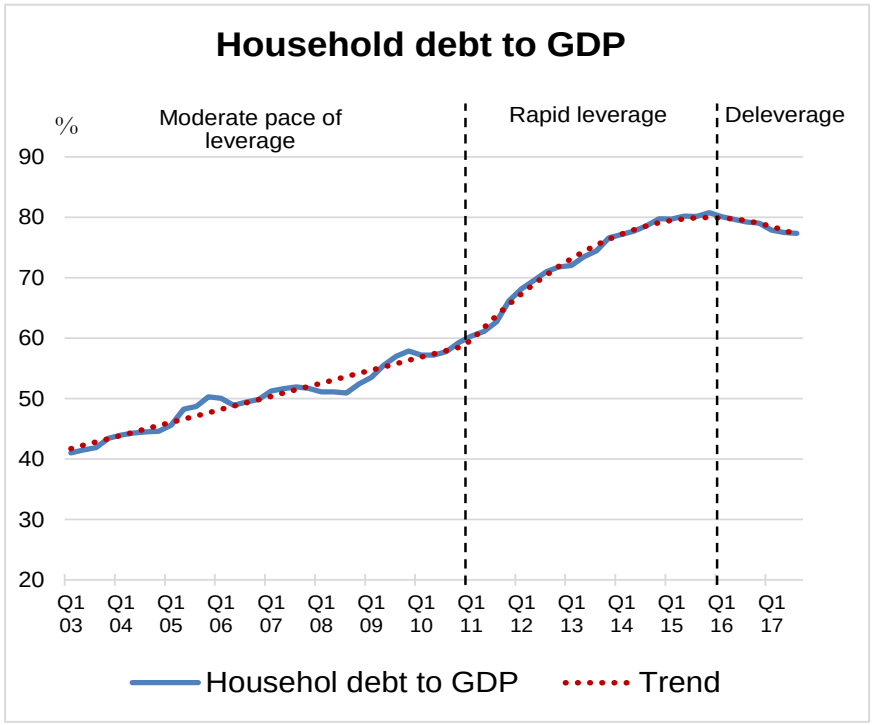
1) Require a granular level of data (panel data or cross sectional data overtime).
2) Less attention is needed on β_j but a high R^2 is preferred
3) Time dummies do not have to have the same frequency as data
4) Direction rather than level
5) Can conduct statistical inference ie. $D_i = D_j = \ldots = D_t$

BANK OF THAILAND

A case study on Thailand's household debt

Level and speed: rapid increases in household debt to GDP during 2011 -2015



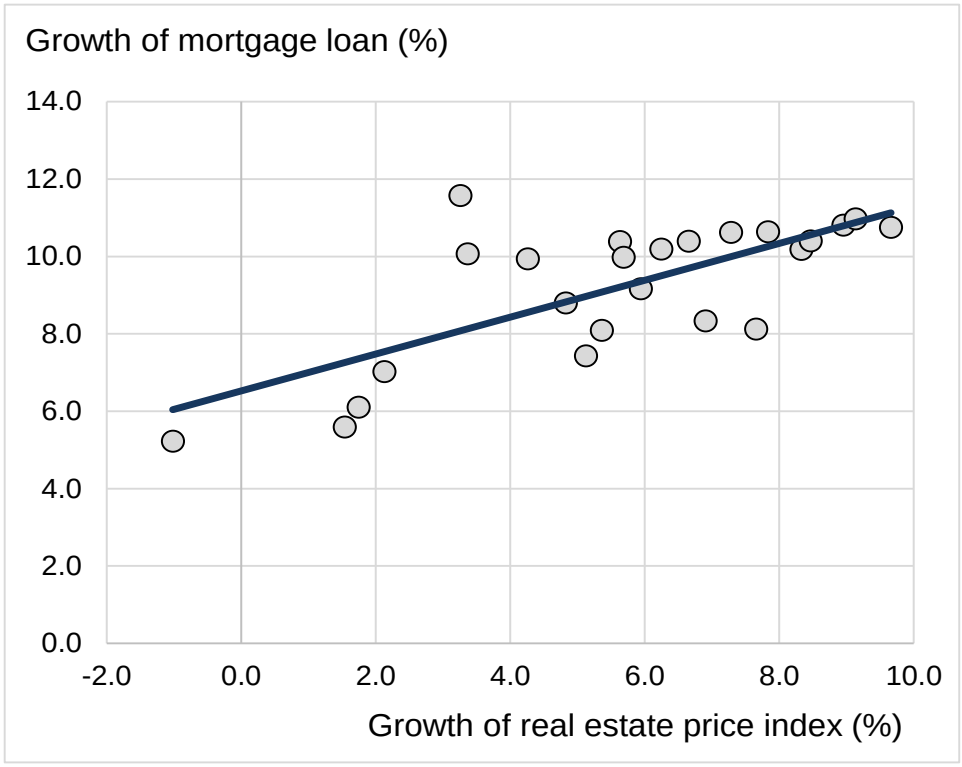


*ADV = Advance economies comprise Australia, Canada, Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States.

Source: BIS, data as of 2017Q3

Source: BOT

(1) Higher real estate prices contribute about one-fourth of mortgage loan growth

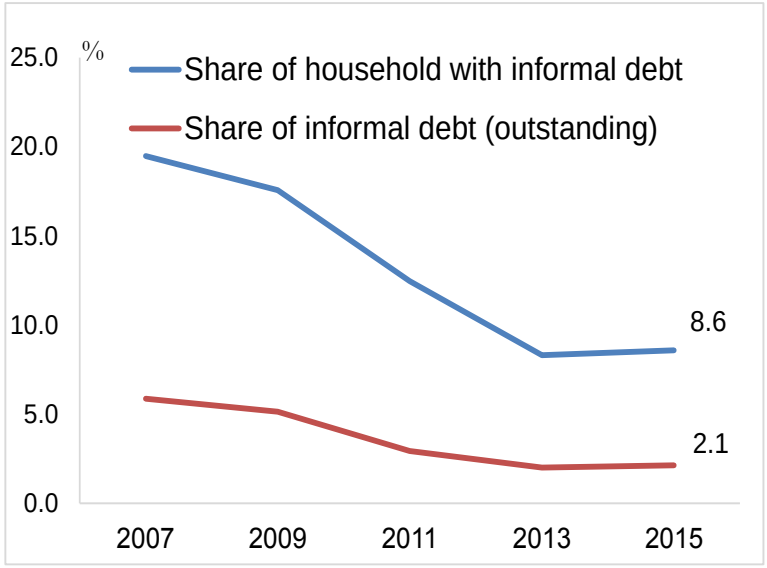


Source: BOT

Between 2011Q4 and 2017Q3	% point to point growth
Real estate prices	34.1
Contribution from real estate price to mortage loan	16.4
Mortage loan	64.5

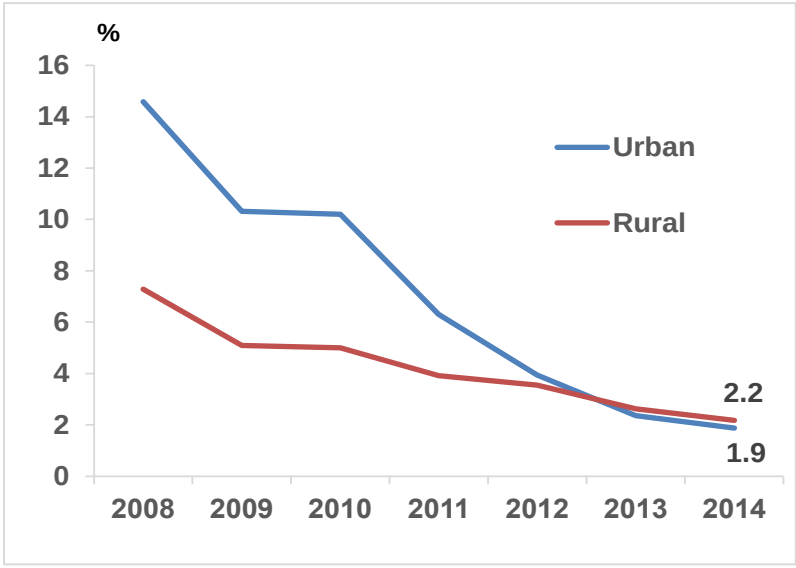
(2) Better access to formal credit overtime

Share of informal debt (Socio-economic survey data)



Source: Socio-economic survey, NSO

Share of household with informal debt (Townsend Thai data)

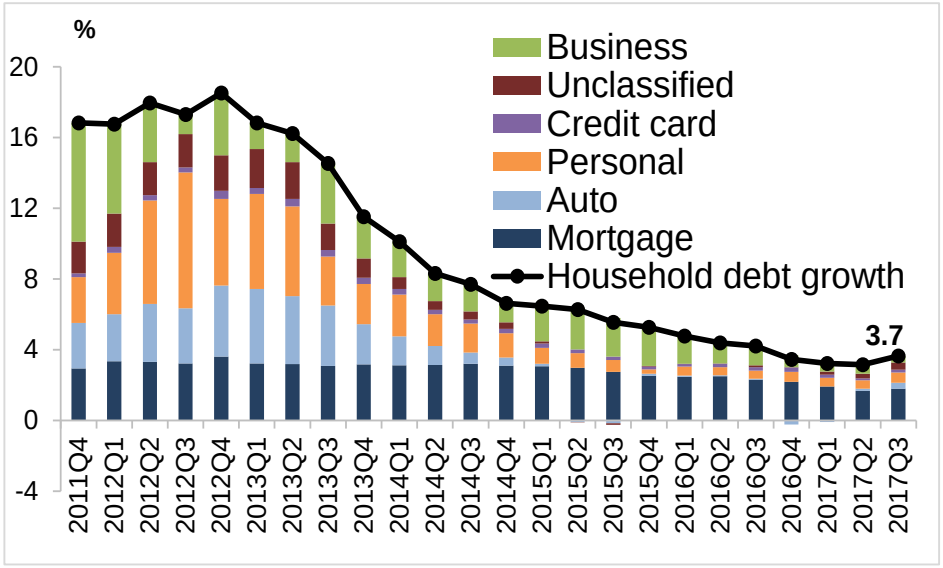


Source: Townsend Thai Household Annual Resurvey

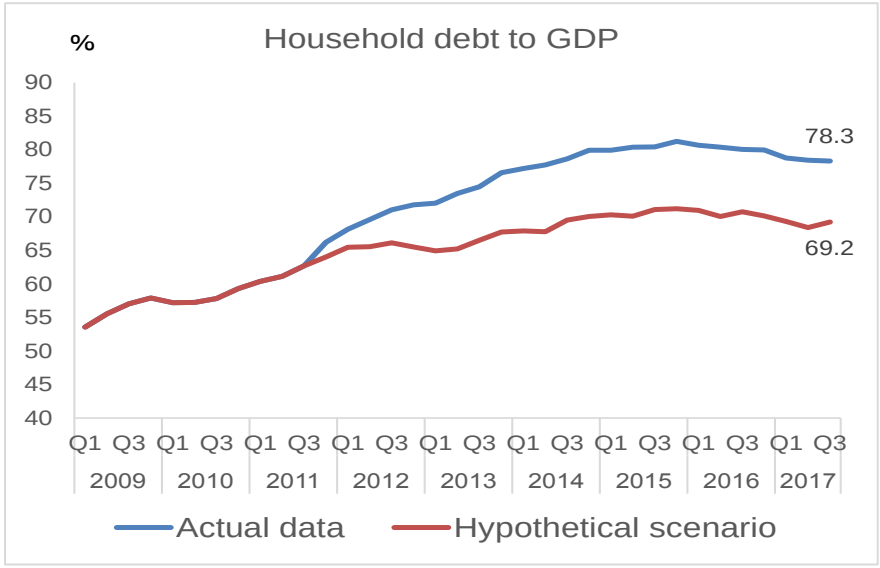
(3) Flood and stimulus policies were the main cause of rapid leverage in household debt

- Severe flood during July 2011 – Jan 2012
- Government policies
  - First car tax rebate scheme (Sep 2011 – Dec 2012)
  - Agricultural price guarantee
- Accommodative monetary policy after the GFC

Contribution to household debt growth by type of loans

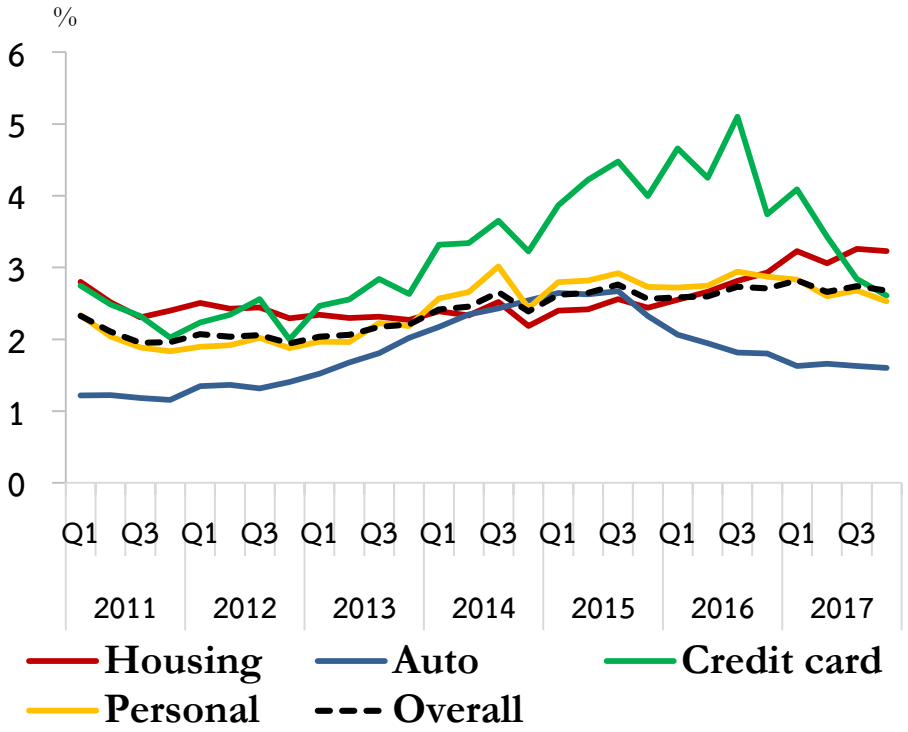


Household debt to GDP (Actual vs. Hypothetical scenario)



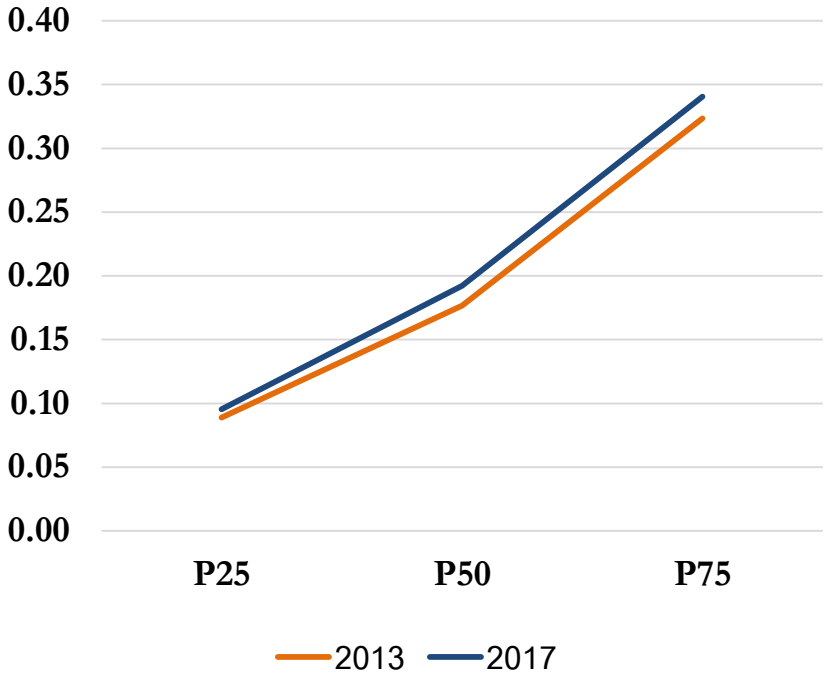
Debt serviceability – worsening

NPL ratio of the commercial bank system by types of loans



Source: BOT

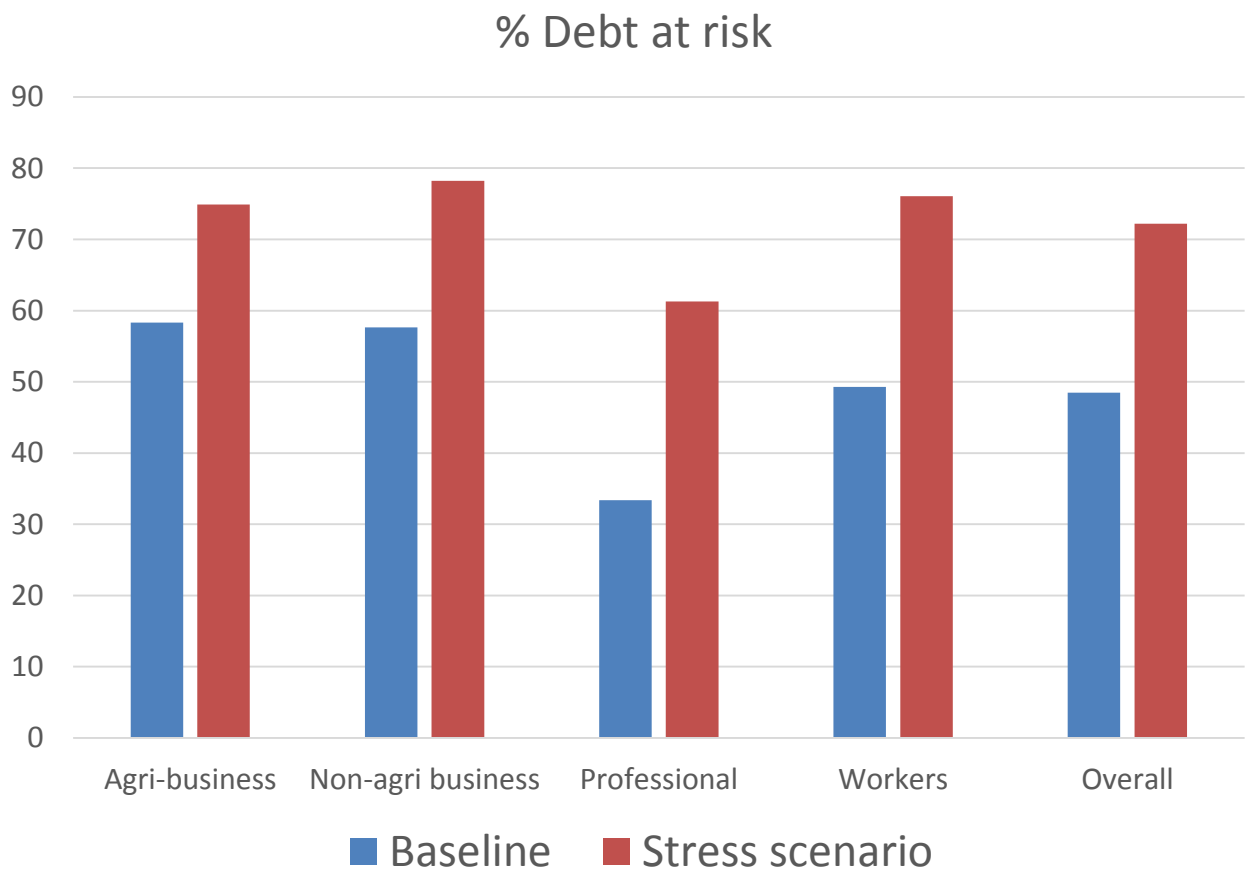
Debt service ratio (SES)



Source: Socio-economic survey, NSO

Vunerability to income shocks is also a concern

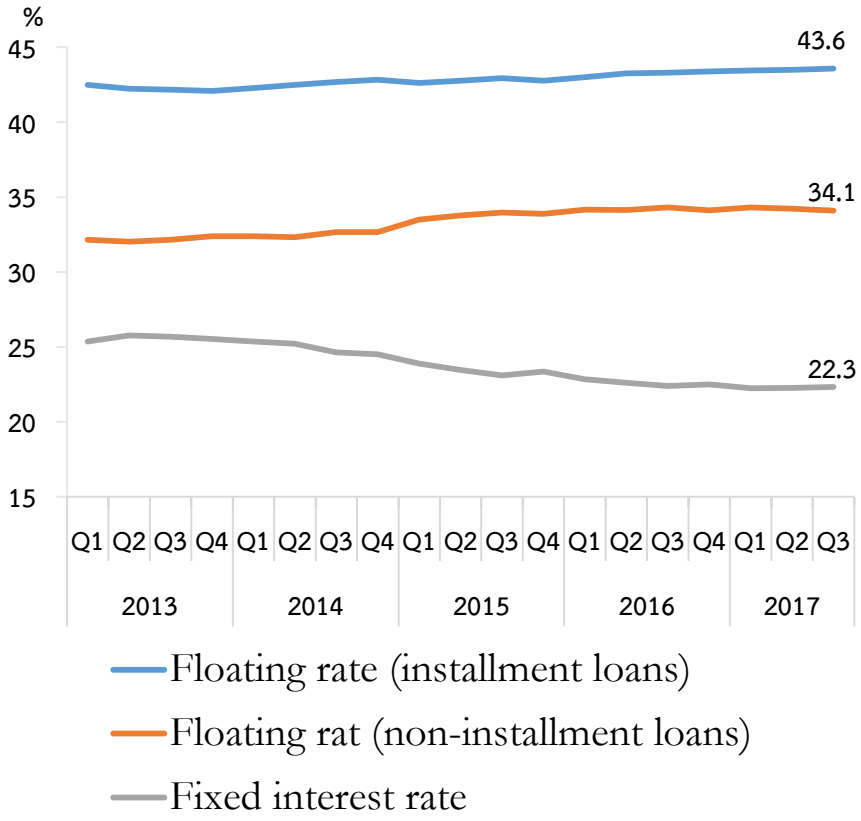
% debt at risk = percentage share of debt with risks of default
(household with income falling short of expenditure and debt service)



Source: Socio-economic survey, BOT's calculation

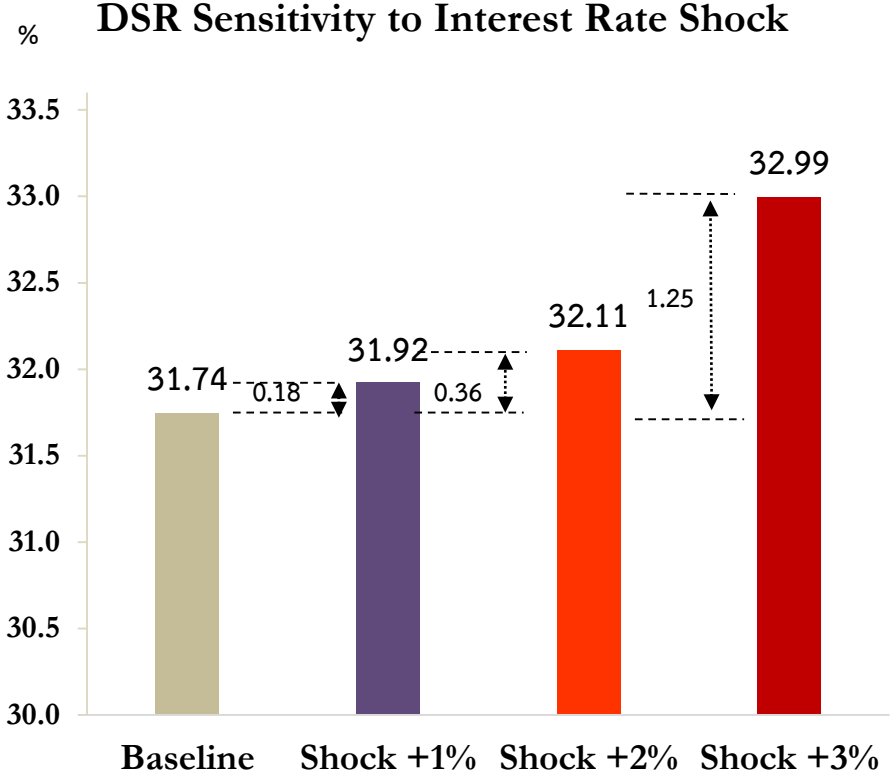
Vunerability to interest rate shocks increases slightly

Share of loan by types of interest rate



Source: BOT

DSR Sensitivity to Interest Rate Shock



Source: NSO, BOT

DSR baseline is the average value taken from SES, NSO. Calculation on stress DSR is done by applying the methodolody used in the BIS paper (Aldasoro et al. (2018)*)

*Aldasoro et al. (2018), Early Warning indicators of banking crises: expanding the family, BIS Quarterly review, March 2018

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A quick summary

Key metrics	Current assessment	Going forward
1. Level of leverage	**High risk** High debt to GDP	**Decrease slightly** Slow pace of deleverage
2. Speed of leverage	**Low risk** Growth rate remain low	**Increase slightly** Signs of growth rate picking up
3. Debt serviceability	**Medium risk** Higher NPL ratio than the past	**Increase slightly** New-entry NPL is still increasing
4. Vulnerability to income shocks	**Medium to high risk** Indebted households are vulnerable to income shocks	**Decrease slightly** Slightly less probability of experiencing negative income shock
5. Vulnerability to funding and interest rate shocks	**Low risk** Most debt are insensitive to interest rate shocks	**Increase** Share of debt associated with fixed interest rate decreases

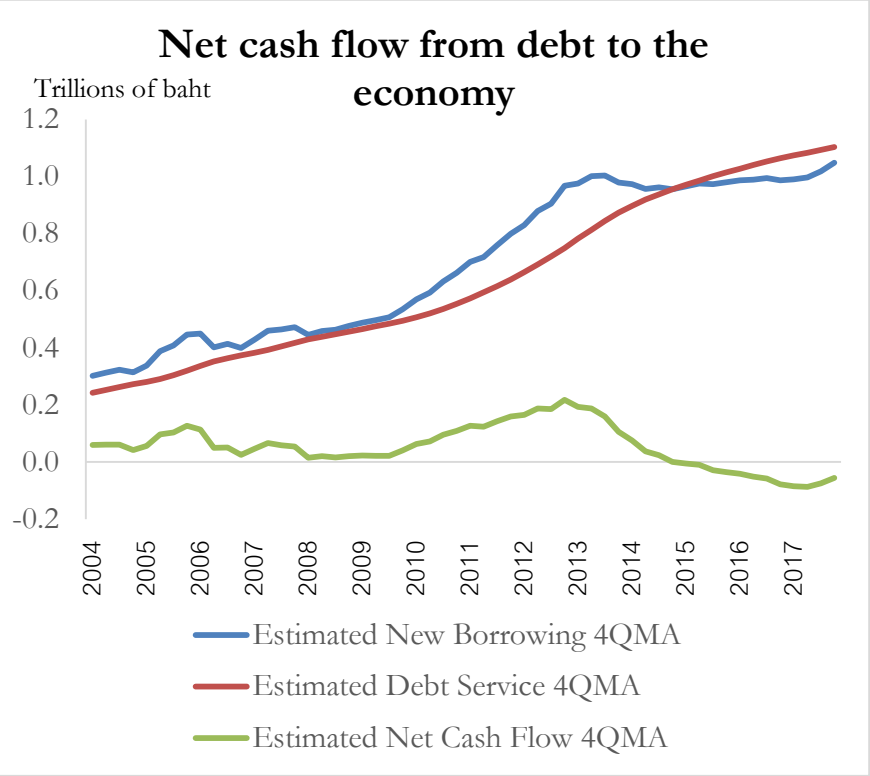
Consequences of high household debt

Three broad consequences of high household debt problem:

1) **Consumption drag:**
   Borrowing demand from the future

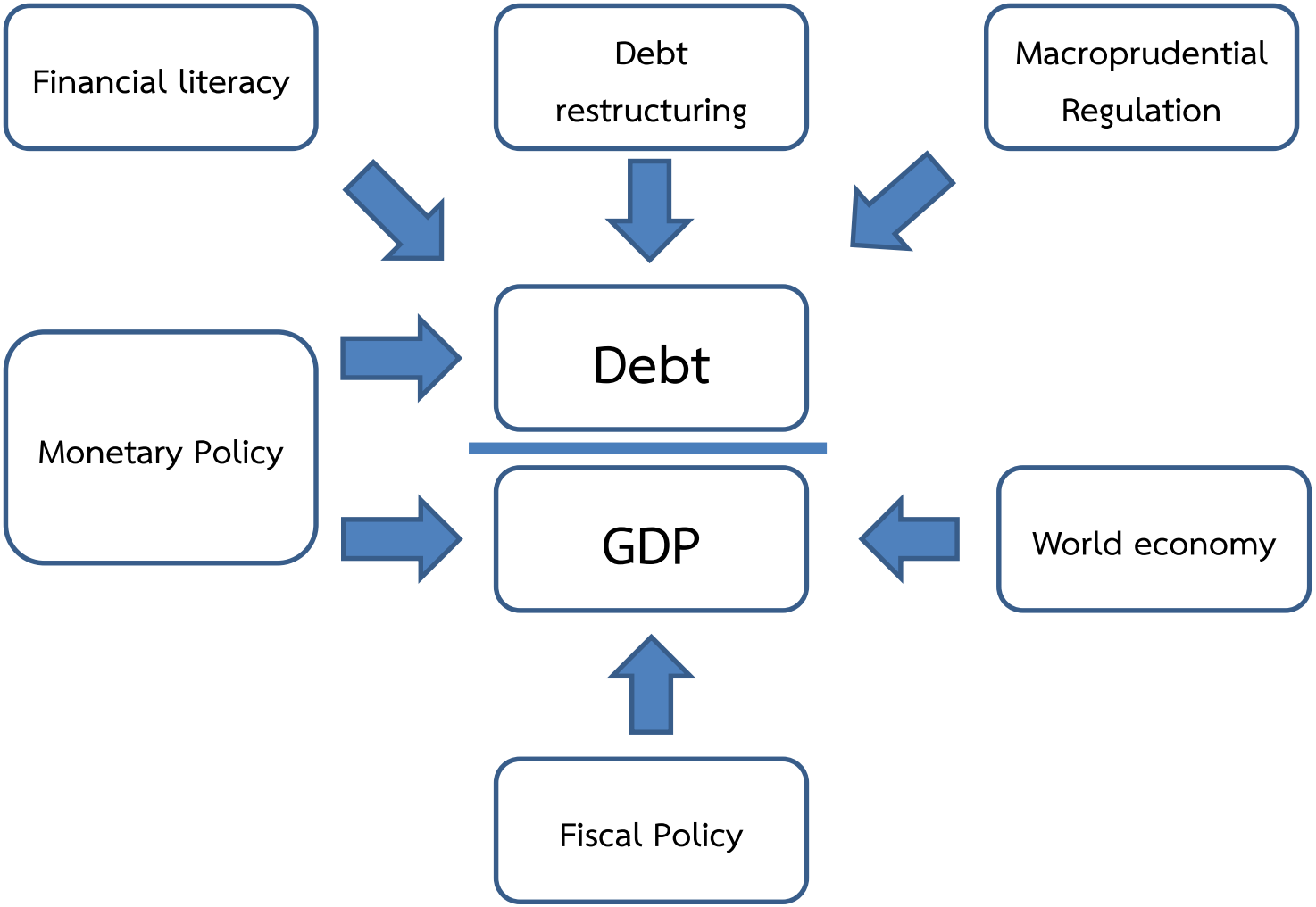
2) **Posing risks to financial stability**
   Vulnerable to shocks / default

3) **Affect inclusive growth**
   Reduce multiplier effects causing less spillover to the economy

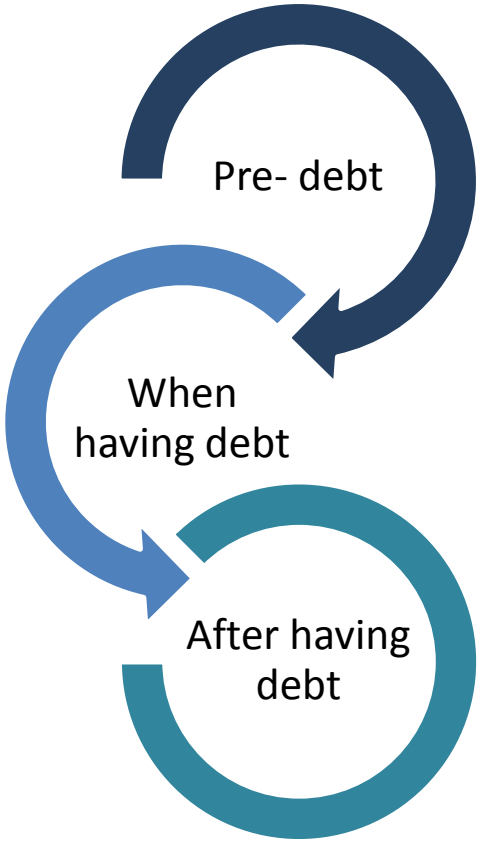


Source: BOT

Overall view of household debt management: MPM is only a part of a larger debt management scheme



BOT attempts to tackle debt problem at every stage



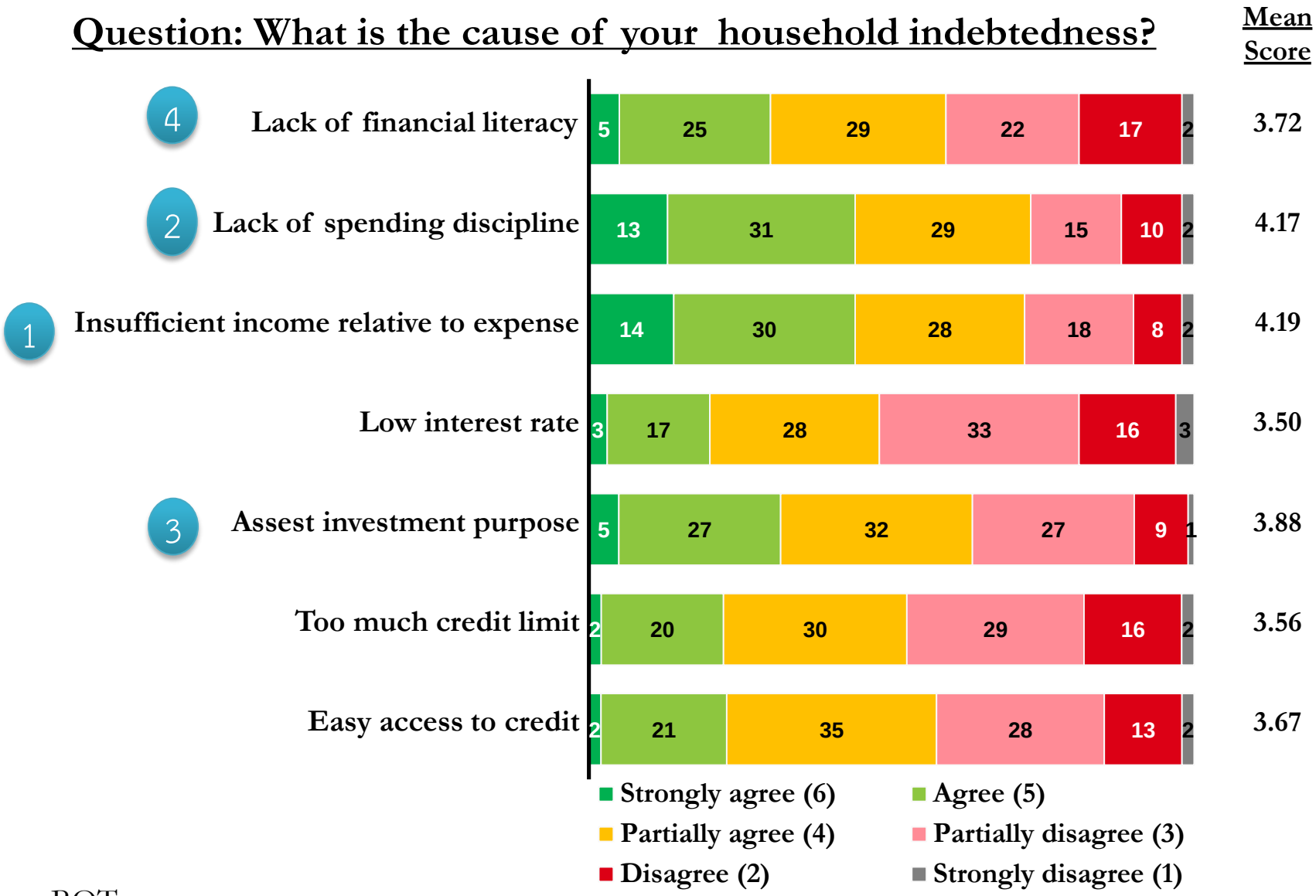
Financial literacy
- Focus on new-entry to job market

Responsible lending
- Credit limits

Debt clinic/debt restructuring
- A debt relief program for those eligible

Survey result from Household Financial Survey in 2017Q3

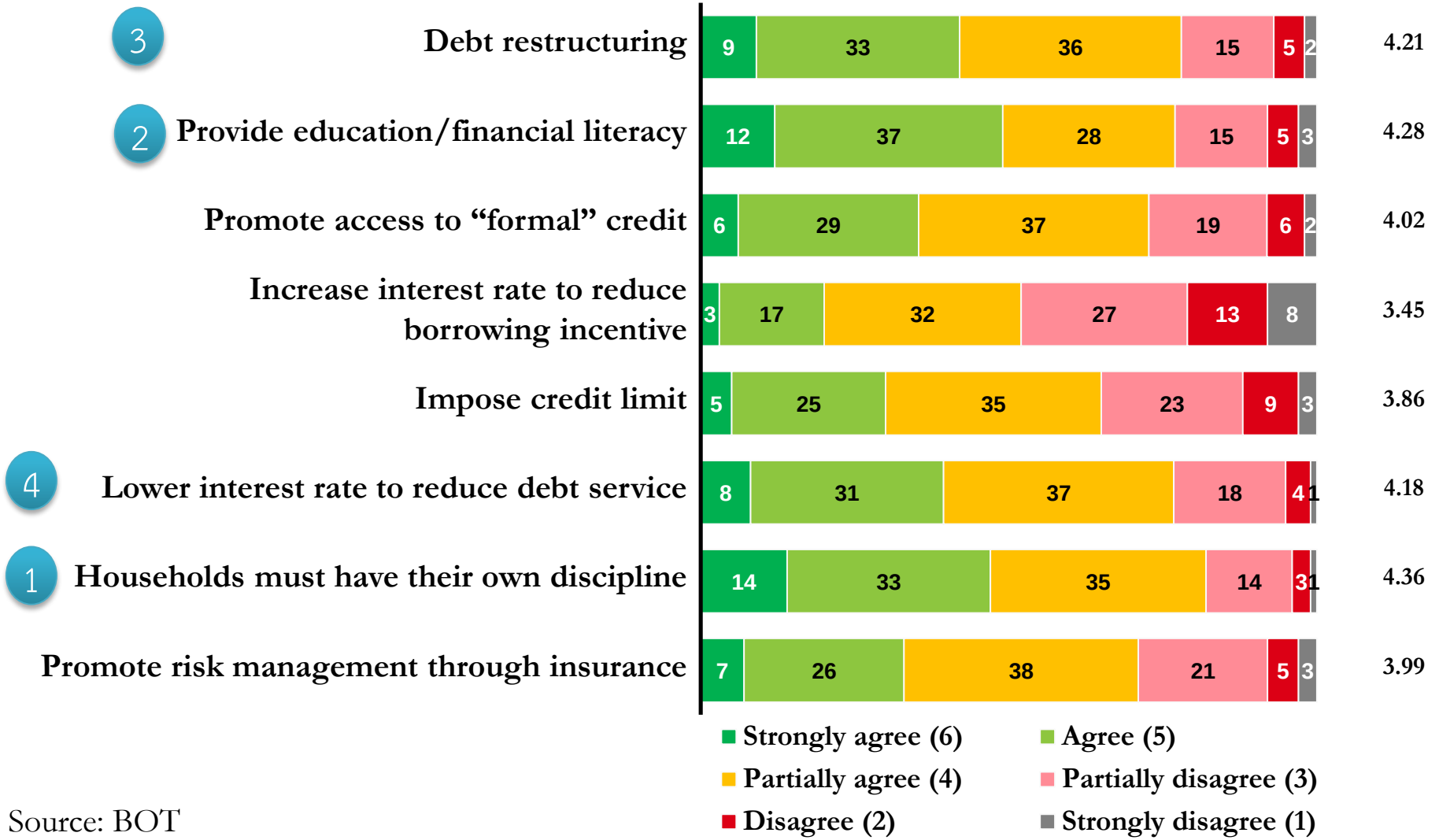
Question: What is the cause of your household indebtedness?



Source: BOT

Survey result from Household Financial Survey in 2017Q3

Question: What measure should be taken to solve the nationwide household debt problem ?



Source: BOT

Do Thai households genuinely fall short of spending discipline?

Concept: Two groups of household – one with debt and one without. Both groups have the same income , located in the same area, have the same number of household member with the same amount of finanacial asset and so on… Do they spend differently?

Method: Conditional mean estimation with "group dummies"

Findings: Debt Vs. No debt

Indebted household spend on average more than non-debt household in many spending categories

1) 7% more in overall spending
2) 390% more in car service expenditure
3) 162% more in travelling expenditure
4) 124% more in telephone related expediture
5) 84% more spending in entertaining related activities

Do Thai households genuinely fall short of spending discipline?

Indebted household: Debt serviceability problem Vs. No problem

Findings:

Indebted household with debt serviceability problem spend on average more than indebted household with no debt serviceability problem in many categories

1) Clothing (606%)
2) Entertainment activities (333%)
3) Healthcare expenditure (326%)
4) Education expenditure (287%)
5) House repair (204%)
6) Car repair (203%)
7) Eletricity and water bill (12%)
8) Food (12%)

BANK OF THAILAND

Why credit limit on credit card and personal loan under regulation (PLR)

1) **Timing:**
   - Too late for a preventive measure, deleveraging process starts to correct itself but very slow.
   - Corrective measure to facilitate deleveraging process
2) **What types of MPM and on what target?:**
   - Curb spending discipline
   - Loans that are easily get carry away
   - Loans with high moral hazard ie. without collateral
   - NCB data shows that 50% of young Thai are in debt very early – most of which are personal loan or credit card loan. One in five of young Thai has trouble paying debt service
3) **Degree of the measure:**
   - Soft measure / signaling approach with wait and see assessment
   - Measure applicable to new borrowers only
   - Stricter credit limit
   - NCB data shows no correlation between number of credit card and defaults but not for PLR – higher defaults for debtors with more than 3 creditors
4) **Possible leakages/Unintended consequence?**
   - Credit card and PLR are a close substitutes
   - Must impose to both banks and non-banks
   - Leakages to informal debt – less likely given soft measure

The measure:
Credit to income limits on credit card and PLR loan

New rules were imposed on September 2017

	Credit card	PLR
Previous regulation	• Minimum income of more than 15,000 baht per month • Credit limit to no more than 5 time the monthly income	• Credit limit to no more than 5 time the monthly income
Changes in credit limit	Income (baht) 15,000: Credit limit — Not eligible 30,000: ≤ 1.5 of income 50,000: ≤ 3.0 of income ≤ 5.0 of income	30,000: Credit limit — ≤ 1.5 of income, No more than 3 issuers ≤ 5 of income, No restriction on no. of issuer
Changes in maximum interest rate	20% ⇨ 18%	Remain at 28%

Discussion on evaluation of macroprudential policy

Macro-prudential policy has become easier to evaluate because of its targeted nature…

1) Difference-in-difference approach

- Afffected group = treatment group
- Non-affected groups = control group
- Common trend assumption

2) Regression discontinuity

- Local linear estimates around the neighborhood of a threshold
- Randomization around threshold assumption.

3) A simple regression with macroprudential index

Using diff-in-diff to evaluate the impact of MPM

$$y_{it} = \alpha + \beta_1 Treat_i + \beta_2 Rule_t + \beta_3 Treat_i * Rule_t + \sum_n \gamma_n X_{nit} + \varepsilon_{it}$$

y = log(outstanding or new flow of loan or new flow of number of credit card)
i = income group, t = period (month), X_n = control variable, Rule = {0,1} , Treat = {0,1}

Credit card

Income group (baht)	Group assignment
15,000 - 20,000	1st treatment group
20,000 - 25,000	1st treatment group
25,000 - 30,000	1st treatment group
30,000 – 50,000	2nd treatment group
> 50,000	Control group

Personal loan under regulation (PLR)

Income group (baht)	Group assignment
< 5,000	1st treatment group
5,000 - 10,000	1st treatment group
10,000 - 15,000	1st treatment group
15,000 - 20,000	1st treatment group
20,000 - 25,000	1st treatment group
25,000 - 30,000	1st treatment group
30,000 – 50,000	Control group
> 50,000	Control group

Using loan outstanding data yields insignificant result

Results on credit card estimation

	Model 1 < 50k Vs. > 50 K	Model 2 < 30K Vs. > 50K	Model 3 30k-50k Vs. 50K
Treat	-0.1986047***	-0.2292859***	0.0370003
	(0.0734861)	(0.0767594)	(0.7711736)
Rule	0.0465033	0.0463741	0.0286303
	(0.1253971)	(0.1245201)	(0.142338)
Treat*Rule	-0.0314611	-0.041241	-0.0025789
	(0.1411861)	(0.1458965)	(0.1783789)
ln(delinquent loan)$_{t-1}$	1.009916***	0.9875812***	1.011934***
	(0.0180109)	(0.0204073)	(0.0267992)
Number of credit card	-0.2439915***	-0.236317***	0.6918814
	(0.0556747)	(0.0594763)	(3.552363)
Constant	6.959383***	6.944685***	-7.315274
	(0.8234629)	(0.8749517)	(54.1577)
No. of observation	845	686	320

Figures in parentheses represent robust standard errors.
*,** and *** denote significance level at 10%, 5% and 1%, respectively.

Using flow data yields significant result

Results on PLR estimation

	Model 1 <30K vs. > 30K Outstanding	Model 2 <30K vs. > 30K New flow	Model 3 (Placebo) 30K-50k vs. > 50K New flow
Treat	0.369399***	0.1317617	0.1306794
	(0.06886)	(0.1009527)	(0.1479274)
Rule	0.1430057	0.3122836*	0.4519739**
	(0.1195894)	(0.1777143)	(0.2220478)
Treat*Rule	-0.1135352	-0.5549352***	-0.2763214
	(0.1399747)	(0.2112013)	(0.3132061)
ln(delinquent loan)$_{t-1}$	1.25179***	1.036751***	1.03912***
	(0.01379)	(0.02293)	(0.0423078)
Constant	1.322158***	-0.7388982***	-0.8160342***
	(0.0813389)	(0.1312655)	(0.2269405)
Number of observation	1645	1394	398

Figures in parentheses represent robust standard errors.
*,** and *** denote significance level at 10%, 5% and 1%, respectively.

Implication of diff-in-diff result on household debt

Impact on new flow

	Growth rate after the rule
PLR of the treatment group (Diff-in-diff result)	Lower by 42 %
Overalll new flow of PLR	Lower by 27 %

Impact on loan outstanding

2017Q4	With credit limit measure (actual data)	Without measure (estimated impact)
% YoY of PLR (outstanding)	6.48	8.11
% YoY of household debt (outstanding)	4.30	4.34

Note: The share of PLR loan is about 3% of total household debt

Other impacts and things to watch

- Increases in number of credit cards
  - No evidence when using stock data
- Impact to bank's profitability
- Credit quality and hence NPL
- Switching effects:
  (1) Between formal and informal debt
  (2) Between types of loan
  (3) Between income group

Thank you

Q&A

(1942-2017)
BANK OF THAILAND

Financial Stability and Macroprudential Supervision at the Bank of Thailand

Rungporn Roengpitya

Financial Stability Unit, Bank of Thailand

APEC Financial Regulators Training Initiative
Seminar on Macroprudential Supervision

19 July 2018

Presentation overview

1. Overview of the Thai financial system and regulatory bodies
2. Institutional arrangements
3. Systemic risk assessment, monitoring and stress testing
4. Macroprudential policy issuance process
5. Remaining challenges

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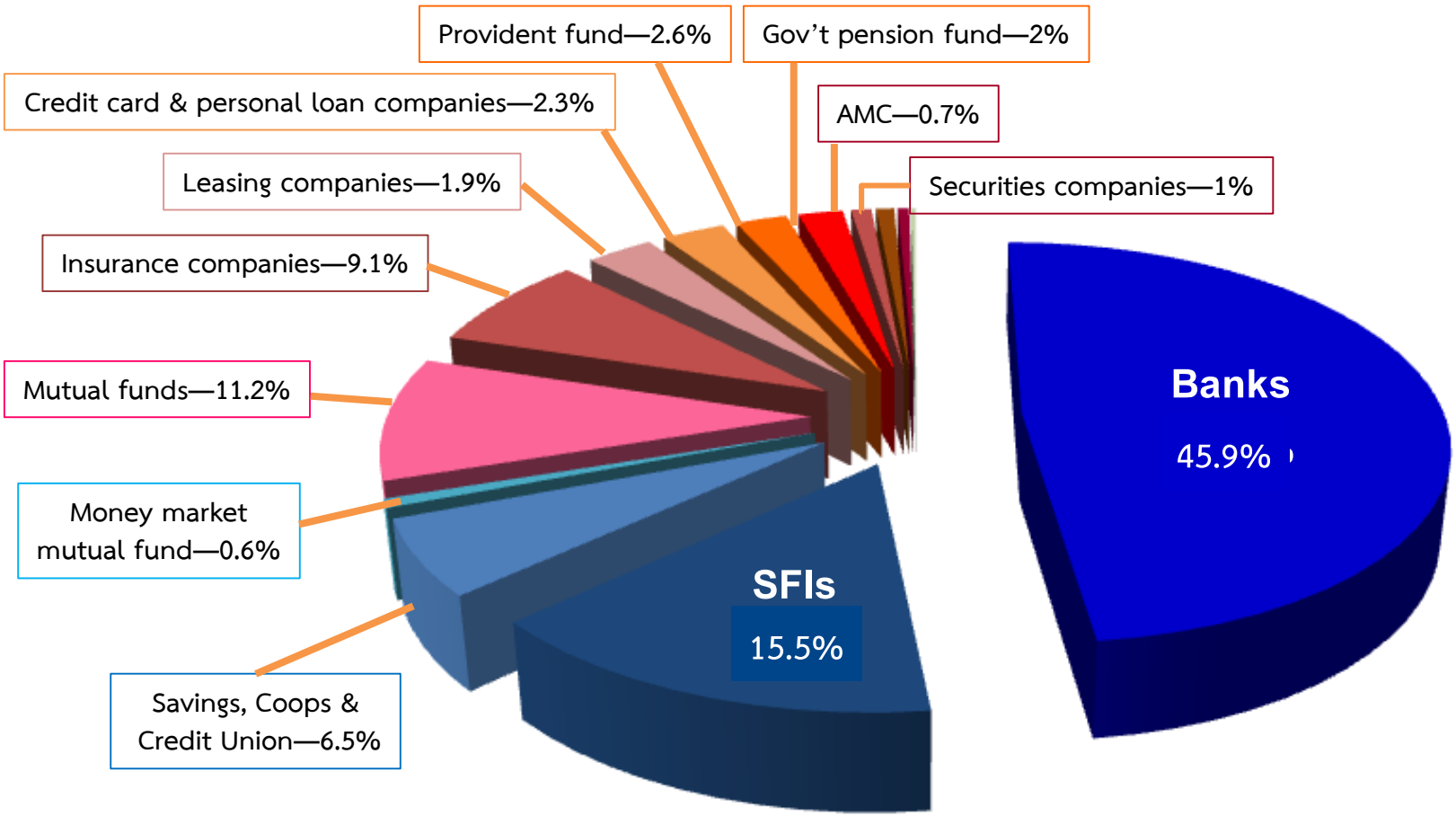
Overview of the Thai Financial System

Overview of the Thai banking landscape: 2017Q4 by assets

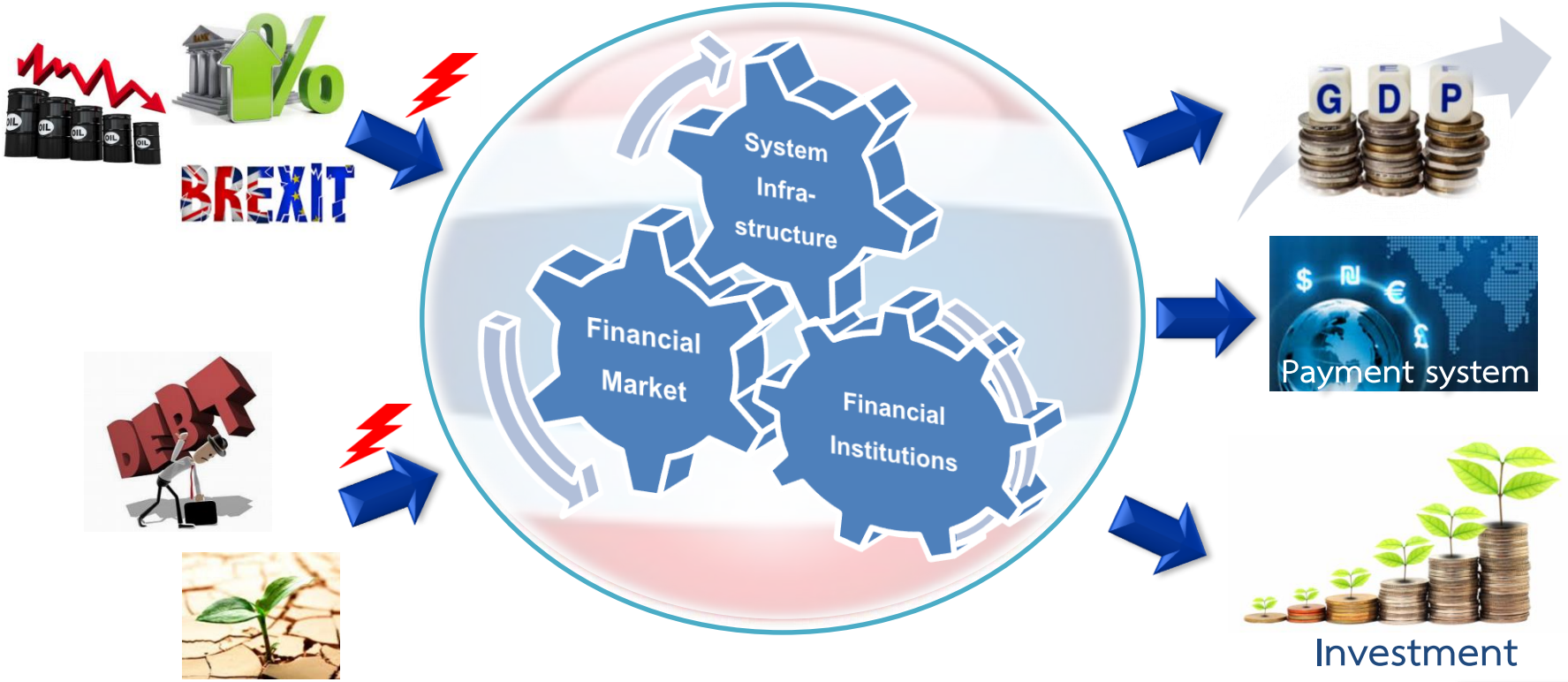


Source: BOT

Financial stability definition in general

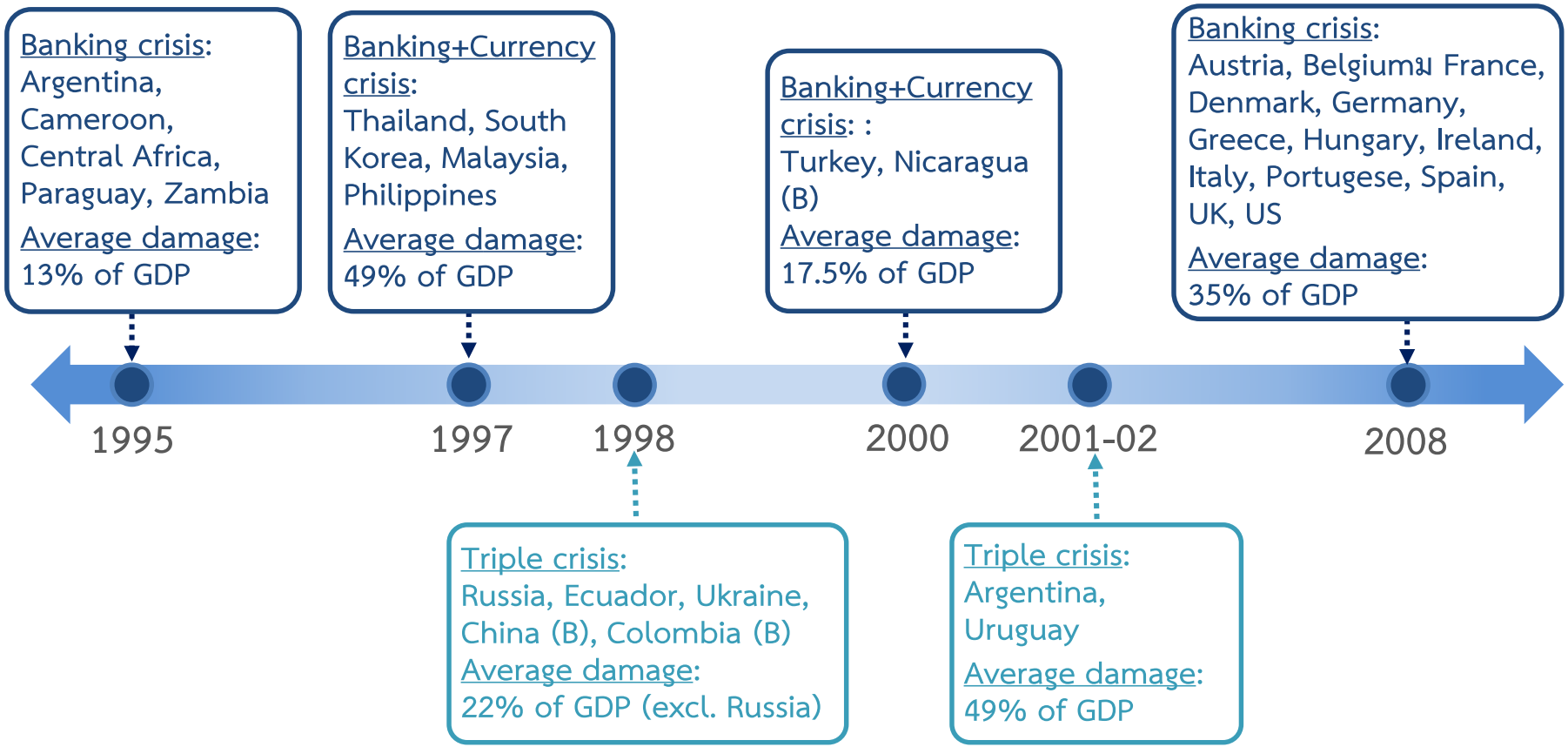
A condition in which the financial system – intermediaries, markets and market infrastructures – can withstand shocks without major disruption in financial intermediation and in the general supply of financial services.

- European Central Bank (ECB)



Consequences of having financial "instability"

The consequence in the past for not paying adequate attention to financial stability



Source: IMF Crises Database (B)=Banking crisis only Triple crisis=Banking+Currency+Sovereign debt crisis

Financial stability differs from other mandates

The stability of an individual financial institution to minimize distress chance

Financial Institutions Stability

Monetary Stability

Overall macroeconomic stability especially the price stability

BOT

Corporate

Household

Financial markets

Government

Financial Stability

Stability of the whole financial system with the aim to minimize "systemic risk"

Inter Connectedness

Risk transmission from other financial institutions

Asset price bubbles Credit cycle

Payment system stability

Risk from financial products

Our plan to enhance the financial stability framework

- Effectiveness assessment
- Design the macroprudential process and designate the responsible parties
- Communication to public

- Data gap identification and closing
- Develop necessary tools and analytical framework to measure systemic risk in a more forward looking fashion
- Holisitc risk assessment and information sharing between all regulatory agencies

- Design national financial stability framework and institutional arrangement
- Recovery and resolution plan
- Crisis simulation exercise

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Various oversight authorities (fragmented model)

Ministry Level

Ministry of Information & Communication Technology

Ministry of Finance

Ministry of Agriculture & Cooperative

Regulators

- **Electronic Transactions Commission**
- **Bank of Thailand**
- **Fiscal Policy Office**
- **Office of Insurance Commission**
- **Securities and Exchange Commission**
- **Cooperative Auditing Department**

Financial Services providers

Payment Services Providers	Financial Institutions			Capital Markets	Semi-formal FIs
▪ **Banks** ▪ **Non-Banks,** e.g. Telcos, Post offices, Counter services, e-money providers, Card Issuers ▪ **Payment Switchers** ▪ **Payment Gateway Providers**	▪ **Thai Commercial banks (including retail banks)** ▪ **Foreign bank branches** ▪ **Finance & Credit Foncier** ▪ **Representatives** ▪ **Asset Management Co.** ▪ **National Credit Bureau** ▪ **Credit Companies** • **SFIs**	▪ **Specialized Financial Institutions** eg. Government Saving Bank / Government Housing Bank	▪ **Insurance Business**	▪ **Supervisory agency for capital market** ▪ **Securities Businesses** ▪ **Derivatives Business**	▪ **Cooperatives**

Now under BOT

Development of financial stability oversight in Thailand

BANK OF THAILAND (1942-2017)

After 1997 financial crisis

- ✓ Implementation of various reform measures e.g. financial supervision
- ✓ Risk assessment from various departments
- ✓ Close coordination amongst supervisory authorities

2009 : FS sub-committee

- ✓ A 'Financial Stability sub-committee' has been formed to oversee financial stability issues and responsible in assessing risks and making policy recommendation
- ✓ Established a 'Financial Stability Working Group' consisting of experts from concerned line departments

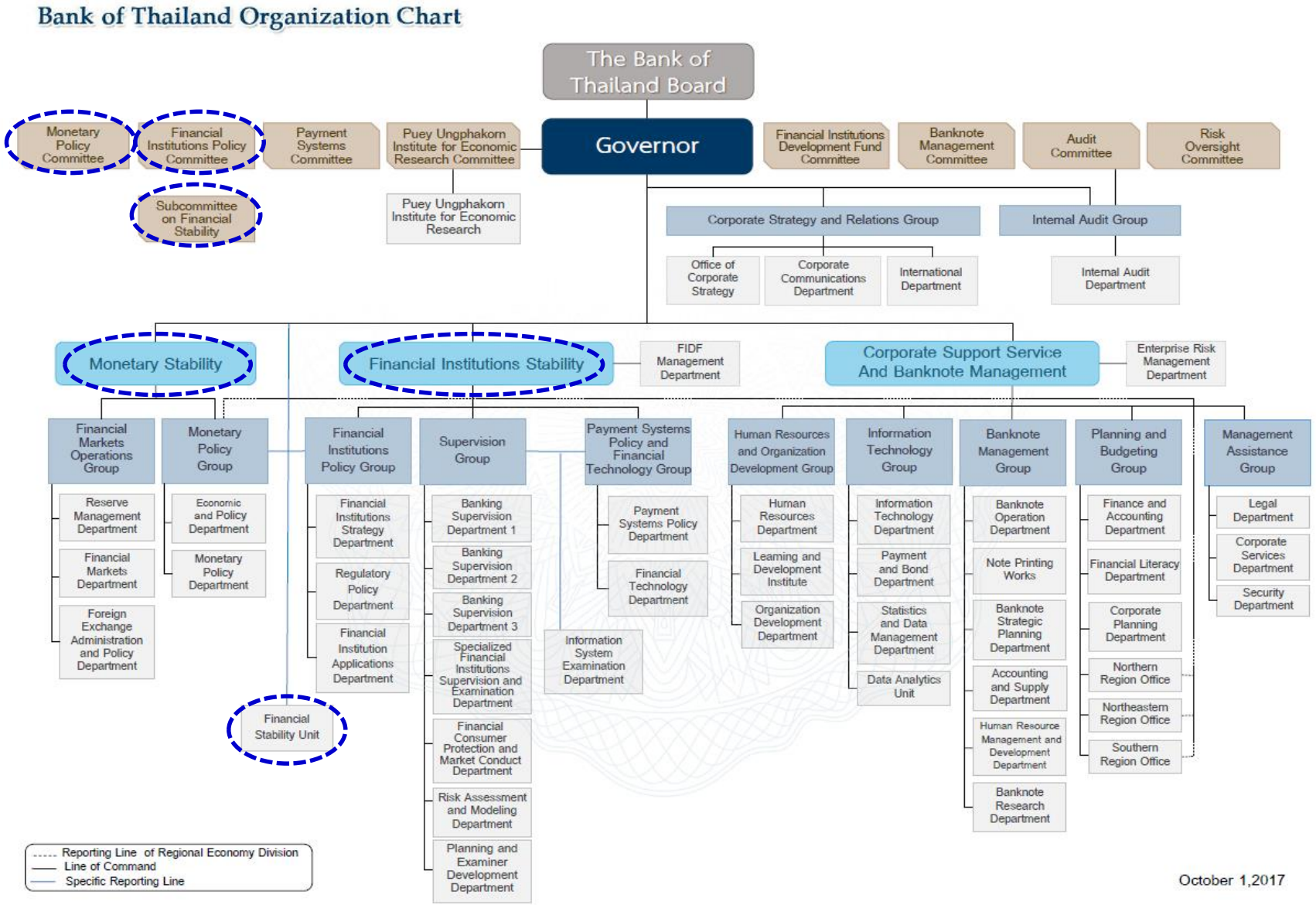
2012-13 : MPC-FIPC Joint meetings & FSR

- ✓ Initiating Joint Meetings between the MPC and the FIPC on a biannual basis
- ✓ A platform for coordination and policy discussion
- ✓ 3 Regulators meeting (BOT SEC OIC)
- ✓ First Financial Stability Report in 2013

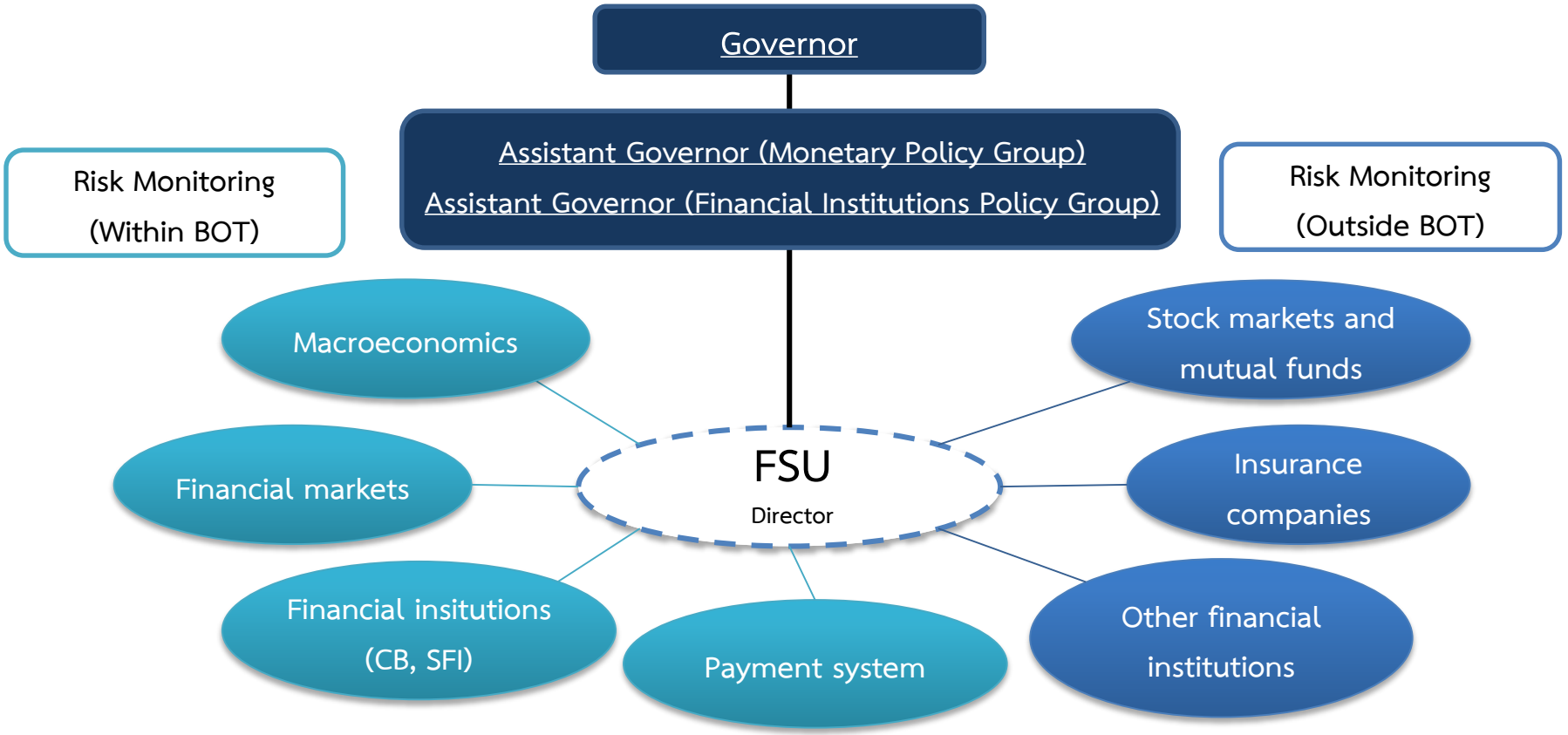
2016 : Financial Stability Unit

- ✓ Established *'Financial Stability Unit'* to improve the framework and internal processes for FS assessment and coordination with outside supervisory authorities

Oversight within the Bank of Thailand



Role of Financial Stability Unit (FSU)



Role and Responsibility of FSU

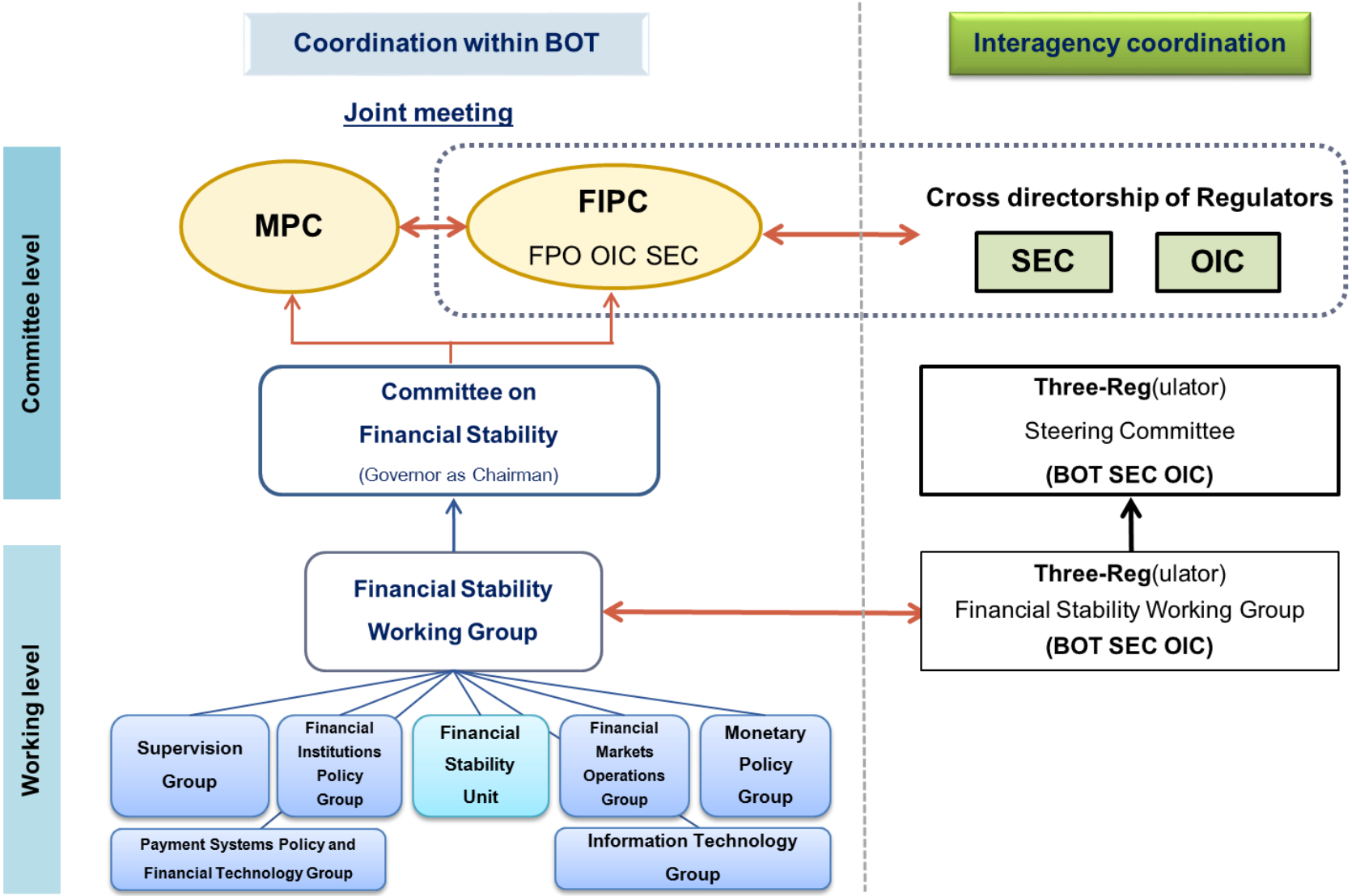
- Center for FS issue analysis
- Develop models/tools on FS
- Undertake general FS task of BOT

- Make policy recommendation to limit systemic risk
- Design the macroprudential policy issuance process

- Editor of annual Financial Stability Report (FSR)
- Secretariat to the Subcommittee and Joint commitee meetings

- Coordinate with other regulatory agencies on financial stability policy issues and data

Internal and interagency coordination



Presentation overview

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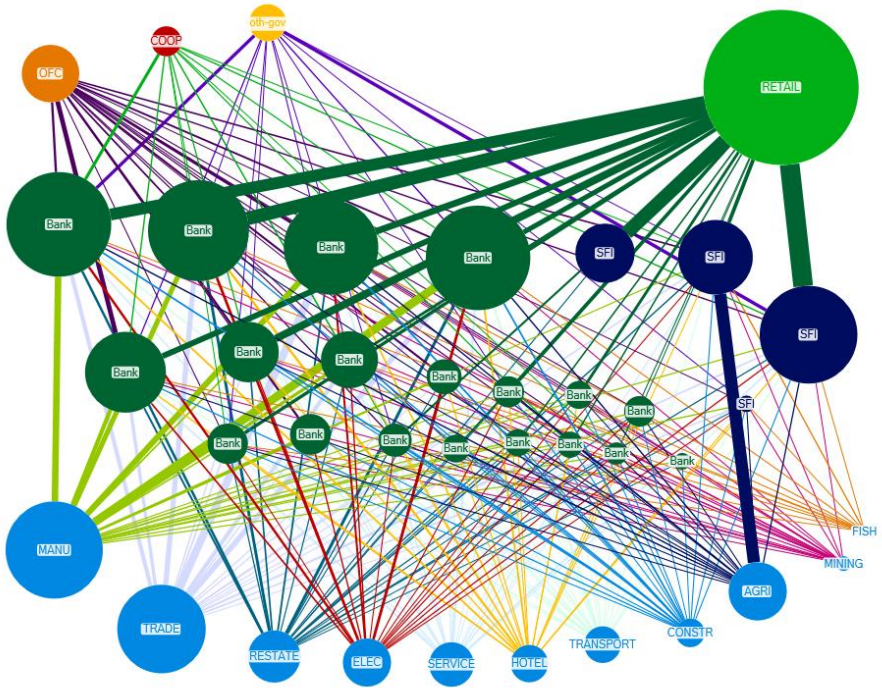
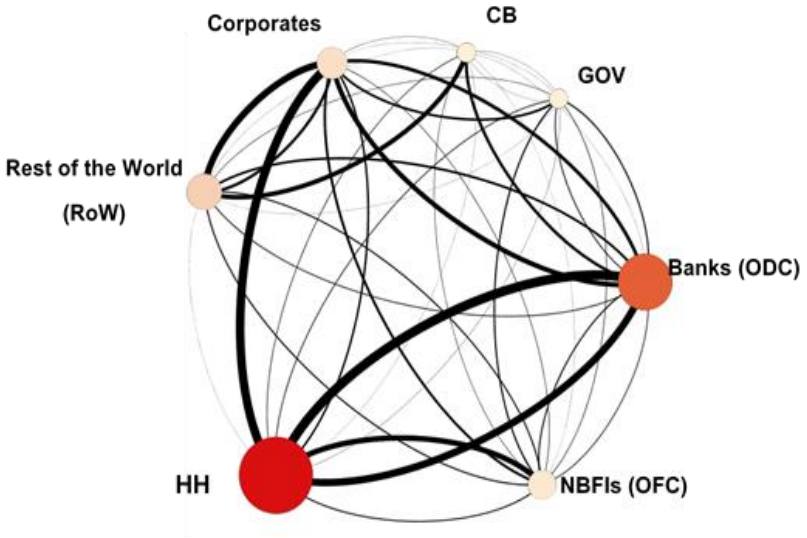
First, understanding the whole system itself

Consider the landscape and connections to have an understanding of "risk profile"

Macro-financial network



Inter-sectoral exposure (2017Q4)



Clockwise from A to B = A's claims on B

Counter clockwise from B to A = B is liable to A

*size of nodes represents relative financial asset size

**edge thickness represents relative size of exposure

"Risk profile" leading to macroprudential surveillance

- *Macroprudential surveillance aim to establish an early warning system for potential threats to financial stability*
- *Key sectors have been monitored and assessed regularly as "factors contributing to financial imbalances"*

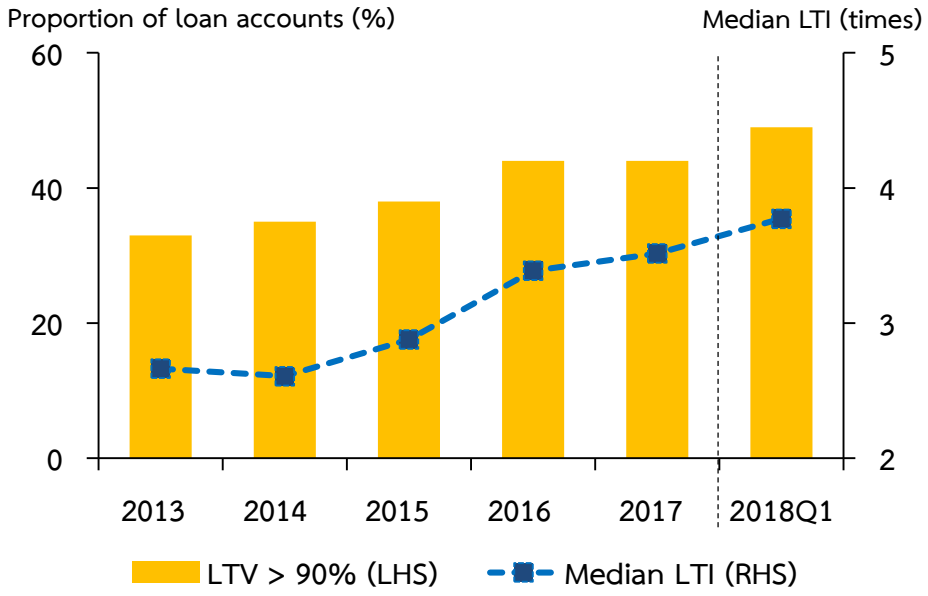
Sectors	Set of Indicators
Household	Loans by purpose and lender; DSR (every 2 years); Income shock capacity; HH debt/GDP; New entry NPL rate
Corporate	(Listed Co.) Corp. debt/GDP; D/E ratio; ICR; New entry NPL rate; ST debt/total debt; Share of foreign currency debt without fx hedging; Profitability; Debt at risk; Non-listed companies (lag 18 mth.)
Banks+SFIs	Capital (BIS ratio); Profitability; Credit Risk (RWA, loan, NPL); Liquidity (LDR,LCR); Market Risk
Non-bank FIs	*NBFIs consist of funds, insurance, cooperatives, credit card company, personal loan/nano finance company, leasing, AMC Loan growth; MMF+daily FI/saving deposits of bank & SFI; FIF growth; leverage; ICR; linkage to FIs
Real Estate	Housing and land price indices; Number of real estate demand and supply; Pre and Post-finance loan+bond growth; ICR of developer; LTV& MDSR; Time to go
Financial Market	Money market rates; FX rates and volatility; USD liquidity (Swap rate); SET & Sectoral indices and volatilities; Government and corporate bond yields + CDS Spread; Commodity prices; Non-resident holding in bond and stock
External	External Debt/GDP; Reserve/ ST-debt; CA/GDP; Exchange rate; 5Y CDS spread; 10Y govt bond spread over G3

Current risk issue: real estate sector

The share of new housing loans with high loan-to-value (LTV) ratio increased. Meanwhile, the overall loan-to-income (LTI) ratio also rose, reflecting higher debt burden relative to income

Developers continued to raise more funds through bank loans and bonds, which could suggest a pick-up in new supply going forward

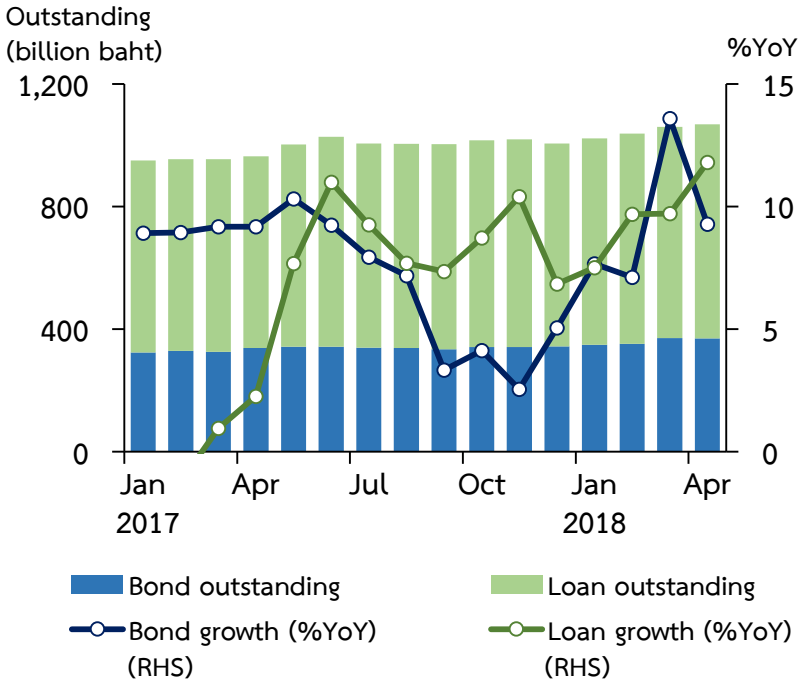
Proportion of new housing loan accounts with LTV above 90% and median LTI of new housing loans



Note: LTV refers to loan-to-value ratio. LTI refers to loan-to-income ratio.

Source: Bank of Thailand

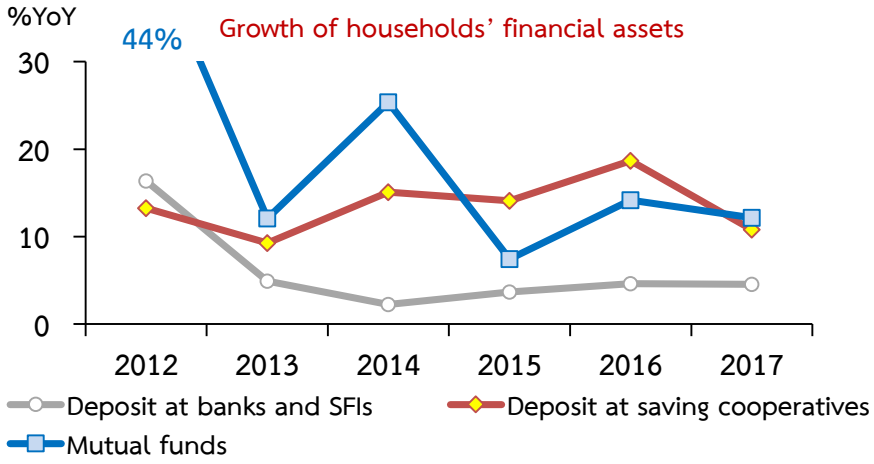
Outstanding of bank loans and bonds of real estate developers



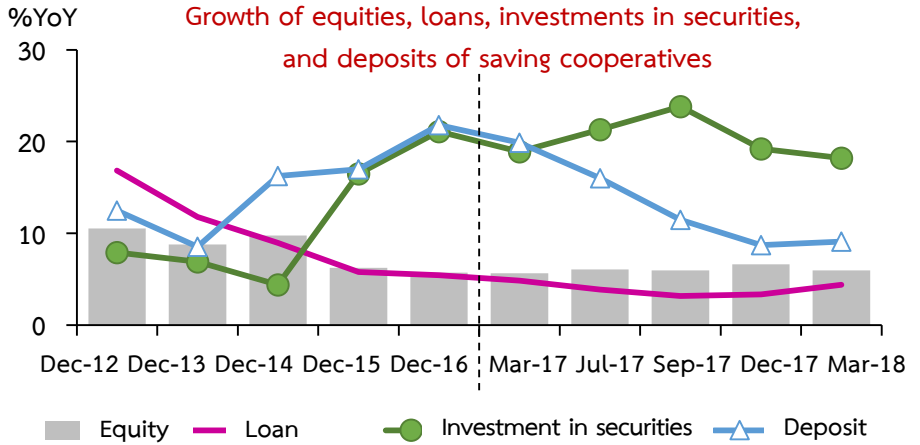
Source: Bank of Thailand

Current risk issue: search for yield behavior

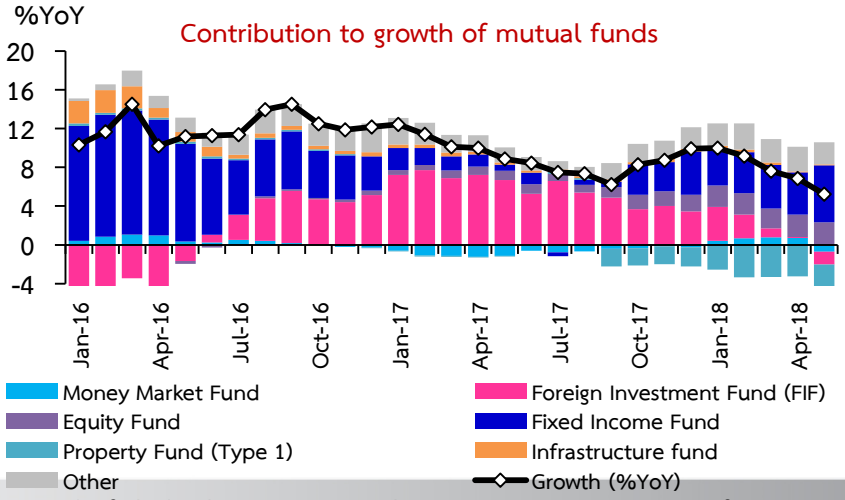
Households increased their deposits with savings cooperatives and investments in mutual funds at a pace faster than that of bank deposits



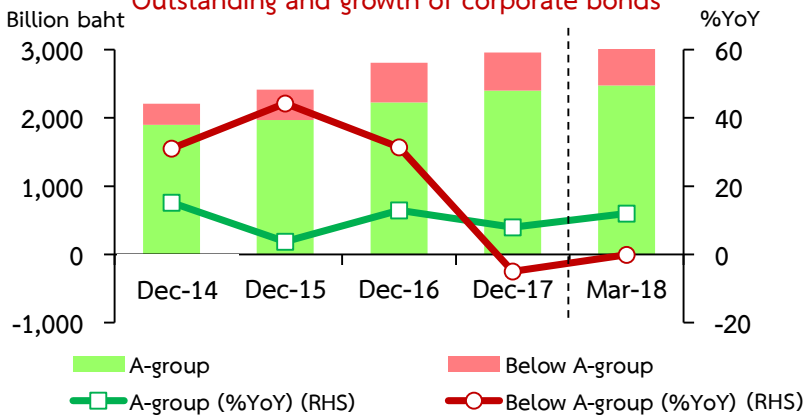
Saving cooperatives' deposits and investments in securities continued to grow robustly



Investment in mutual funds continued to grow. Fixed income funds expanded while FIFs decelerated



New issuances of low-rated corporate bonds slowed down



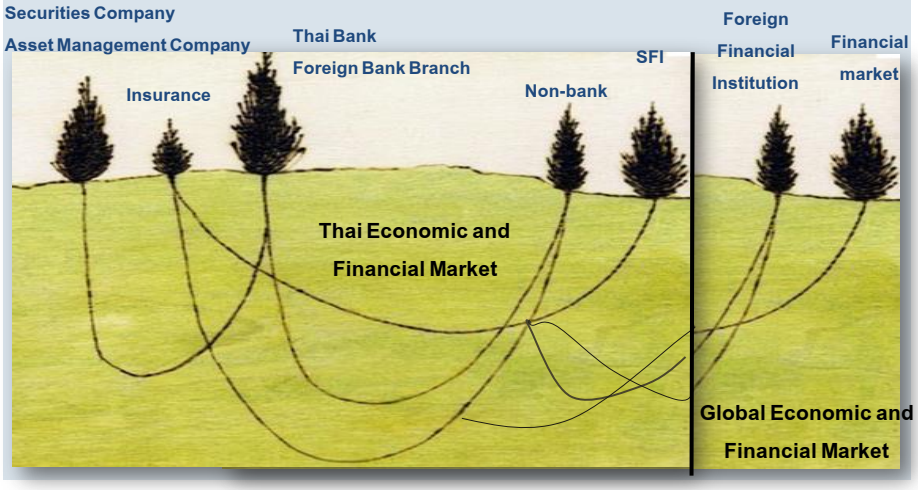
Source: Bank of Thailand, Cooperative Auditing Department, Association of Investment Management Companies (AIMC), and Thai Bond Market Association (ThaiBMA)

Second, understanding systemic risk

*"**Systemic risk**" is a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy.*
There are two dimensions of systemic risk: 'time dimension' and 'cross-sectional dimension'.

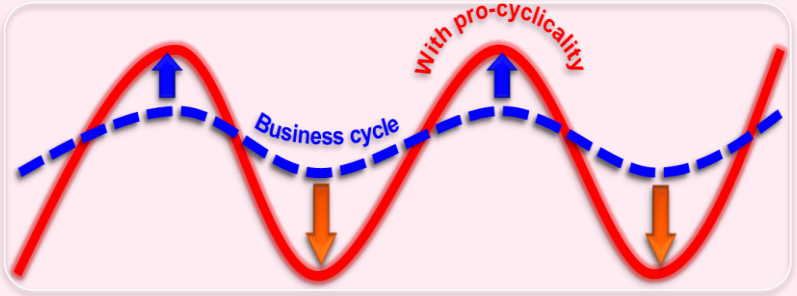
Cross-sectional Dimension

- Financial system malfunction due to failure of FIs or the seizing up of financial markets
- Policy concerned with the interconnectedness, size, commen exposures, increase the likelihood and severity of systemic events



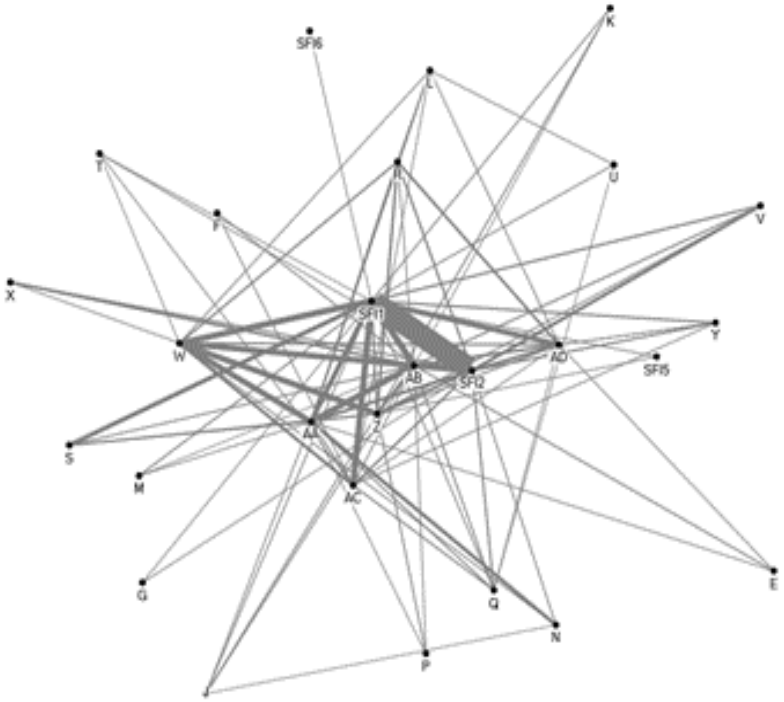
Time Dimension : Procyclicality

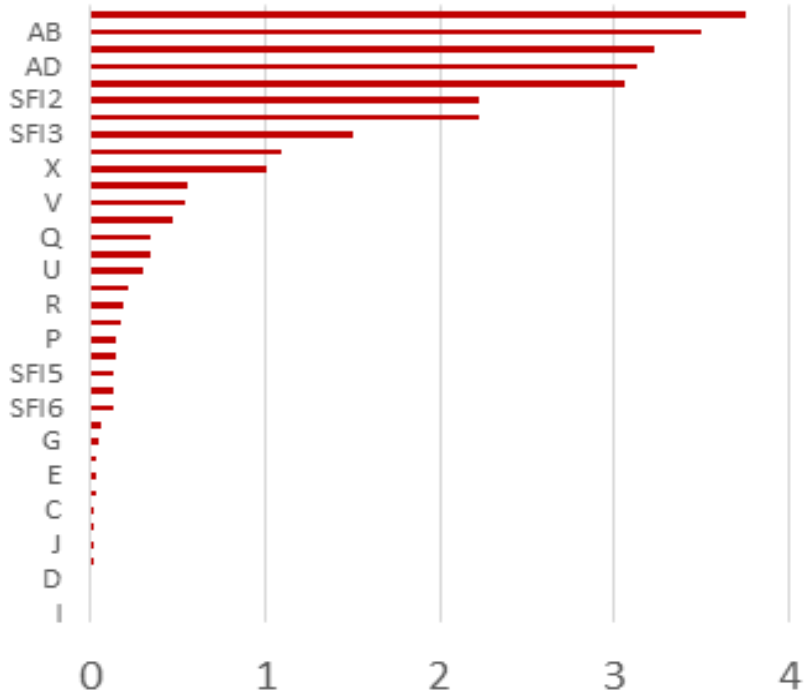
- The degree to which financial system can amplify business fluctuations
- Policy concerned with the degree of dynamic interactions between financial and real sectors



Measuring interconnectedness: bank contagion

The model explores systemic linkages between financial sector entities (banks and non-banks) based on the direct and indirect financial linkages. The financial linkages are mainly credit, holding of debt securities and deposits, i.e. financial exposures between financial entities.



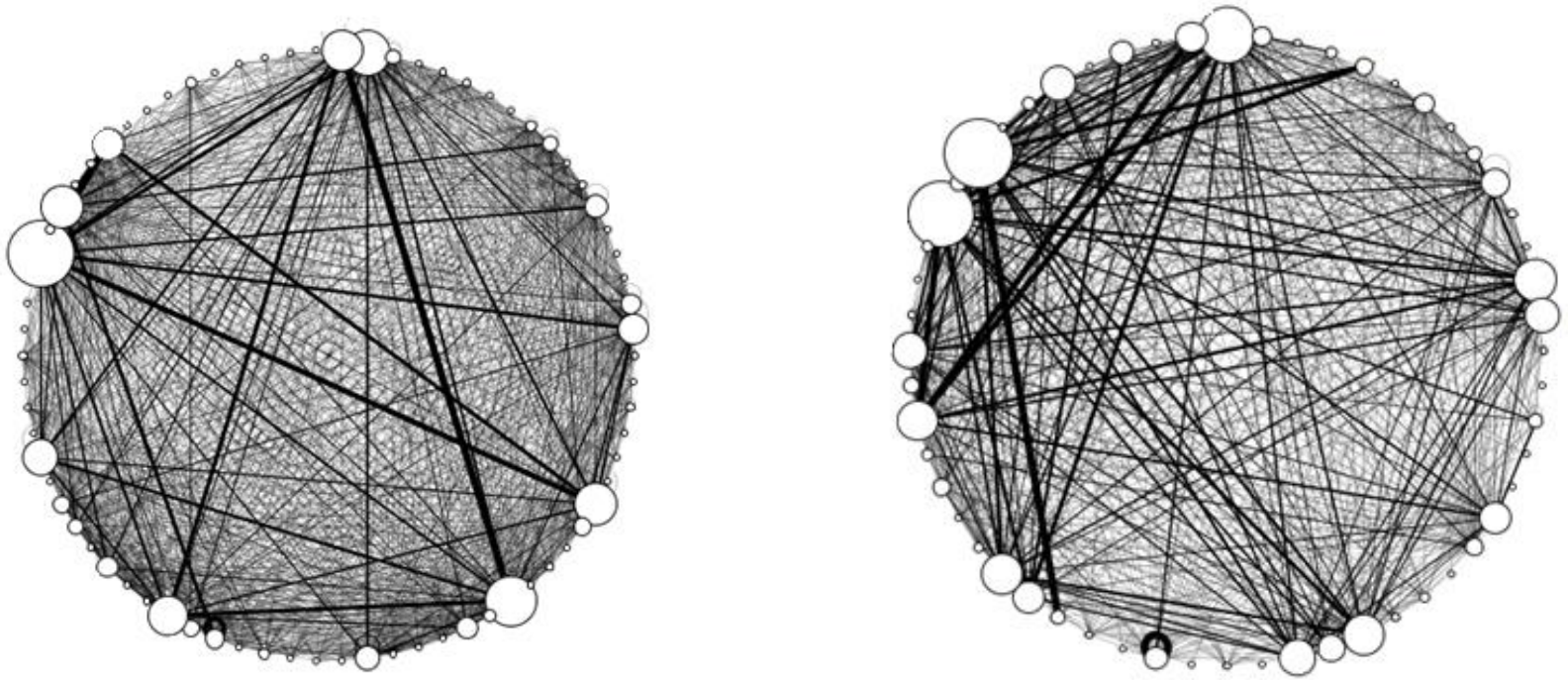


This is based on the approach used by Espinosa-Vega and Sole (2010), 'Cross-Border Financial Surveillance: A Network Perspective', IMF working Paper No. 10/105

Measuring interconnectedness: network model

The model utilizes the concepts of centrality and eigenvectors. It yields 3 types of indices: closeness centrality index, betweenness index and eigenvector index. Generally, we concentrate on centrality measure, which yields how many nodes are connected to a specific node and how those other connected nodes connect with additional nodes.

This network model is used in measuring the interconnectedness of banks in the interbank market as well as in the payment system



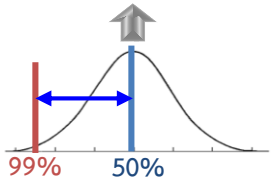
Source: Bank of Thailand

Measuring interconnectedness: CoVaR

Here, systemic risk is measured by the value "Δ CoVaR" which is the difference between CoVaR and the VaR of the system at the median. The higher the value of "Δ CoVaR" is, the more systemic a financial institution is to the system

DeltaCoVaR = Beta x VaR 99-VaR 50

Degree of correlation between negative returns

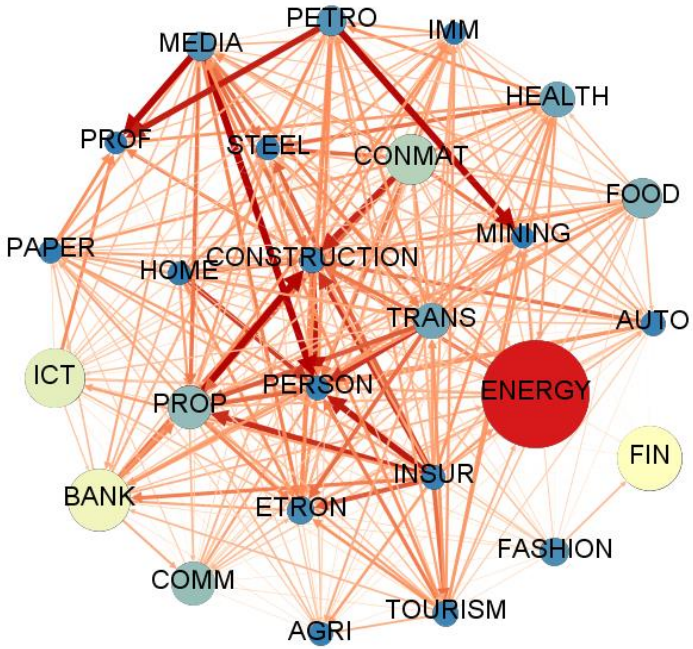


Obtained from the distribution of mtm assets

Measuring banks' interconnectedness

Bank	beta	var99-var50	deltacovar
A	0.5918	-0.0943	-0.0558
B	0.5097	-0.0797	-0.0406
C	0.7445	-0.0393	-0.0292
D	0.6712	-0.0362	-0.0243
E	0.0773	-0.2903	-0.0224
F	0.3321	-0.0605	-0.0201

Measuring business sectors' connectedness



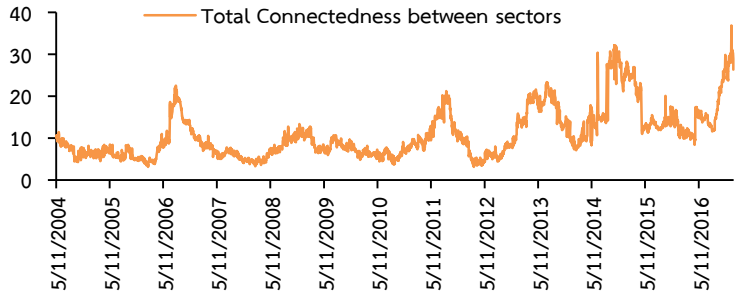
Source: Bank of Thailand

Measuring interconnectedness: Diebold-Yilmaz

Here, systemic risk is measured by the volatility spillover calculated from variance decomposition. We generally consider the "net" connectedness, which is the difference between "to" and "from" connectedness measures, where "to" measure captures the inward spillover from the network to individual banks and "from" represents the reverse direction.

- Estimate VAR model of daily stock price volatility
- Calculate volatility spillovers from variance decomposition

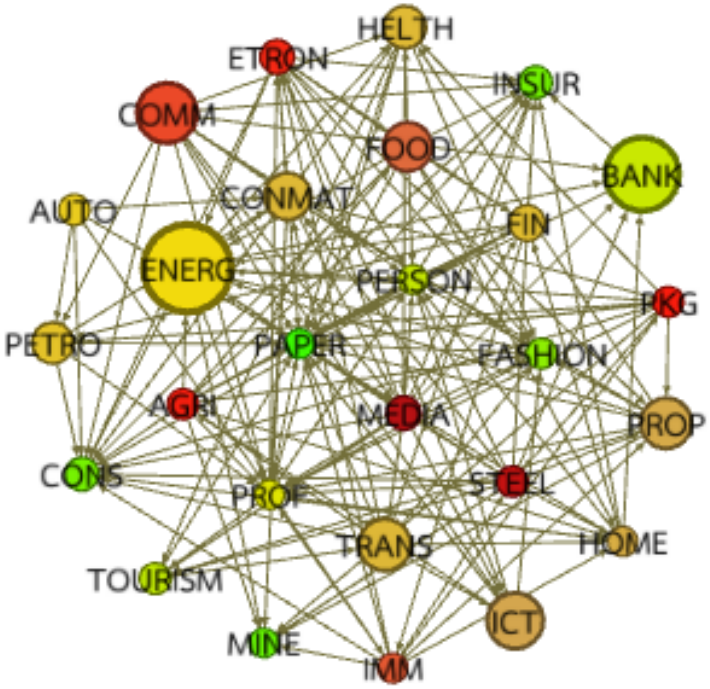
Total Connectedness



Measuring banks' interconnectedness

	To	From	Net
U	11.73	-10.09	**1.64**
V	11.48	-9.89	**1.58**
W	10.62	-9.41	**1.20**
X	10.09	-9.83	**0.26**
Y	10.28	-10.21	**0.07**
Z	10.00	-9.98	**0.02**

Measuring business sectors' connectedness



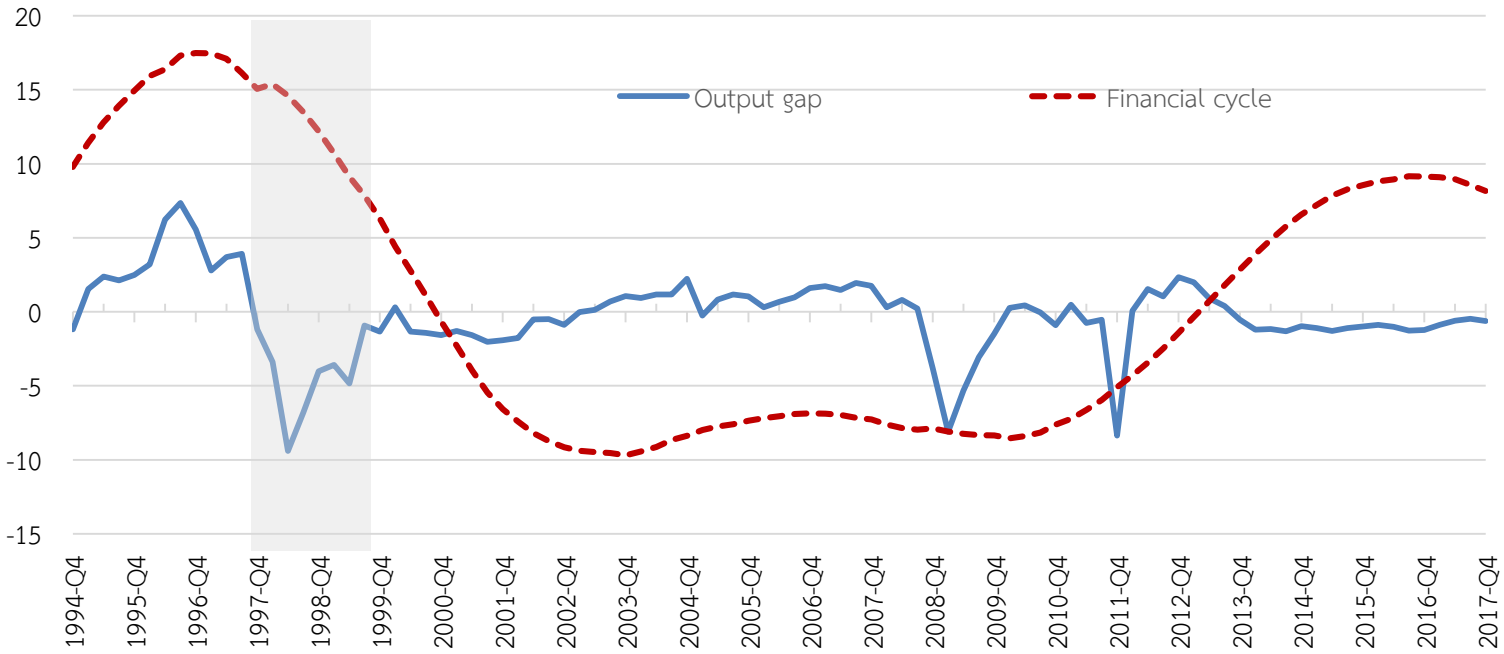
Source: Bank of Thailand

Measuring procyclicality: financial cycle

Currently, our financial cycle has 4 factors in it: (1) credit-to-GDP gap (2) credit gap (3) land price index gap and (4) house price index gap

Financial cycle exhibits a slight downturn, reflecting the taming financial stability risk in general

Financial cycle vs. Business cycle (1994Q1 – 2017Q4)



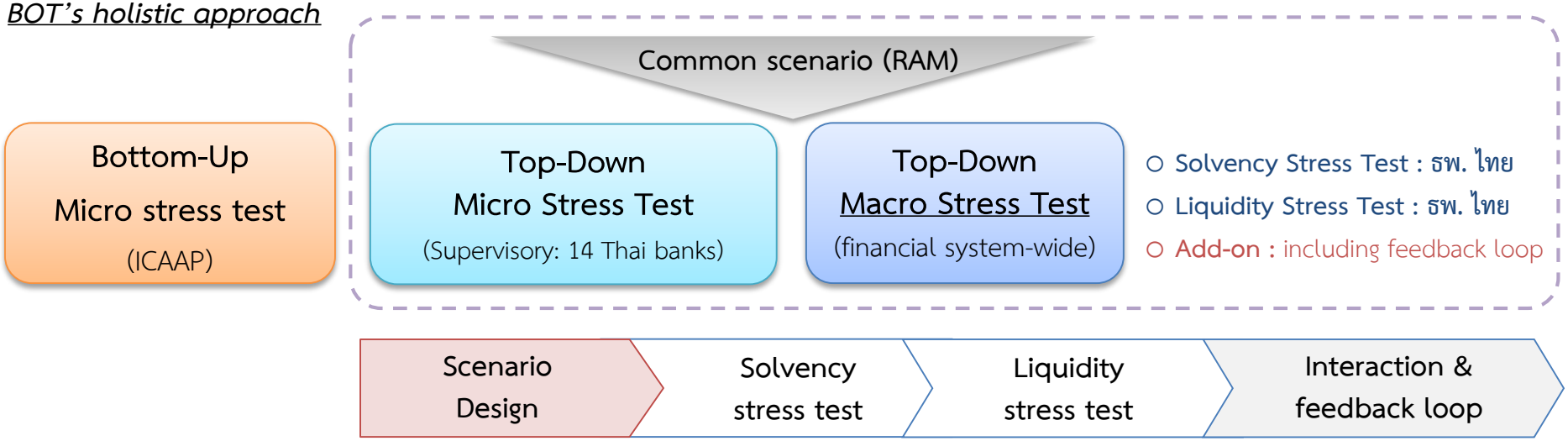
Source: Bank of Thailand

Third, understanding behaviors during stress time

Bank of Thailand's stress testing framework

BOT's holistic approach

Overview of the BOT stress testing



General usage of stress tests

- Help identify vulnerabilities and provide an insight into risk transmission channels
- Supervisors can have dialogs with banks and discussions on the risk mitigation plan

Usage of our macro (prudential) stress test

- Serve as one of the systemic risk identification tools with the benefit of incorporating the interplay between the real and financial sectors (macro-financial linkages)
- Serve as a platform for establishing dialogs with senior management of banks regarding the risk assessment, stress testing methodology and risk mitigation plan

Why macro(prudential) stress test?

What IS macro(prudential) stress test?

Microprudential stress test

Macroprudential stress test

Macroprudential stress test concepts

Assigning RAM

Stress scenarios

- Macro risk factors
- Specific risk factors

Extreme but plausible stress scenarios

Calibrating the degree and direction of risks for 3-year horizon

Stress test process

Risk assessment

(model-based or expert judgment)

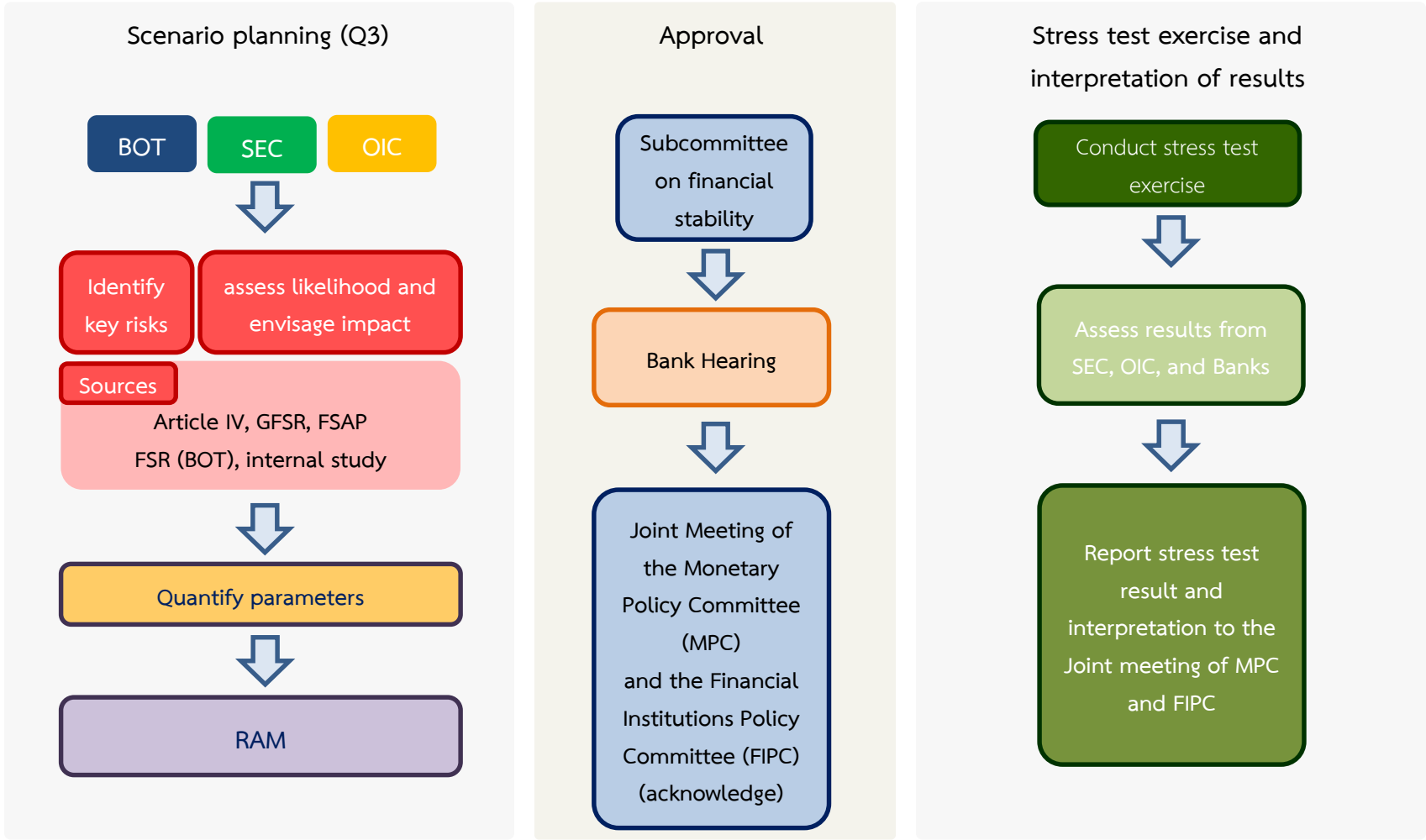
- Credit risk
- Market risk
- Operational risk
- Liquidity risk
- Interconnectedness and spillovers
- Behaviors of players and markets

Risk assessment for each bank

Risk assessment for the system

Macro stress test results

Designing the stress scenarios: Risk Assessment Matrix (RAM)



2017 RAM scenarios

Risk factors

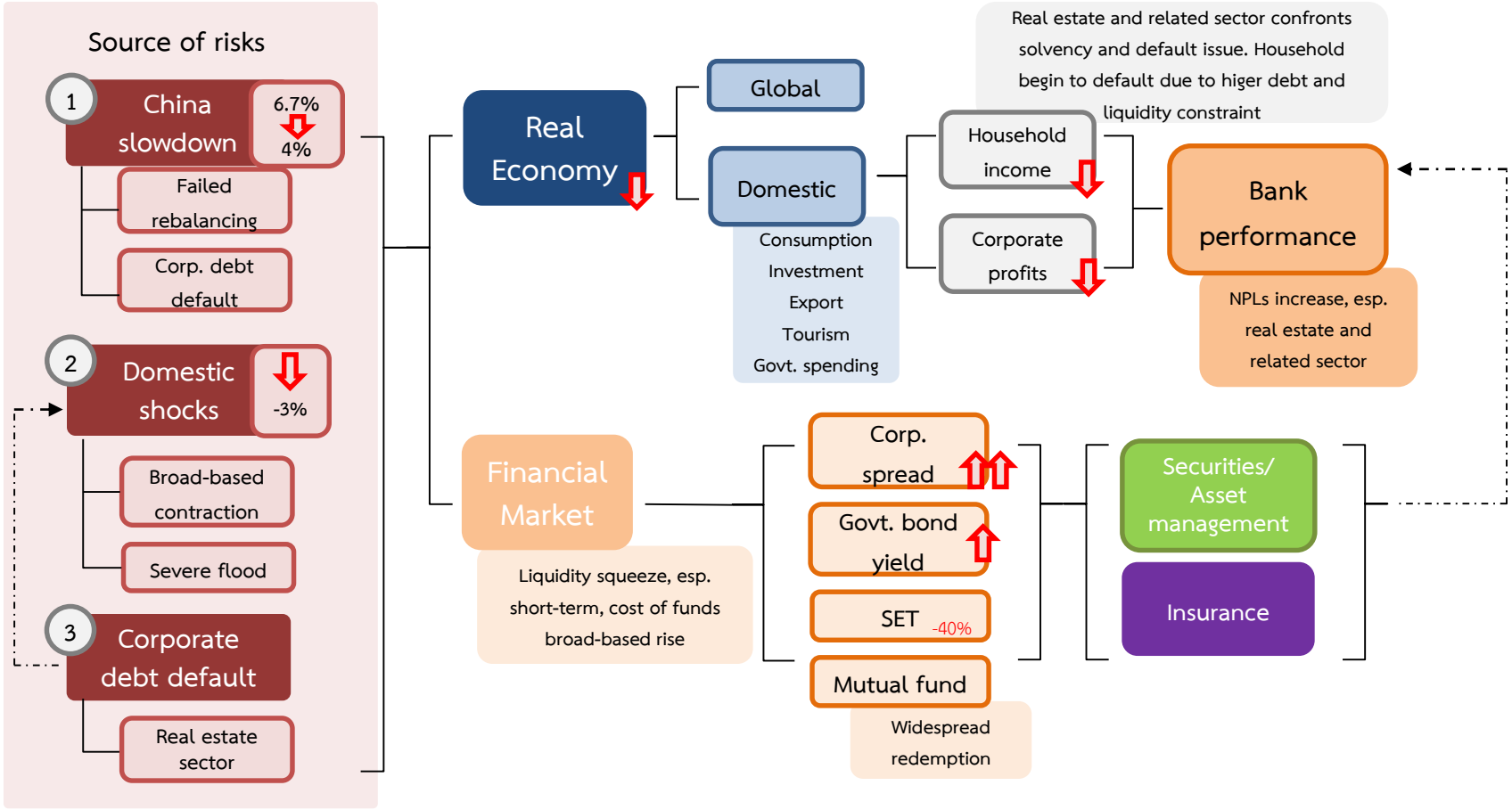
Risk factor A China slowdown	Risk factor B Domestic shocks	Risk factor C Corporate bond default
• China's economic and financial problem derails the global economy, while geopolitical risk occurs on the backdrop	• Domestic economy contracts, esp. consumption and investment while government expenditure is constrained • Market loses confidence, mutual funds facing redemptions • Special risk factor: servere flood	• Large real estate companies face debt serviceability issues leading to corporate bond default and a rapid rise in NPLs • Asset prices drop sharply and severe price corrections in the real estate market

Scenarios

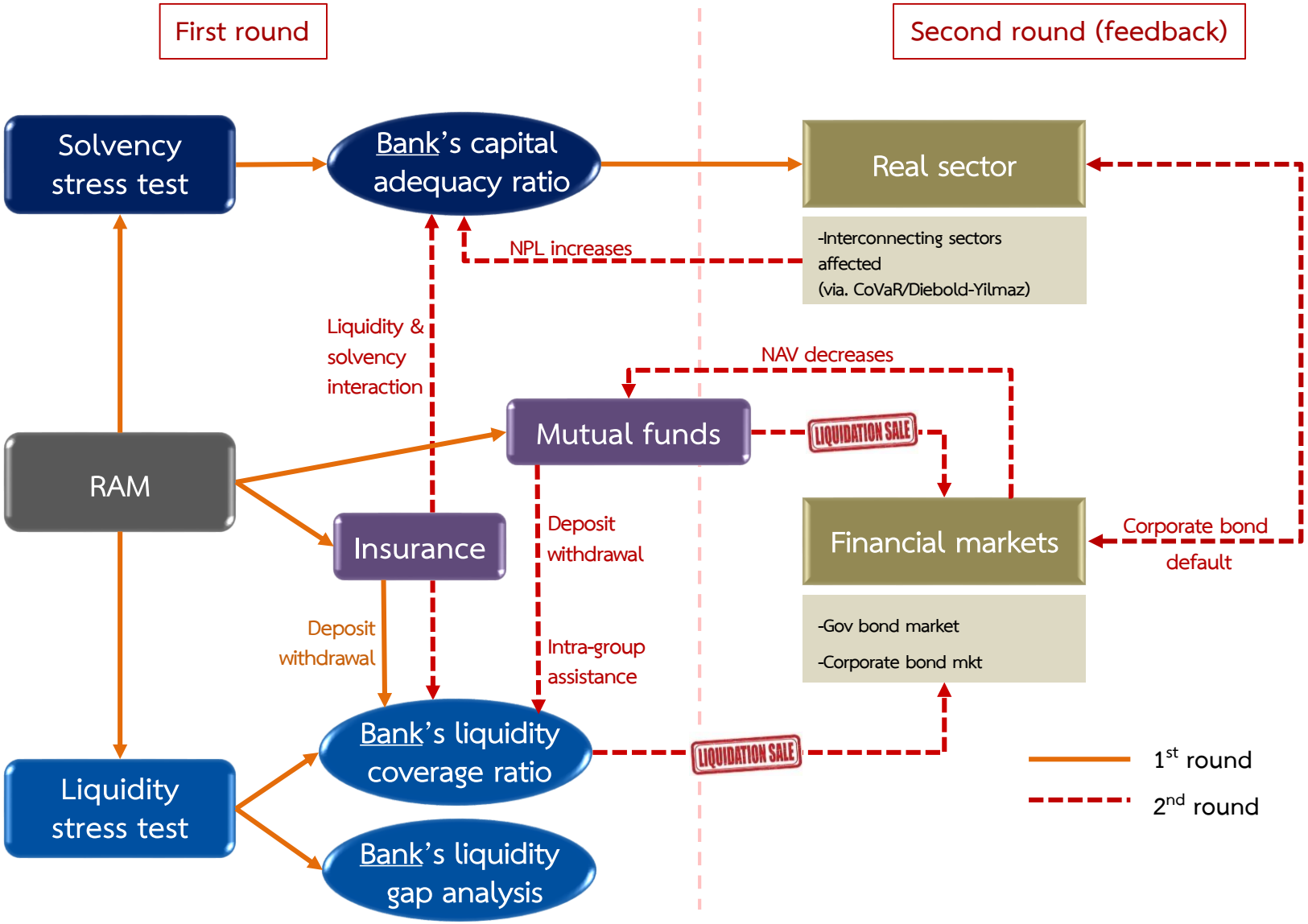
- Scenario 1: China slowdown (**Risk factor A**)
- Scenario 2: China slowdown + Domestic shock (**Risk factor A+B**)
- Scenario 3: China slowdown+ Domestic shock + Corporate bond default & short-term liquidity stress (**Risk factor A+B+C**)

2017 RAM scenarios: severe case

Scenario narrative: as a consequence of economic slowdown, corporate default occurs from large real estate companies then spread to related sectors. Confidence in financial markets is severely affected causing a sharp fall in asset prices, leading to investors' redemption of their investment from mutual funds. Corporate spread increases dramatically. Debt serviceability of household and SMEs worsen.



2017 macro stress test process



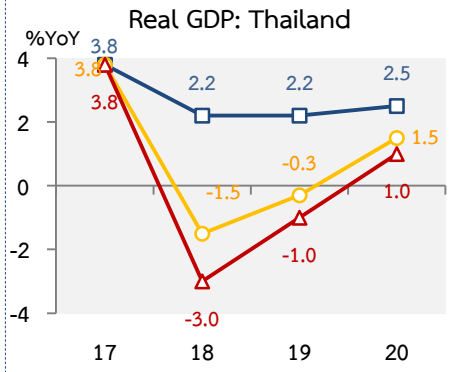
2017 solvency stress test process

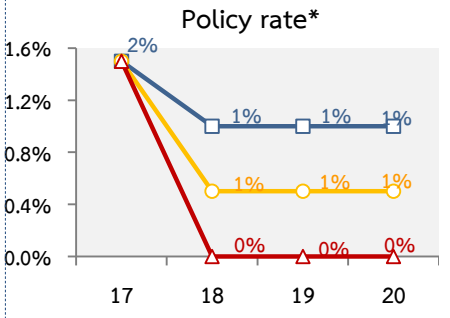
BANK OF THAILAND (1942-2017)

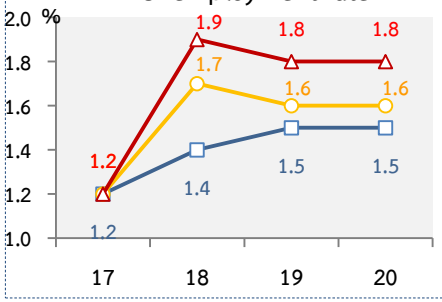
Scenario

S1: China slowdown
S2: China slowdown + Domestic shock
S3: China slowdown + Domestic shock + bond default

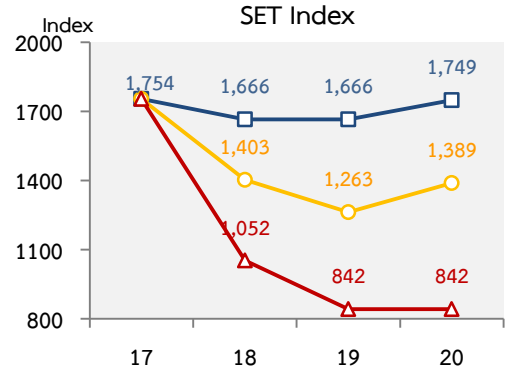
Macroeconomic factors

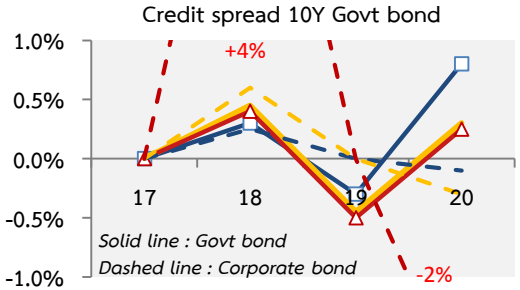


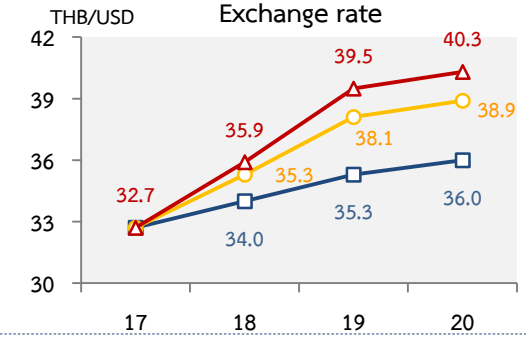




Financial market factors







macro scenarios

Satellite projections (2018-2020)

Transmission to banking system

(Position at the end of 2017)

Bank 1 | Bank 2 | ..... | Bank 14

Assessing CAR ratio (2018-2020)

2017 liquidity stress test process

Structual setting: Most of the Thai banks are funded by retail deposits while smaller banks may have a larger share of wholesale funding. Larger banks are connected with mutual funds through its AMC

RAM

Liquidity risk triggers

- Sluggish economy
- Corporate bond default
- SET index dropped 40%
- Mutual fund redemption

Assumptions of outflow rates from liquidity triggers

- Volatile financial markets led to MF redemption
- Banks facing reputation risk have deposit outflows especially uninsured deposits
- Average outflows on retail deposits at par with 1997
- Uninsured wholesale funding outflow a little more than 1997 level
- Banks minimized reputation risk by providing assistance to mutual funds

Historical data (from 2007)

% monthly change of

- Different types of deposits and borrowings
- Financial market data and haircut under ELA
- Credit utilization rate by corporates
- New NPL formation
- History of corporate bond defaults

Benchmark with 1997 crisis and 2008 crisis in US/EU

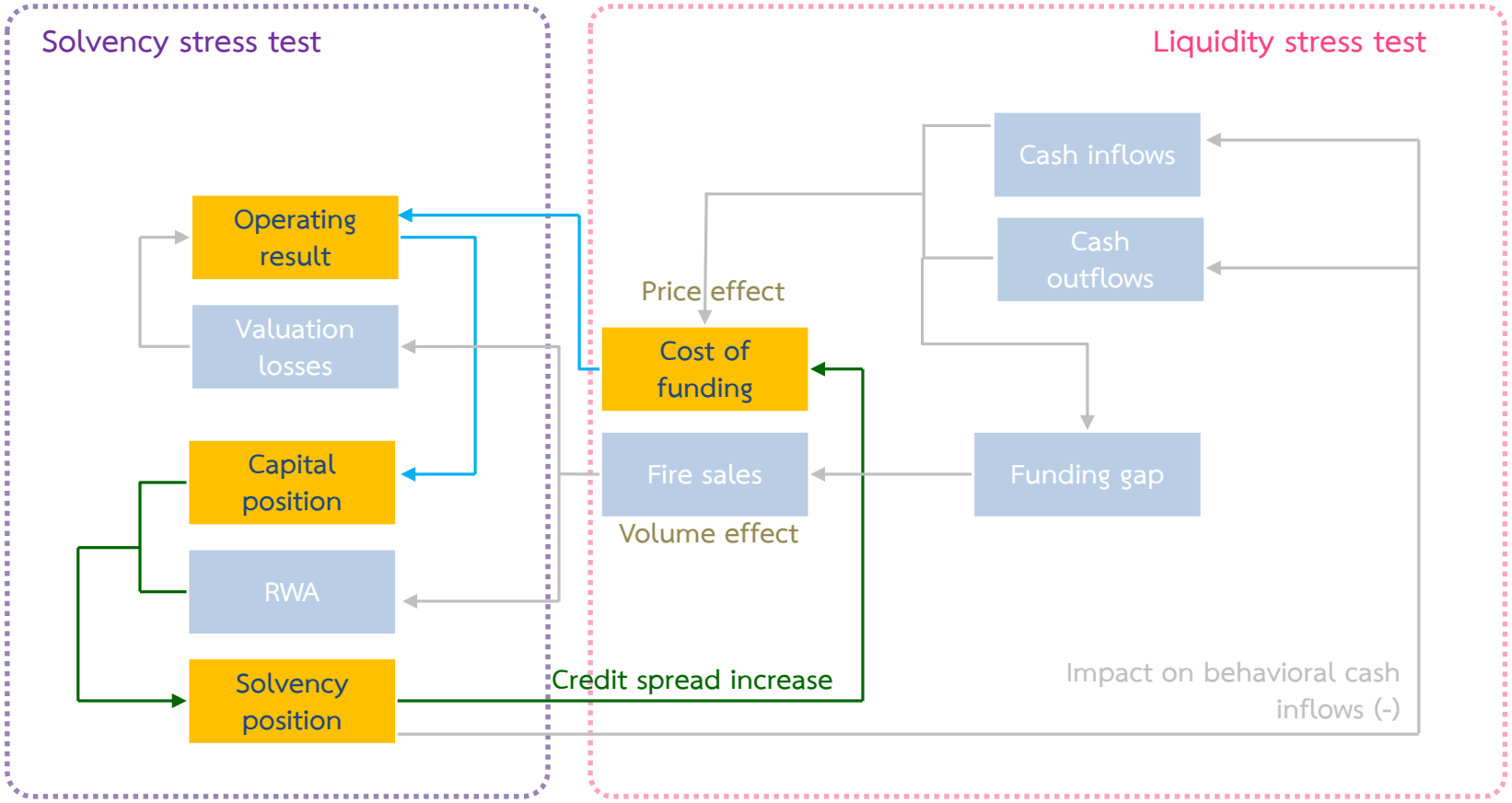
Cash outflow on selected factors

- Retail deposit outflows *upto* 2 times*
- Wholesale funding outflows *upto* 2 times*
- Interbank deposit outflows *upto* 2 times*
- Mutual fund assistance 2 times LCR*

* Compared to the rates assigned under LCR

Feedback between liquidity and solvency

Currently, BOT assess the feedback between solvency and liquidity through the funding cost channel but will later include the effects from fire sale on cash outflow/inflow



Overview of our solvency-liquidity impact estimation

2-stage regression

Quarterly data from 2003Q1 to 2018Q1

Simultaneous equations:

Funding cost = f (CAR, net profit, vix, market share, L/D ratio, policy rate)

CAR = f (funding cost, net profit, loan loss provision, loan growth, nom gdp)

Coefficients

Estimated variables from solvency stress test

Δ Funding cost = (-0.124 x Δ CAR)+(-0.087 x Δ net profit)+(-0.071 x Δ market share) + (-0.001 x Δ L/D ratio)+(0.372 x Δ policy rate)

Δ CAR = -2.309 x Δ funding cost

Calculated qoq change of CAR

Calculate cumulative impact on CAR obtained from solvency stress test

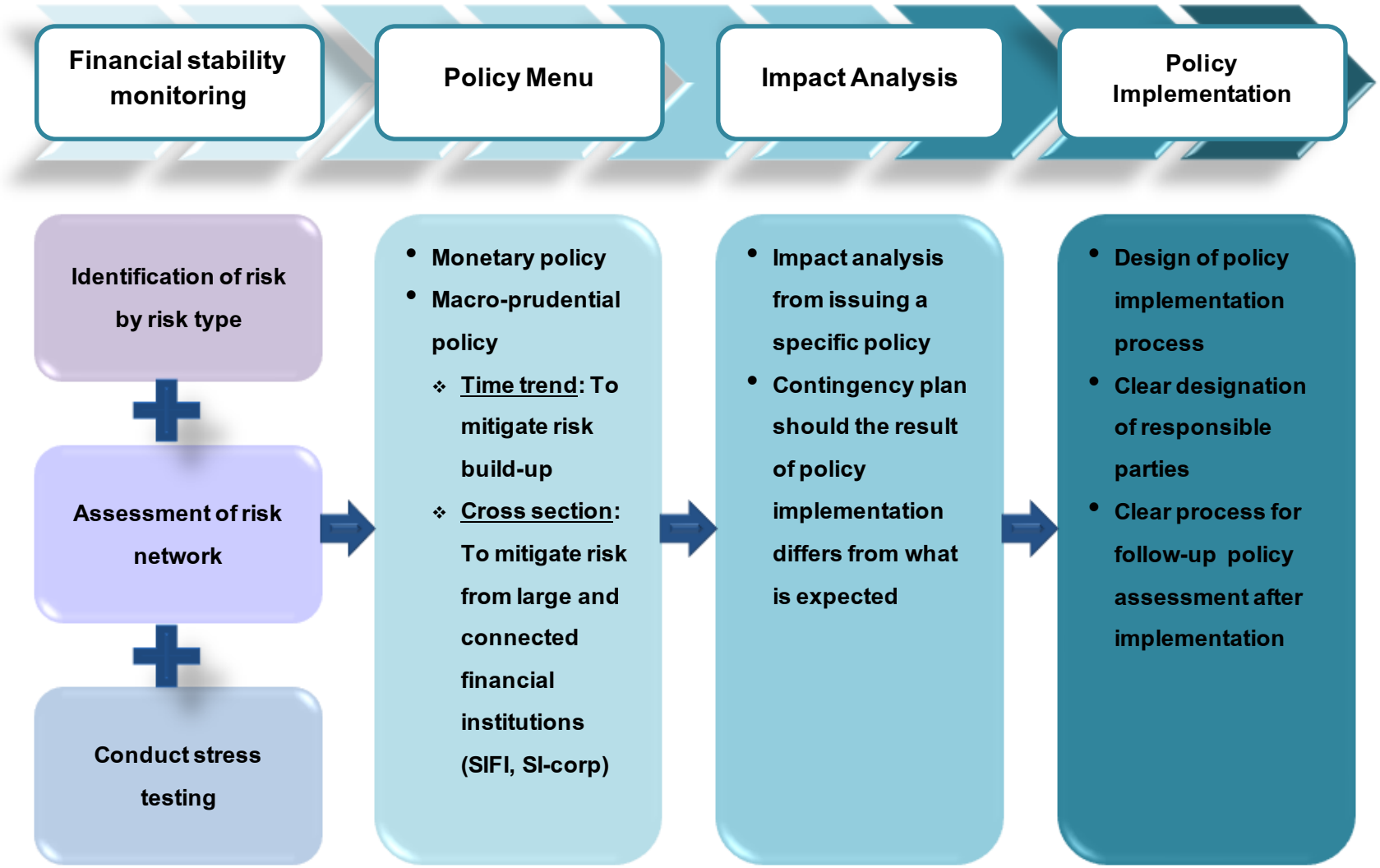
Presentation overview

1. Overview of the Thai financial system and regulatory bodies
2. Institutional arrangements
3. Systemic risk assessment, monitoring and stress testing
4. **Macroprudential policy issuance process**
5. Remaining challenges

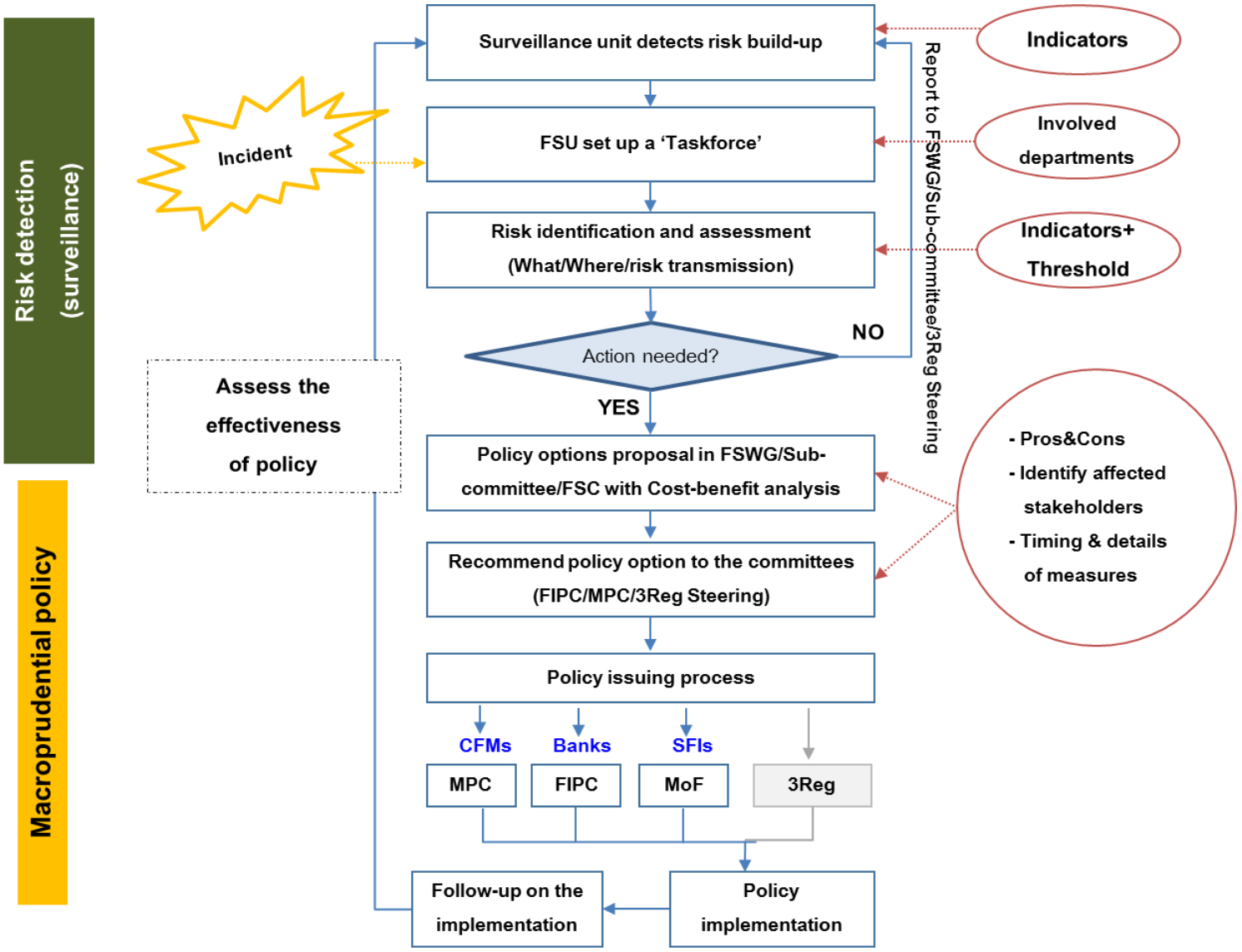
Macroprudential policy issuance concept

	Identification of risk by risk type	Assessment of risk network	Conduct stress testing	Design appropriate policy actions
Scope	Must monitor the sources of risk from •Domestic/International economic environment • Domestic/Foreign financial markets • Thai and foreign banking status	Must comprehend the following • Network structure • Risk transmission mechanism • Impact assessment	Must have complete information and deep analysis on the market environment and bank's behavior under stress time and being able to assess the impact under stress	Design the appropriate policy action depending on the analysis of risk, policy menu, impact assessment and policy implementation challenges
Necessary tools	• Up-to-date and efficient risk monitoring tools such as Dashboards, Heat maps, Composite indicators • Information sharing system	Tools to enhance risk network identification •Model-based •Expert-based	• Process and method for scenario setting • Process and method for conducting stress test both on a solo and system-wide basis	• Governance structure • Clear policy issuance process

Macroprudential policy issuance concept

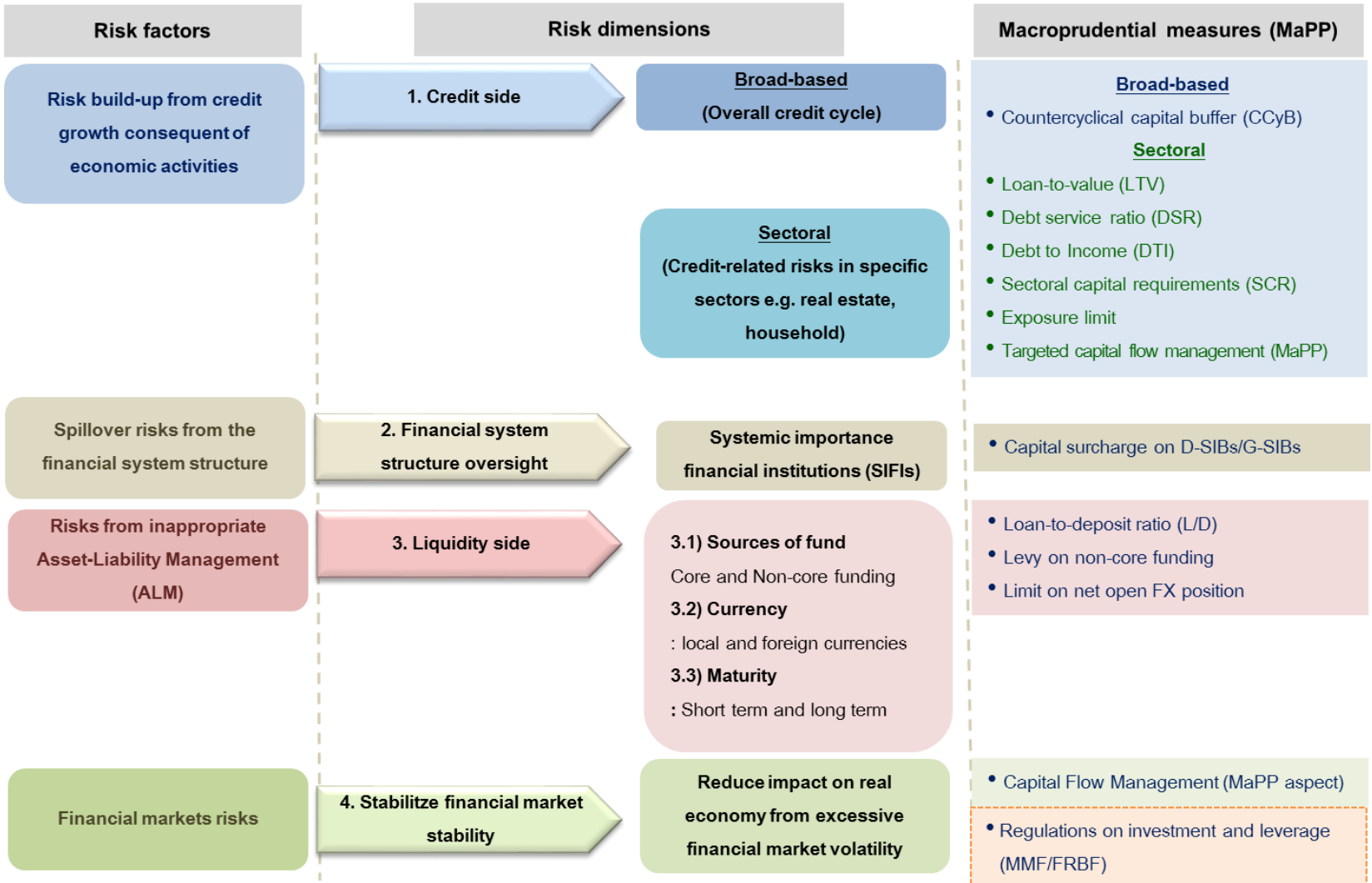


Integrated work process on macroprudential policy



BANK OF THAILAND (1942-2017)

Macroprudential policy toolkits



Examples of our macroprudential policies

Credit card & personal loans

Credit card loan — 2002, 2004

- Raise minimum monthly payment from 5% to 10%
- Set minimum income ≥ 15,000 THB per month
- Limit credit line to no greater than 5 times average monthly income

Personal loan — 2005

- Limit credit line to no greater than 5 times average monthly income

Credit card & personal loan — 2017

- Credit card: Limit credit line to 1.5 times for those with income less than 30,000 THB/mo and limit to 3 times for income between 30,000 – 50,000 THB/mo
- Personal loans: Limit to 1.5 times income for those with less than 30,000 THB/mo and limit exposure to no more than 3 banks

Bank's provision

2006 - 2007

Provisioning according to IAS39

2012

Provisions for (1) possible impaired loans and (2) current loans under supervisory process

2013

BANK OF THAILAND

Presentation overview

1. Overview of the Thai financial system and regulatory bodies
2. Institutional arrangements
3. Systemic risk assessment, monitoring and stress testing
4. Macroprudential policy issuance process
5. **Remaining challenges**

Remaining challenges

On risk surveillance

- Identifying and closing the data gap
- Continue to develop a sensible, forward-looking early warning systems
- Continue to develop a comprehensive, holistic systemic risk surveillance tools

On macroprudential policies

- Comprehend interactions between financial and economic cycles
- Interactions between macroprudential and other policies (monetary, fiscal)
- Identify risk profile, risk transmission channels and feedback loop for macro stress testing and scenario design

Remaining challenges

On macroprudential policies

- Measuring the effectiveness of macroprudential policies
- Identify and prevent regulatory arbigrage and spillovers
- Distinguish between short-term and medium-term risk build up
- Coordination with other regulatory agencies (process, responsibility, data)
- Policy goal: resiliency (structural) vs. leaning against the wind (cyclical)

On other issues

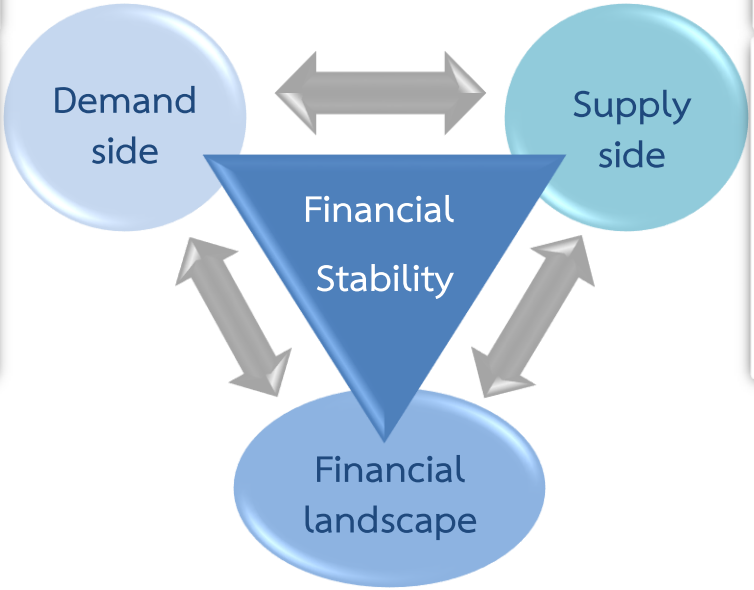
- Changing financial landscape/behavior and possible unknow unknowns

Going forward: financial stability in a VUCA world

BANK OF THAILAND (1942-2017)

Living in a Vulnerable/Uncertain/Complex/Ambiguous world: difficult to assess risk

Cyclical Factor	Structural Factor
• Household debt • Fiscal position • Interest rate normalization • Search for yield behavior	• Aging society • More volatility • Markets are more connected globally • Gen Y, Z, M preferences



Cyclical Factor	Structural Factor
• Oil prices • Agricultural prices • Extreme weather conditions	• Global warming • Export structure • China slowdown • New regulations (ICAO, IUU, TPP) • Aging society • Brexit

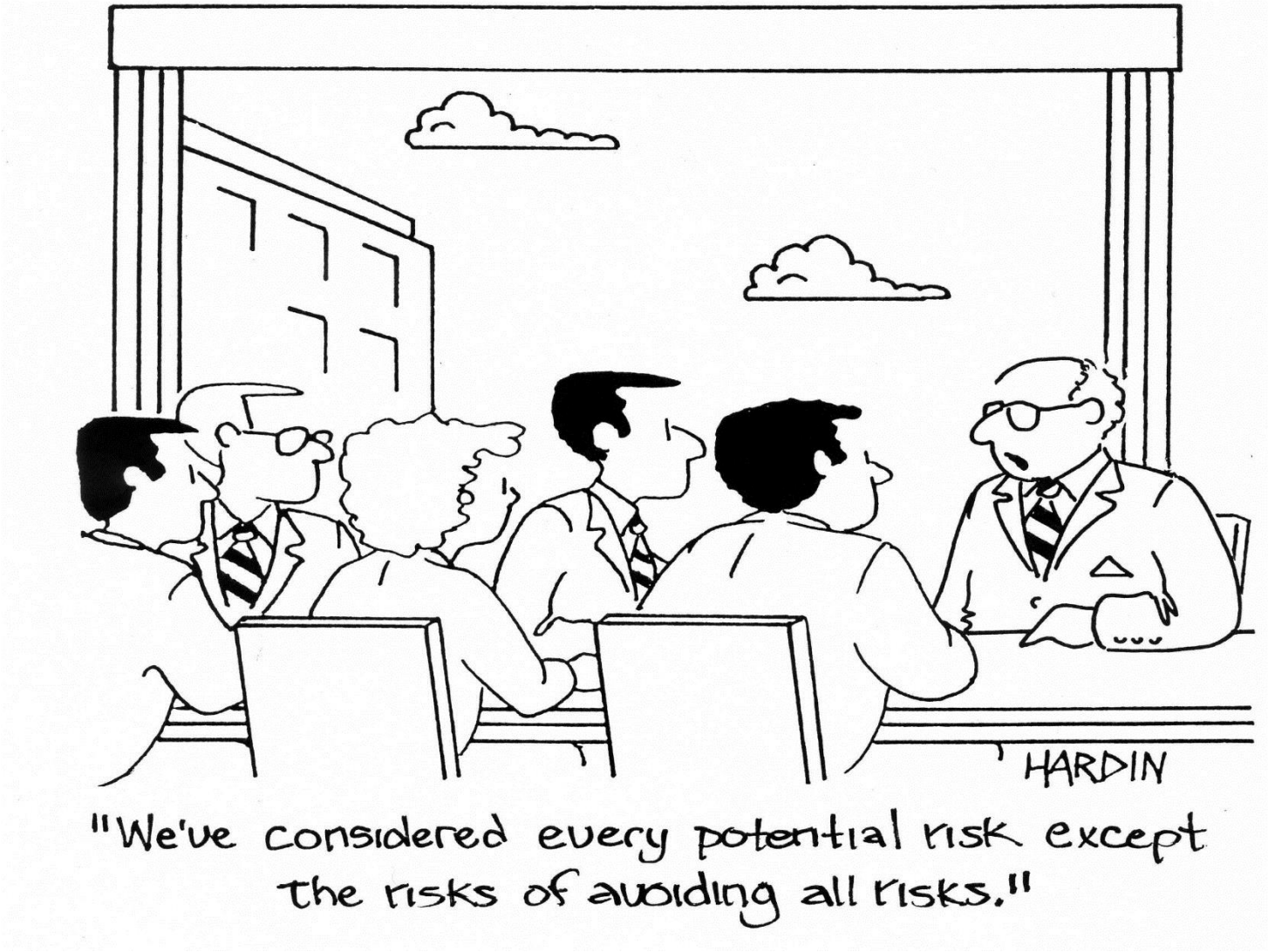
More connected/complex

More volatile

Factors affecting the financial landscape and behavior of financial intermediaries

- Competition from new players (CB/FinTech)
- New regulations (Basel IV)
- New payment landscape
- Fragmented regulatory bodies
- Digital banking/IT Risk
- Shadow banking
- Linkages between financial markets stock markets and financial products are increasing

Food for thought: too much of a good thing can be bad?



Thank you and Q&A

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(1942-2017)
BANK OF THAILAND

The Effectiveness of Macroprudential Policies in Thailand : an Empirical Analysis using Micro-Level Data

Chantawit Tantasith

Nasha Ananchotikul

Chatlada Chotanakarn

Vorada Limjaroenrat

Runchana Pongsaparn

Bank of Thailand

APEC Financial Regulators Training Initiative

Bangkok, 16-19 July 2018

Recap: What is a systemic risk?

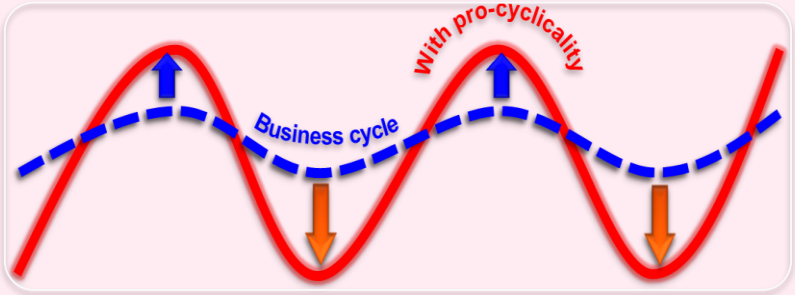
"Systemic risk" *is a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy.*

Source: FSB, IMF, and BIS, 2011. "Macroprudential Tools and Frameworks." Update to G20 Finance Ministers and Central Bank Governors.

Time Dimension

: How aggregate risk evolves over time

- The degree to which financial system can amplify business fluctuations
- Policy concerned with the degree of dynamic interactions between financial and real sectors

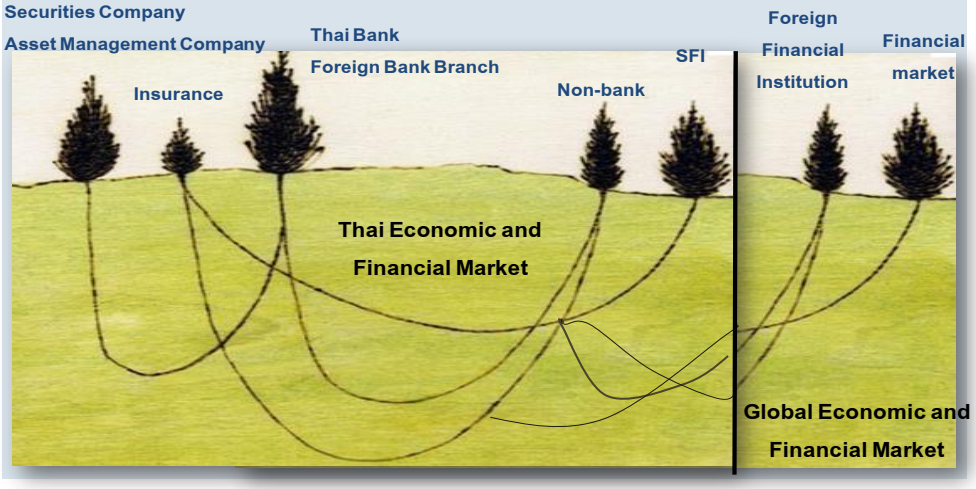


Cross-sectional Dimension

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

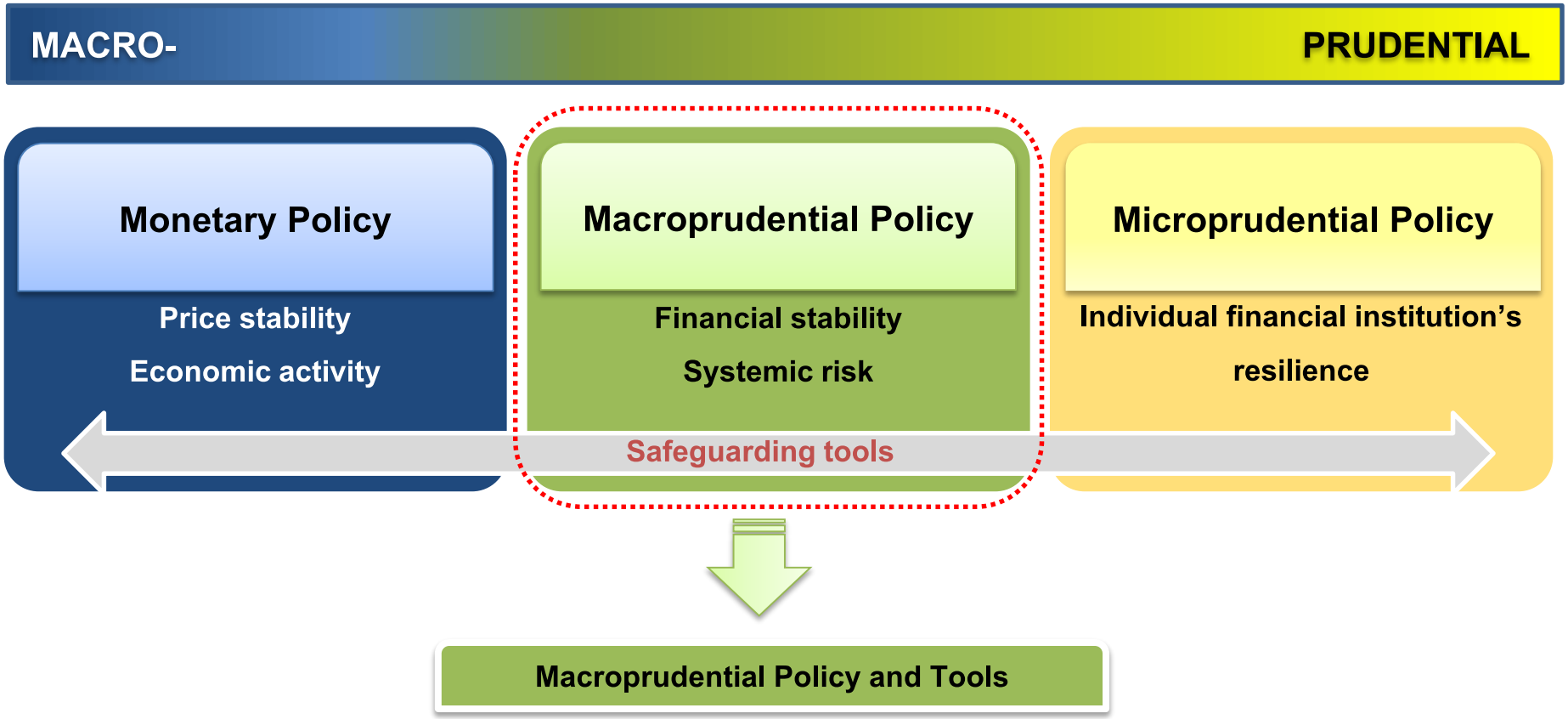
seizing up of financial markets

- Policy concerned with the interconnectedness, size, commen exposures, increase the likelihood and severity of systemic events



Recap: Policy to mitigate systemic risk

To deal with systemic risk, policy response should be resonable, practical and being used at the right time and magnitude.



Recap: Macroprudential Policy Toolkits

Risk factors	Risk dimensions		Macroprudential measures (MaPP)
Risk build-up from credit growth consequent of economic activities	1. Credit side	**Broad-based** (Overall credit cycle)	**Broad-based** • Countercyclical capital buffer (CCyB) **Sectoral** • Loan-to-value (LTV) • Debt service ratio (DSR) • Debt to Income (DTI) • Sectoral capital requirements (SCR) • Exposure limit • Targeted capital flow management (MaPP)
		Sectoral (Credit-related risks in specific sectors e.g. real estate, household)	
Spillover risks from the financial system structure	2. Financial system structure oversight	Systemic importance financial institutions (SIFIs)	• Capital surcharge on D-SIBs/G-SIBs
Risks from inappropriate Asset-Liability Management (ALM)	3. Liquidity side	**3.1) Sources of fund** Core and Non-core funding **3.2) Currency** : local and foreign currencies **3.3) Maturity** **:** Short term and long term	• Loan-to-deposit ratio (L/D) • Levy on non-core funding • Limit on net open FX position
Financial markets risks	4. Stabilitze financial market stability	Reduce impact on real economy from excessive financial market volatility	• Capital Flow Management (MaPP aspect) • Regulations on investment and leverage Regulations on securities borrowing facility

Note: *Reserve requirement is categorized as a liquidity management tool but it is usually used as a credit condition which is evident among other countries.

Source: BIS and IMF, synthesized by the BOT

Outline

I. Background

- Macroprudential Policy in Thailand
- Research Questions
- Data

II. Stylized Facts and Methodology

III. Main Findings

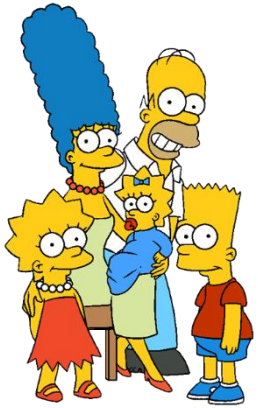
IV. Key Takeaways

I. Background

Macroprudential Policy in Thailand

- **The objectives of macroprudential policies in Thailand are to prevent speculation, mitigate risk build-up and signaling.**
- Since 2003, the BOT has implemented three forms of MaPP
  - **LTV measures**
  - **Debt-to-income measures**
    (maximum credit limits on credit cards and personal loans)
  - **Capital surcharge for Domestic Systemically Important Banks (D-SIBs)**

How is housing bubble created?



Bank lending to households

The Real Estate Market Cycle

The Peak:
Prices are at an all-time high, inventory is down, multiple offers are common, even above asking price

The Tipping Point:
Prices begin to fall, compensating for the over-building and high-prices. Foreclosures begin rising, as homeowners cannot sell due to owing more than their home is worth

The Decline:
Prices continue to fall, foreclosures flood the market. People are fearful of buying, causing even more inventory and driving prices down.

The Bottom:
Prices bottom out, causing investors to start purchasing much of the excess inventory. Deals are plentiful and cashflow is at an all-time high.

The Climb:
Confidence among home buyers improves, leading to more sales, decreasing inventory, and higher prices.

The LTV measures in Thailand

- The primary aim of LTV measures is to ***ensure that banks are sufficiently prudent in their lending standard.***
  - The most direct way to measure policy effectiveness is LTV-setting behavior of banks.
- Each LTV measure targets specific loan sectors.
- Strict maximum limit and then risk-weighted approach have been applied.
- **We will focus on the LTV measures introduced in 2009, 2011 and 2013.**

The LTV measures in Thailand

Dec 2003

High-value residential properties experienced the boom period

LTV capped at 70% for high-value mortgages ≥ 10 mil.THB

Mar 2009

GFC causing global downturn

- Remove 70% LTV cap for high-value mortgages
- Set higher risk weight capital charge for loans with:
  LTV > 80% → RW = 75%
  LTV ≤ 80% → RW = 35%

Jan 2011

Strong housing demand and intense competition in mortgage lending

LTV rules set for mortgages < 10 mil.THB

- Jan 2011: High-rise
  LTV > 90% → RW = 75%
  LTV ≤ 90% → RW = 35%

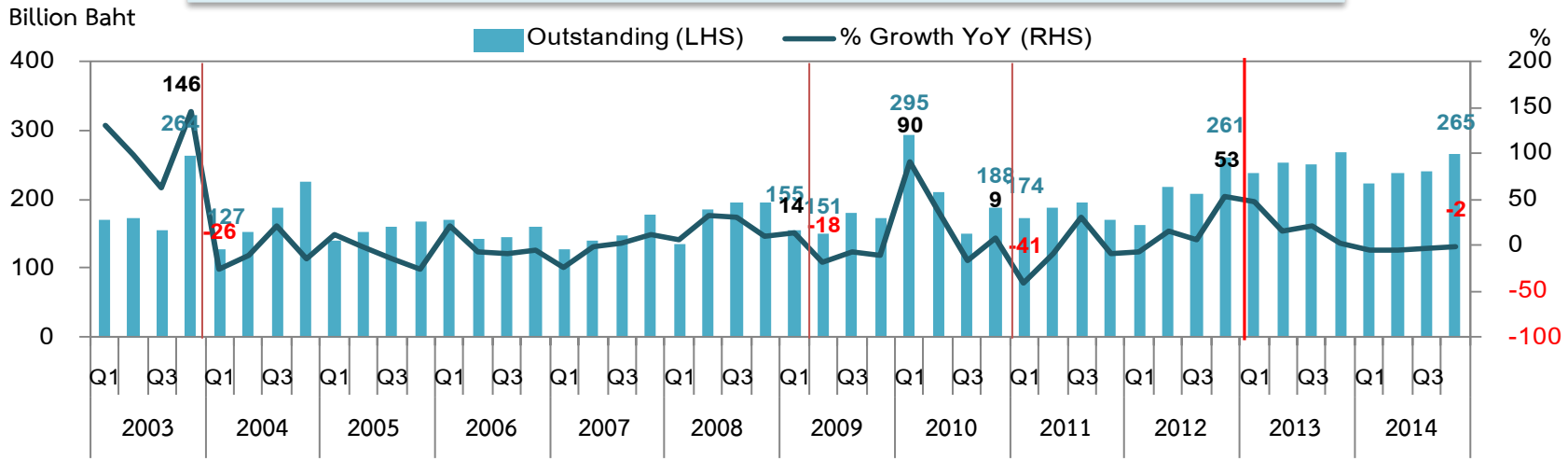
Jan 2013

Severe flood in 2011Q4 causing a delay in the imposition of low-rise LTV

LTV rules set for mortgages < 10 mil.THB

- Jan 2013: Low-rise
  LTV > 95% → LTV = 75%
  LTV ≤ 95% → RW = 35%

Land and building transactions



The LTV measures in Thailand

Measures	Motivation	Target	Action	Status
2003	Prevent risk build-up in the property market	Mortgage loan of **properties ≥ 10 million baht (HV)** 	Impose strict LTV limit at 70%	removed
2009	Support activities in the property market amid global economic slowdown	Mortgage loan of **properties ≥ 10 million baht (HV)** 	• Increase the limit from 70% to 80%. • For LTV within the limit, risk-weighted capital charge = 35% • If LTV exceeds the limit, risk-weighted capital charge = 75%	in place

The LTV measures in Thailand

Measures	Motivation	Target	Action	Status
2011	Prevent build-up of risks in the property market	Mortgage loan of **high-rise properties < 10 million baht (HR-LV)** 	• Impose the limit at 90% • The same capital-surcharge rule as 2009	in place
2013	• Prevent build-up of risks in the property market • Originally planned to enforce in 2012, but postponed to 2013 due to flood	Mortgage loan of **low-rise properties < 10 million baht (LR-LV)** 	• Impose the limit at 95% • The same capital-surcharge rule as 2009	in place

International Experiences on LTV Effectiveness

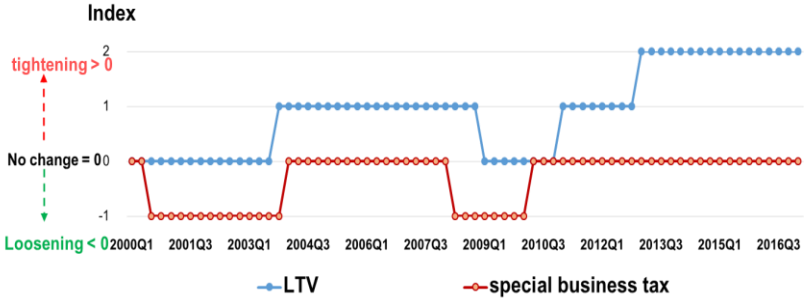
- **Examples of Cross-country Panel Study:**
  - Cerutti, Claessens and Laeven (2015) conducted a dynamic panel regression on 119 countries based on the IMF's Global Macroprudential Policy Instruments (GMPI) database and found LTV and Debt-To-Income (DTI) measures effective in slowing down both credit growth and house prices.
  - Akinci, Olmstead-Rumsey (2017) based on a dynamic panel regression of 57 countries found that housing-related MaPP measures were effective in dampening credit growth and house prices.
- **Examples of Individual Country Study:**
  - Wong, Ho and Tsang (2015) found that LTV measure had an impact on borrowers' leverage and credit growth in the case of Hong Kong
  - Kim (2013) found that LTV is more effective than LTI in slowing down housing credit growth in Korea

Thai Experience on LTV Effectiveness

- Pongsaparn R, W Wongwachara and R Nudam (2017) assessed the effectiveness of LTVs on credit growth in the case of Thailand using aggregate housing credit data and constructed LTV index

- Main Findings:
  - LTV was found to be effective in slowing down overall housing credit growth.
  - Counterfactual exercise suggested that the magnitude of LTV's impact was in line with international experiences and did not derail long-term credit growth.
  - Economic growth and tax measure also influenced credit growth

LTV and tax indices



- Limitations:
  - Aggregate level data did not allow categorization of data into different 'target groups', e.g. high-rise, low-rise
  - LTV index did not differentiate between different types of LTVs

Our Research Questions

- **Does MaPP in Thailand achieve its objectives?**

  Do banks respond differently to the policy?

  - Policy effectiveness needs to be evaluated against the intended impact set by policymakers prior to policy enforcement.

    The micro-level data allows us to do so.

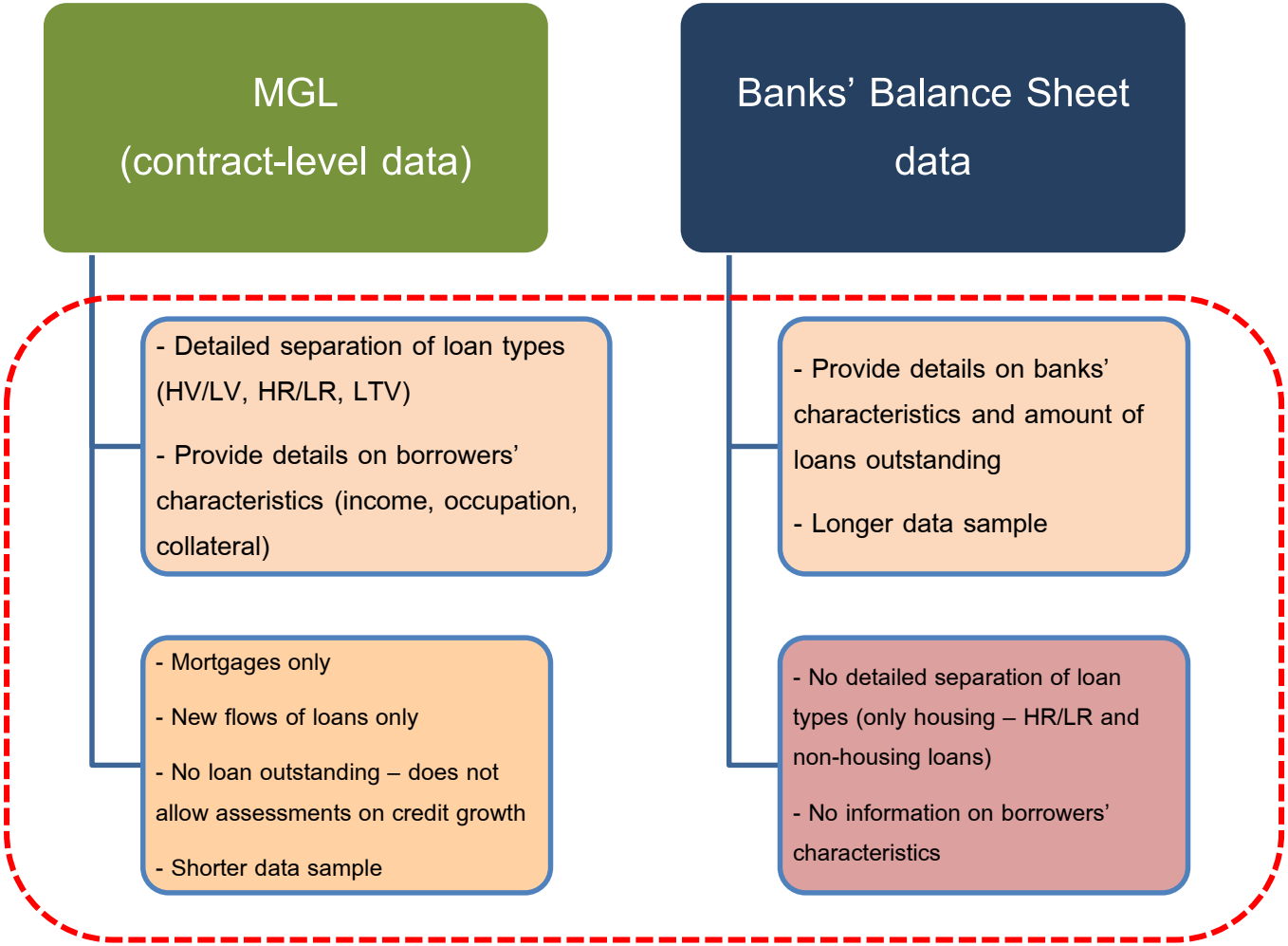
  - Our study abstracts away from the questions of

    - Interaction between MaPP and Monetary Policy
    - Possible leakgaes to the unregulated financial sector/ cross-border transaction

Data

- Two sets of data are employed for our study: Mortgage Loan Database (MGL) and Banks' balance sheet
- **MGL**
  - Records amount of property-collateralized loans newly issued at the contract level. The data contains associated borrower- and loan characteristics.
  - Includes all commercial banks operating in Thailand, including foreign branches and subsidiaries (23 banks in total)
  - Quarterly basis from 2007Q1 to 2017Q3
- **Banks' balance sheets**
  - We use information on bank characteristics (e.g. asset sizes, liquidity ratio) and amount of loan outstanding (for credit-growth calculation) for this analysis.
  - Bank coverage matches MGL data.
  - Quarterly data from 2004Q1 to 2017Q3

Data



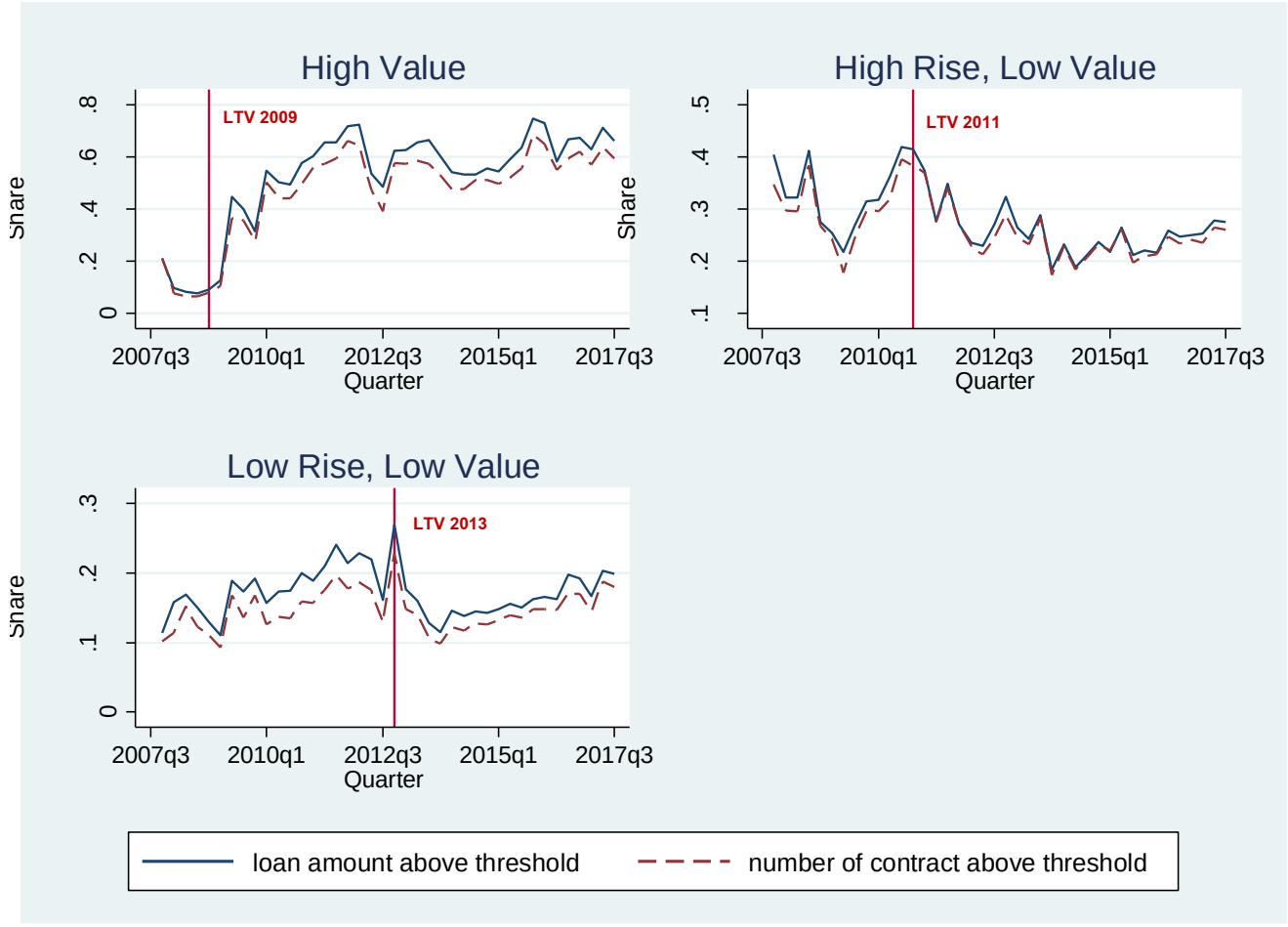
We combine the two datasets to examine sub-segments of loans (in line with policy targets) with matching details on borrowers and lenders

II. Stylized Facts and Methodology

Stylized Fact 1

The implementation of each LTV measure appears to be followed by a change in the LTV distribution as intended by the policy

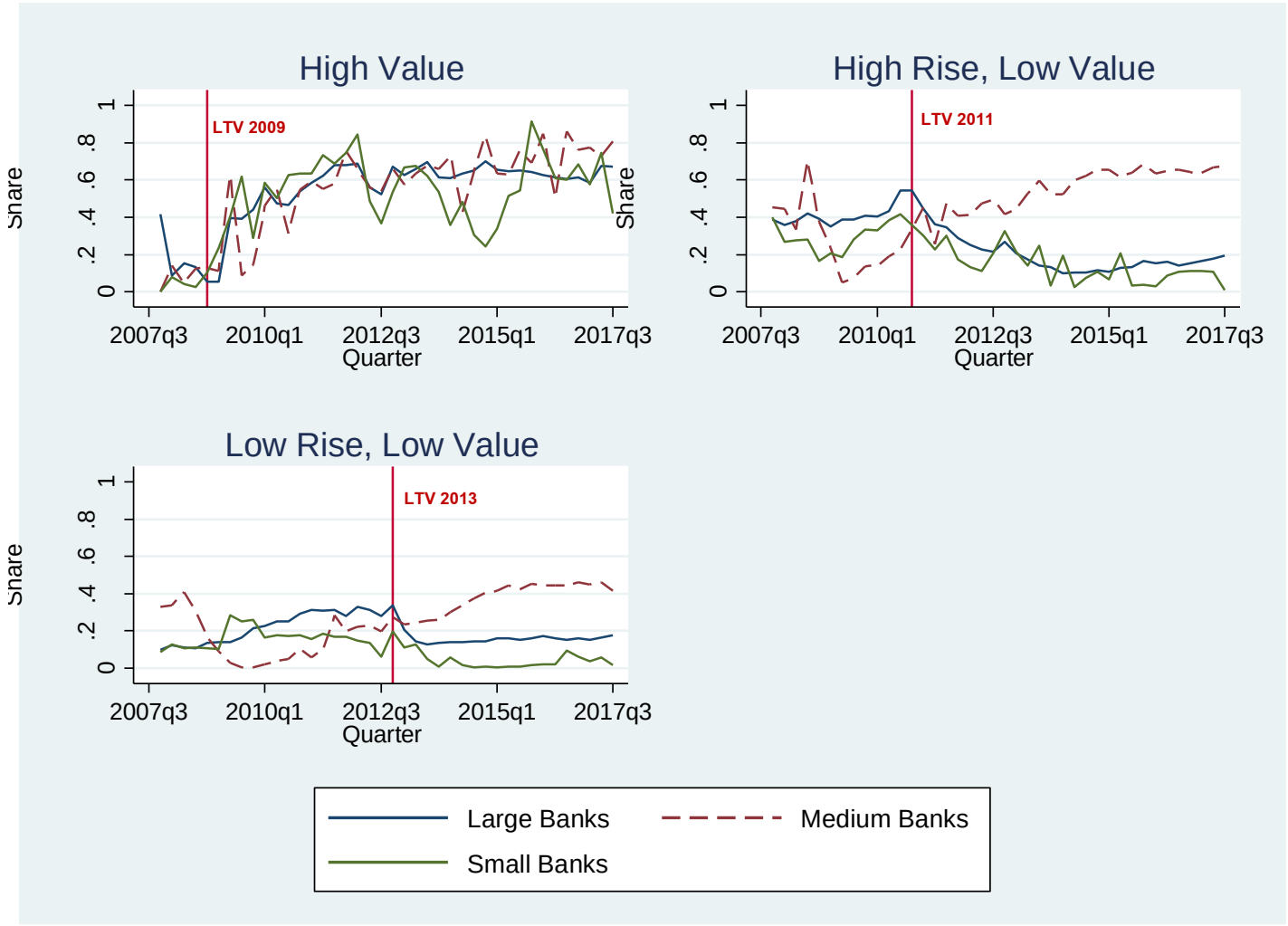
Share of loans above the LTV threshold, all banks



Stylized Fact 2

Different types of banks respond to LTV measures differently

Share of loans above the LTV threshold, by bank size



Methodology

1. Bank-Level Regressions

❖ Apply difference-in-difference (DID) approach to evaluating the impact of *each LTV* measure on banks' LTV-setting behavior

$$\textbf{\textit{Share of loans above threshold}}_{b,l,t} = Constant + \boldsymbol{\delta_1}\, LTV_t + \boldsymbol{\delta_2}\, Target\ loan_l + \boldsymbol{\beta_1}\, LTV_t * Target\ loan_l + \boldsymbol{\theta'}\, Other\ LTV\ policy_t + \boldsymbol{\alpha'}\, Bank\ characteristics_{b,t} + \boldsymbol{\gamma'}\, Macro\ controls_t + \varepsilon_{b,l,t}$$

- ❖ **Dependent Variable**: share of loans above the LTV threshold
- ❖ **Treatment group:** housing loan sector that the measure targets

  Control group: other types of housing loan
- ❖ **Pre- and post-policy intervention** is captured by a dummy variable, *LTV policy*.
- ❖ **Control variables:**

  - *Bank characteristics*: asset size, liquidity, capitalization, profitability, funding structure
  - *Macroeconomic controls*: growth, exchange rate, monetary policy, credit-to-GDP gap
  - *Other controls*: crisis dummy, flood dummy, other LTV policies

Methodology

The baseline model is extended by

- Including interaction terms with *bank size* and *share of housing loans* to allow for banks' differential response
- Changing the dependent variable to credit growth

2. Contract-Level Probit Model

- To assess whether the *probability* that a new loan is granted with a certain LTV ratio changed after the implementation of the LTV measures
- Dependent variable:

  BinaryVar = 1 for contracts with LTVs above the given threshold, 0 otherwise
- Controlling for borrowers' characteristics

III. Main Findings

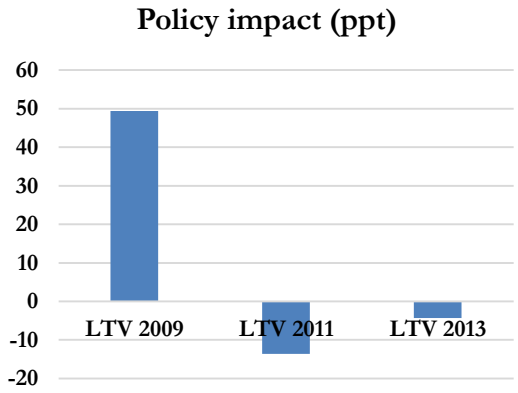
Finding 1

The LTV measures were effective in reshaping banks' LTV distribution of the targeted mortgage loans

- **Banks responded strongly to LTV2009, indicating that the previous limit at 70% was binding for banks**
- **The impact of LTV 2013 is smaller than LTV 2011 possibly due to (1) the announcement effects (2) the level of the thresholds and (3) the nature of the targeted housing sector**

Dep Var: Share of loan subject to LTV threshold	LTV above 70	LTV above 90	LTV above 95
LTV Policy	**2009**	**2011**	**2013**
HV loan	-77.313***		
	(-15.610)		
LTV 2009 x HV loan	**49.420*** **		
	(18.072)		
HR-LV loan		16.802**	
		(2.637)	
LTV 2011 x HR-LV loan		**-13.582*** **	
		(-6.934)	
LR-LV loan			6.878
			(1.832)
LTV 2013 x LR-LV loan			**-4.346** **
			(-2.710)
Observations	1523	1481	1481
R Squared	0.458	0.022	0.025

Notes (1) t-stat in parentheses (2) * p<0.05 ,** p<0.01 ,*** p<0.001 (3) some variables are omitted



Finding 2

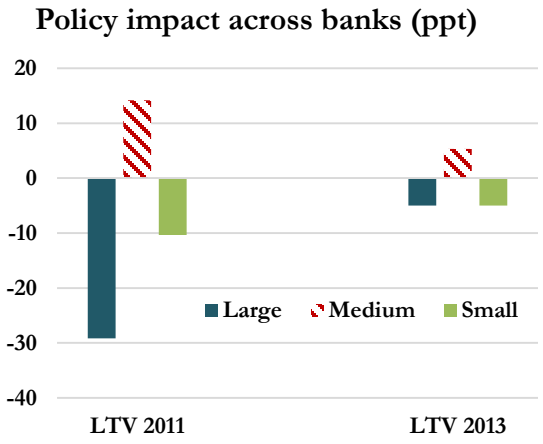
Banks responded differently to the LTV measures

- **Large and small banks** responded in the direction of policy intention
- **Medium banks** behave distinctively from large and small banks, likely reflecting their different business strategy, competitive stance and greater willingness to bear costs
- **Banks that carry more housing loans** in their portfolios responded more strongly to the measures

	(1)	(2)	(3)
	LTV 2009	LTV 2011	LTV 2013
Dep Var: Share of loan subject to LTV threshold	LTV above 70	LTV above 90	LTV above 95
LTV Policy			
LTV x Target Loan	47.849***	-10.359***	-4.992*
	(10.052)	(-3.468)	(-2.045)
LTV x Target Loan x Large bank	-5.379	-18.817***	3.233
	(-0.826)	(-4.549)	(0.975)
LTV x Target Loan x Medium bank	-0.696	24.555***	10.334**
	(-0.093)	(5.189)	(2.692)
LTV x Target Loan x High share_hloan	13.443*	-8.384*	-11.366***
	(2.099)	(-2.085)	(-3.317)
Observations	1487	1487	1487
R Squared	0.469	0.128	0.194

t statistics in parentheses

* p<0.05 ,** p<0.01 ,*** p<0.001



Finding 3

From the borrower's perspective, the probability of getting a loan with LTV above the given threshold changed significantly after the LTV measure

Probit model results

	(1)	(2)	(3)
Target loan subsample:	**LTV 2009**	**LTV 2011**	**LTV 2013**
Dep Var: Dummy subject to threshold	**LTV above 70**	**LTV above 90**	**LTV above 95**
Salary-based income dummy	-0.068***	0.070***	0.099***
	(-9.302)	(37.600)	(103.128)
Number of (co-)borrowers	-0.006	0.018***	0.006***
	(-1.006)	(9.351)	(7.864)
Bangkok area dummy	0.046***	0.068***	0.079***
	(5.916)	(29.558)	(90.034)
Crisis dummy	-0.198***	-0.051***	-0.031***
	(-10.829)	(-12.892)	(-13.978)
Flood dummy	0.078***	-0.049***	0.021***
	(4.873)	(-11.978)	(10.346)
LTV 2009	**0.443*** **	0.000	0.026***
	(9.472)	(0.000)	(13.683)
LTV 2011	0.036***	**-0.177*** **	0.032***
	(2.929)	**(-31.556)**	(20.970)
LTV 2013	0.053***	-0.054***	**-0.147*** **
	(5.851)	(-22.621)	**(-42.633)**
Observations	21,230	272,777	654,244

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: (1) The table reports average marginal effects
(2) Some variables are omitted to preserve space

Finding 4

Impact of the LTV policies was muted in terms of credit growth at the bank level

- **We did not find statistically significant impact of the LTV policy on the housing credit growth**
- **A shift towards loan sectors not subject to the policy measure ?**

	(1)	(2)	(3)
	LTV 2009	LTV 2011	LTV 2013
Dep Var: %YOY loan growth	LTV above 70	LTV above 90	LTV above 95
LTV Policy			
LTV	-0.089	-0.008	0.047
	(-0.803)	(-0.104)	(0.658)
LTV X HOUSE LOAN	**0.233***	**0.039**	**-0.155**
	(2.455)	**(0.394)**	**(-1.555)**
LTV X HOUSE LOAN X Large bank	**-0.240**	**-0.135**	**0.145**
	(-1.136)	**(-0.634)**	**(0.679)**
LTV X HOUSE LOAN X Medium bank	**-0.131**	**0.085**	**0.134**
	(-0.501)	**(0.325)**	**(0.511)**
Observations	2552	2552	2552
Overall R-Squared	0.028	0.025	0.026

t statistics in parentheses

* p<0.05 ,** p<0.01 ,*** p<0.001

Note: Some variables are omitted to preserve space.

IV. Key Takeaways

- **Overall, the LTV measures impact banks' lending behavior on the specific sectors they aim to target.** But the impact may not necessarily manifest in terms of credit growth slowdown

- **Policy design should take into account:**
  - differential responses among banks
  - the threshold effects of the policy
  - unintended consequences such as potential spillovers to non-targeted loans

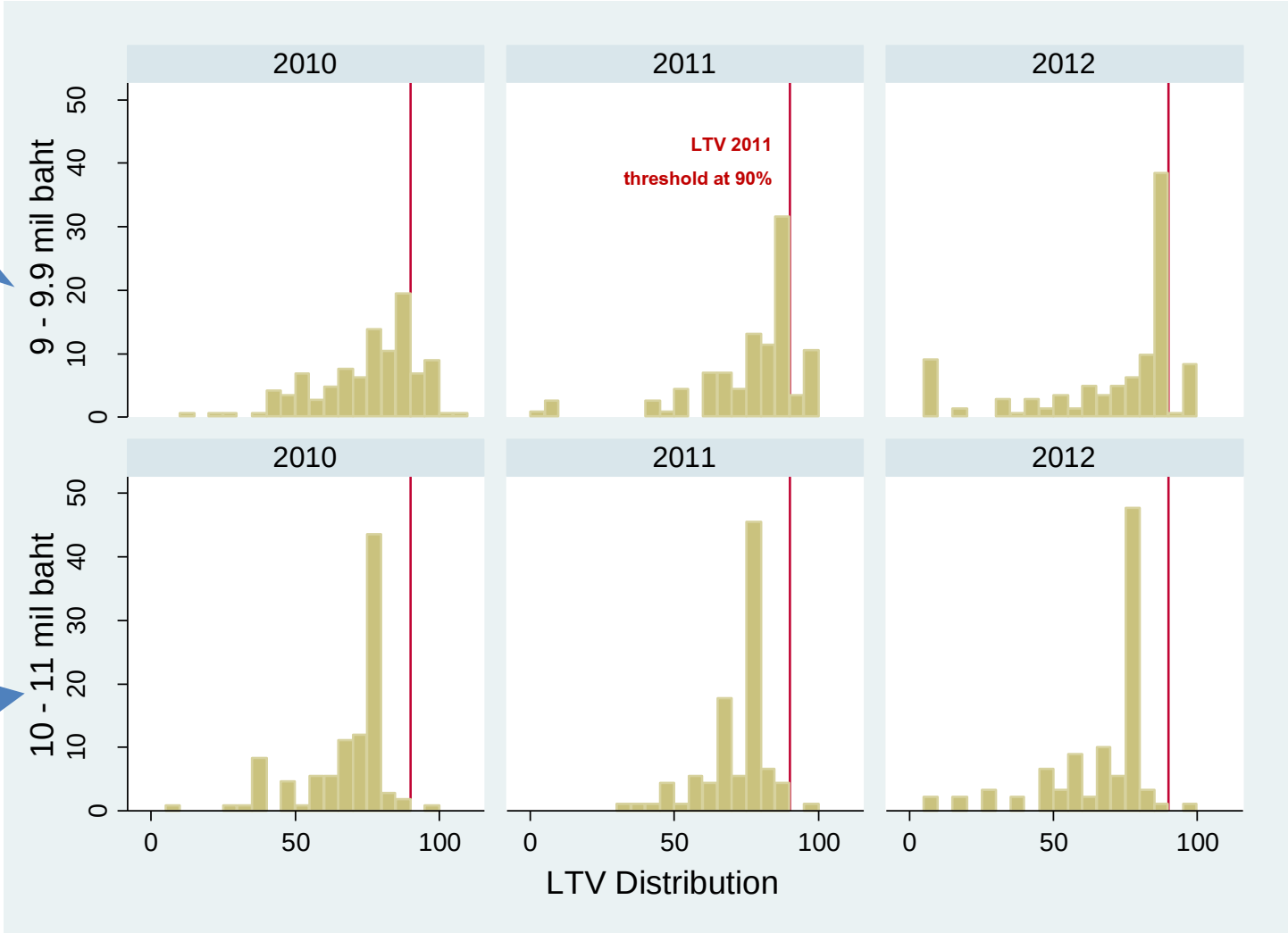
- **Central banks' warning signals about a buildup of financial imbalances can play a part in nudging banks to adjust their lending behavior** even before the policy becomes effective. This helps facilitate a smooth transition of the policy implementation

The target and threshold effects are strong

LTV Distribution for high-rise housing loans, by house price range

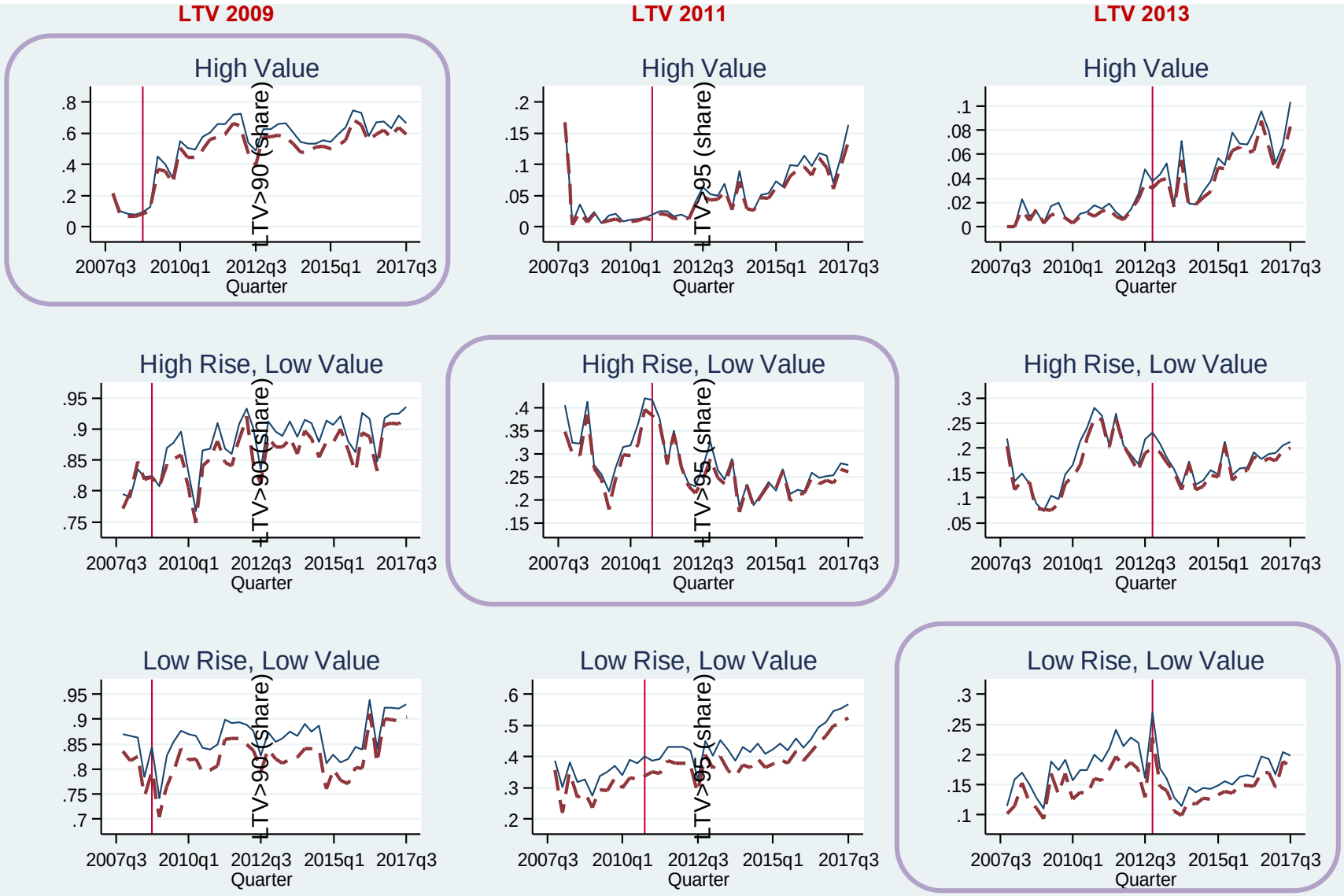
'Low value' subject to LTV 2011 at 90%

'High value' subject to LTV 2009 at 80%



*Only for large and small banks

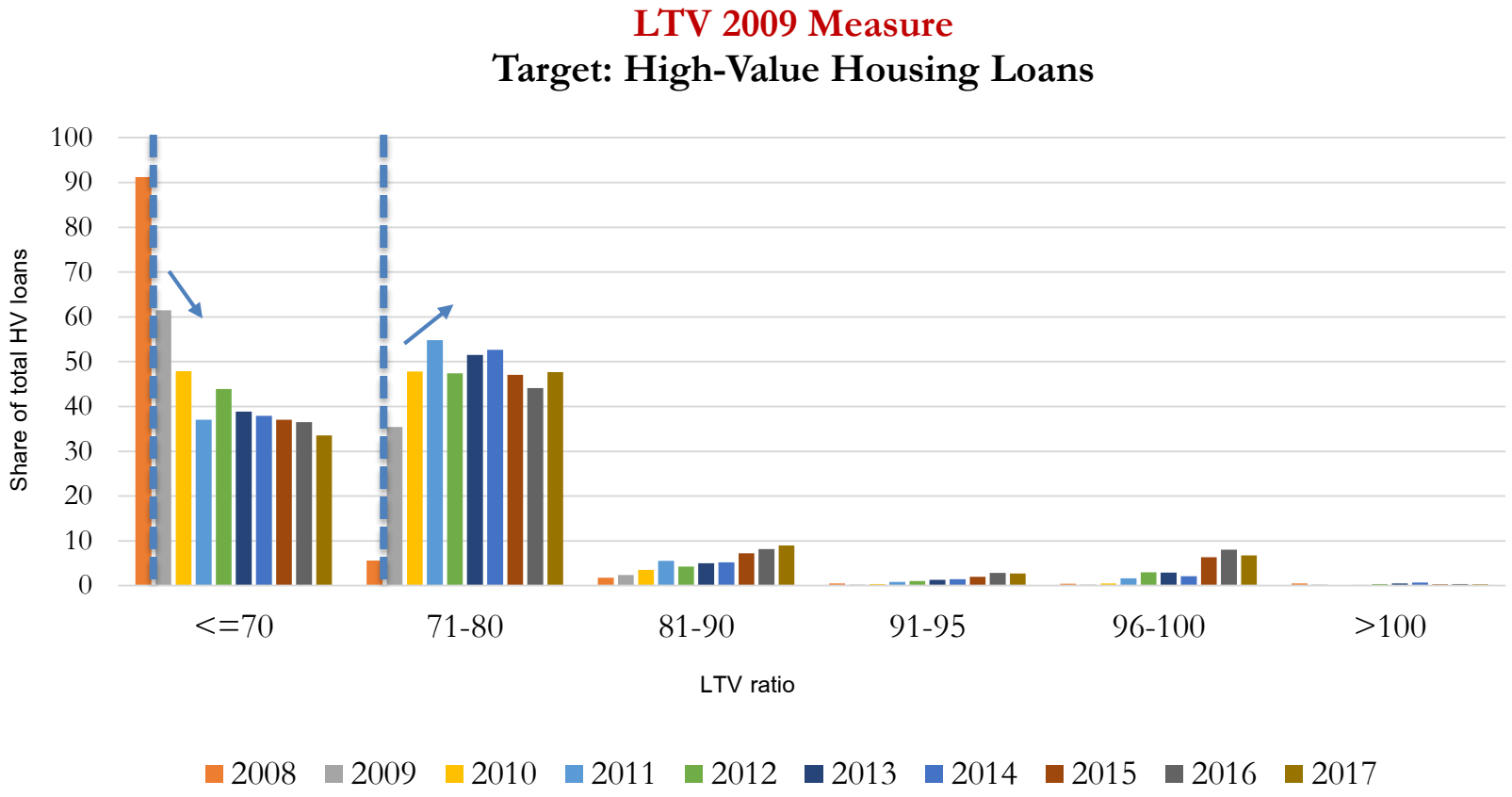
Potential spillovers?



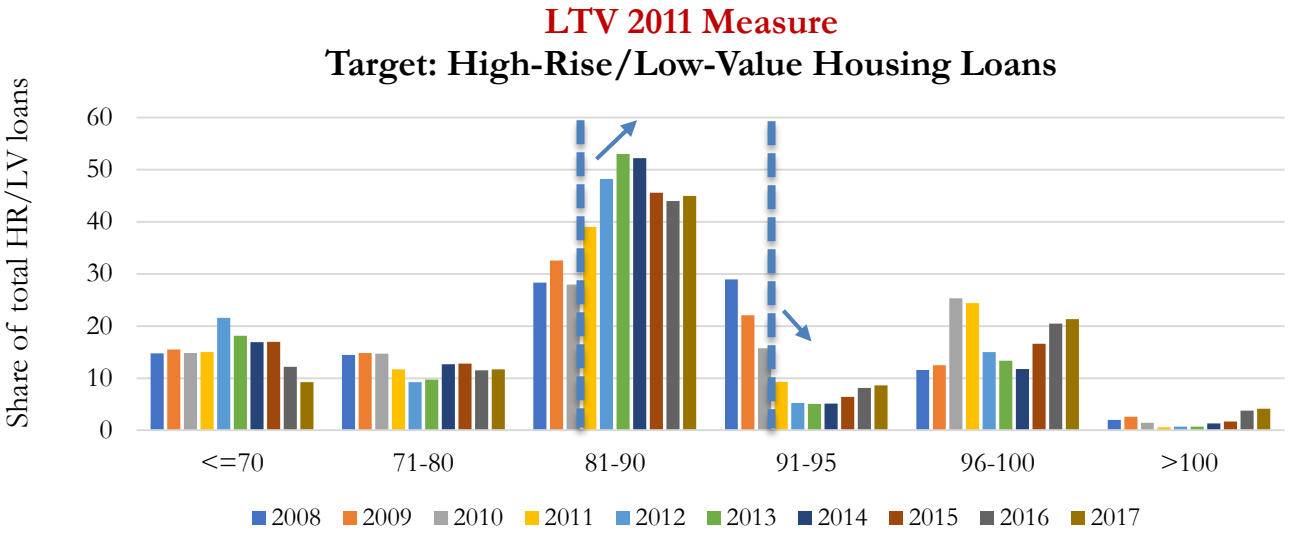
Thank you
Q&A

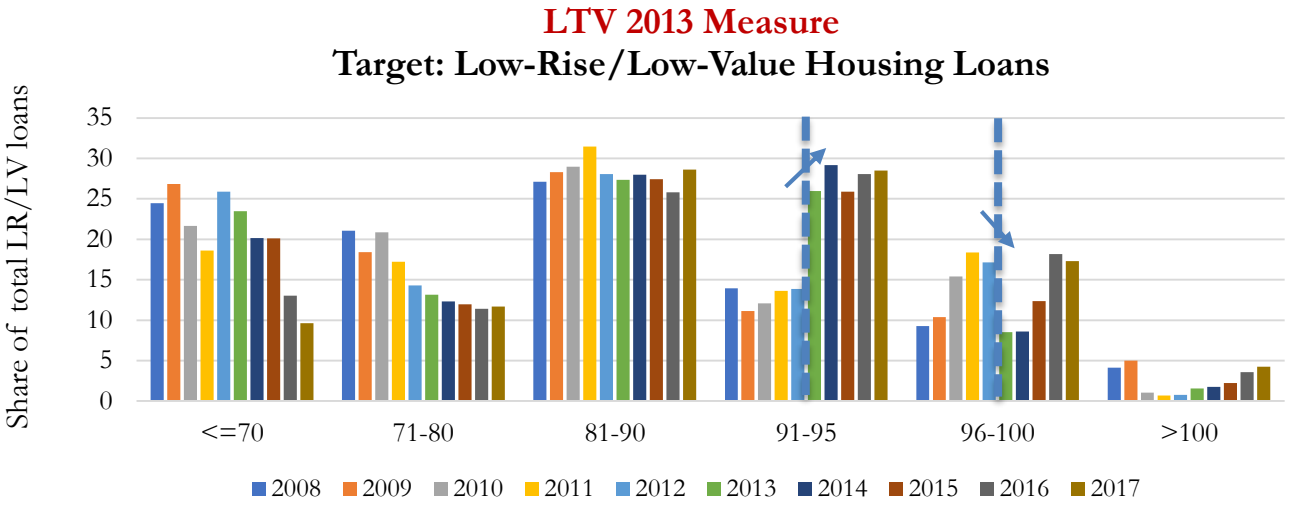
Stylized Fact 1

The implementation of each LTV measure appears to be followed by a change in the LTV distribution



Stylized Fact 1



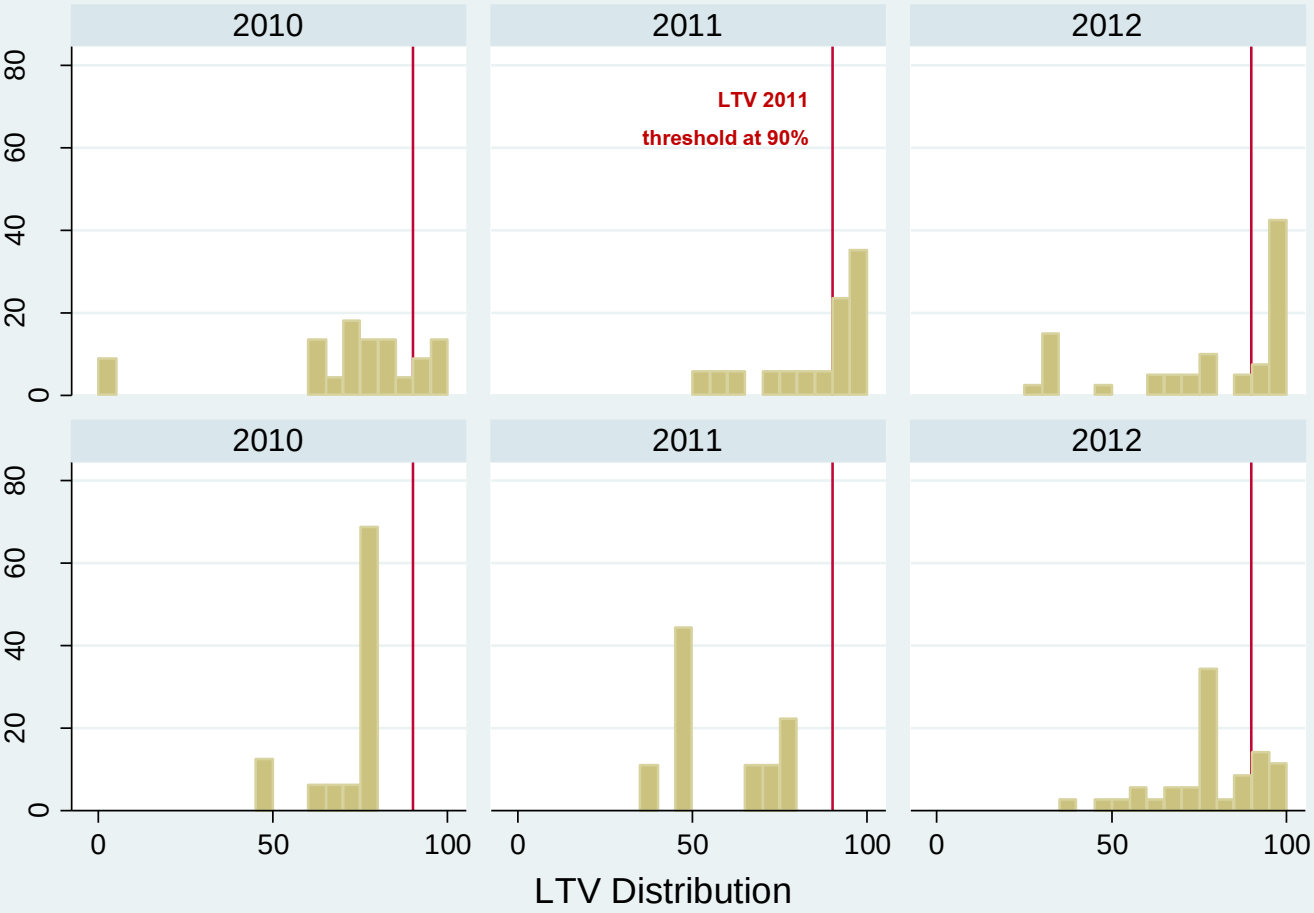


Medium banks behave differently

LTV Distribution for high-rise housing loans, by house price range

'Low value' subject to LTV 2011 at 90%

'High value' subject to LTV 2009 at 80%



*Only for medium banks