Trend in Digital Finance and Implications for Financial Industry and Regulators

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Key Points

- Time to take a structural systemic view of risks and uncertainties in Asia
- Cyber-security is high priority in light of ransomware etc.
- Whilst regulators playing with “sandbox”, FinTech is rapidly gaining market share on banks SCALE X SPEED X SCOPE
- Asia going through fundamental transformation and leap into NEW ECONOMY
- Must allow banks to use new FinTech to compete head-on with new giants
- Develop equity, long-term savings market to fund long-term infrastructure and higher risk SMEs that push innovation, competition and job creation
- Financial supervision should be focused on enforcement of red-lines on corruption, market manipulation and fraud

Section 1 Global Finance

Megatrends in Geopolitics, Technology and Business models – KNOW YOUR CONTEXT

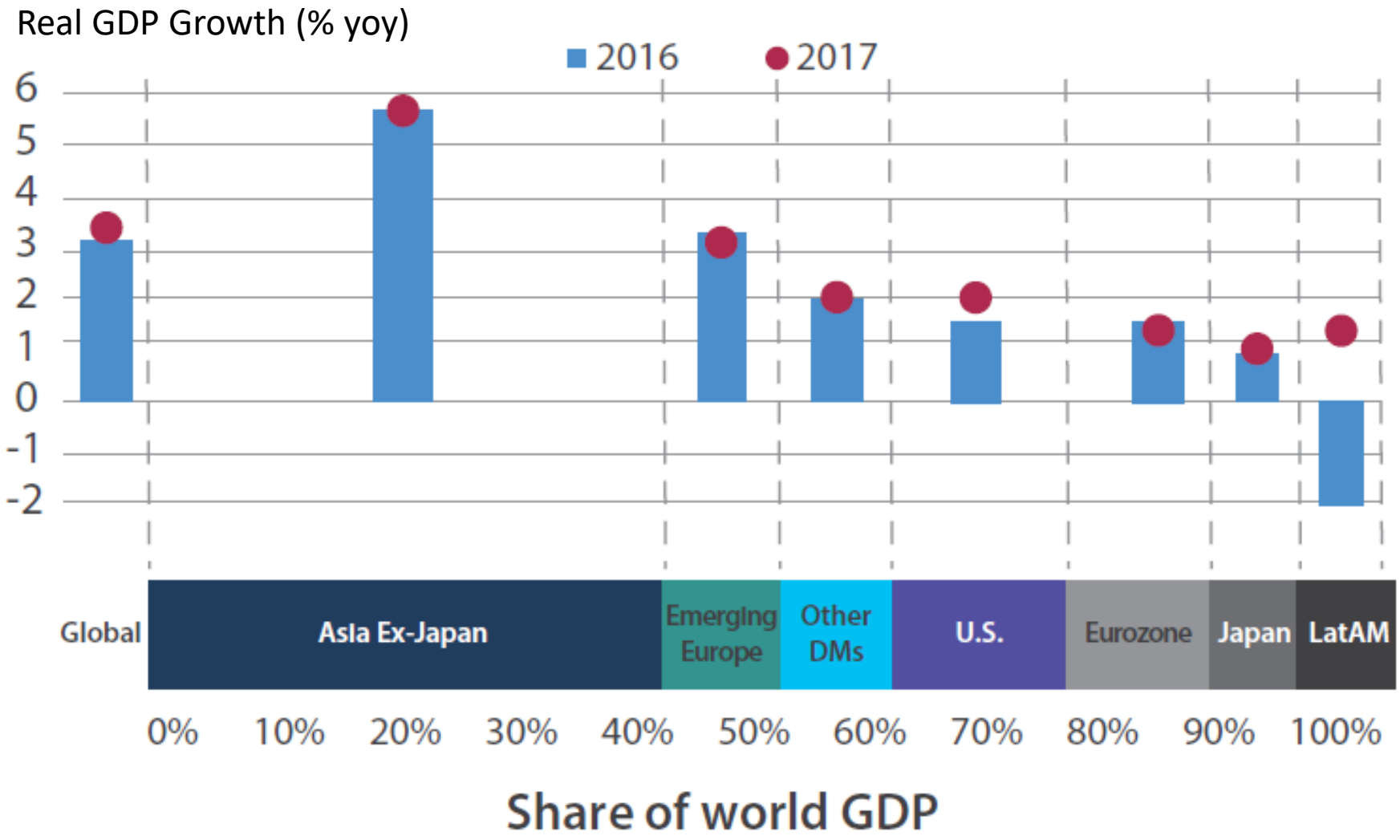
Global and Asian GDP Overall Up

– IMF WEO July 2017

(Percent change unless noted otherwise)	Year over Year		
	Estimate	Projections	
	2016	2017	2018
World Output	**3.2**	**3.5**	**3.6**
Advanced Economies	**1.7**	**2.0**	**1.9**
United States	1.6	2.1	2.1
Euro Area	1.8	1.9	1.7
Japan	1.0	1.3	0.6
Emerging Market and Developing Economies	**4.3**	**4.6**	**4.8**
Emerging and Developing Asia	6.4	6.5	6.5
China	6.7	6.7	6.4
India 4/	7.1	7.2	7.7
ASEAN-5 5/	4.9	5.1	5.2

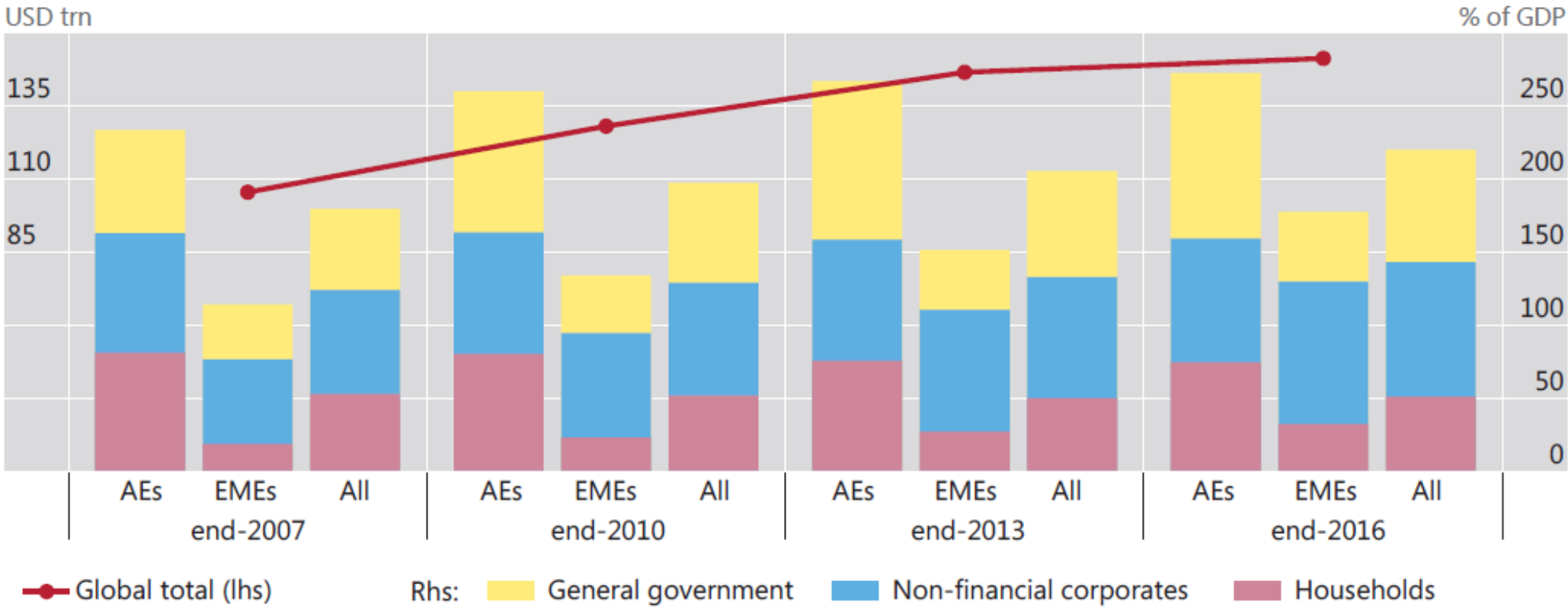
3/ Excludes the G7 (Canada, France, Germany, Italy, Japan, United Kingdom, United States) and euro area countries.4/ For India, data and forecasts are presented on a fiscal year basis and GDP from 2011 onward is based on GDP at market prices with FY2011/12 as a base year. 5/ Indonesia, Malaysia, Philippines, Thailand, Vietnam.
IMF. 2017. "*World Economic Outlook Update, July 2017*."

Asia Ex-Japan 5%-6% Growth (2016-2017)



Data sources: Consensus Mean Forecast from Bloomberg (as of 31 March 2017).
Source: AMRO. 2017. "*ASEAN+3 Regional Economic Outlook 2017*."

Global Debt Continues to Rise – *BIS (June 2017)*



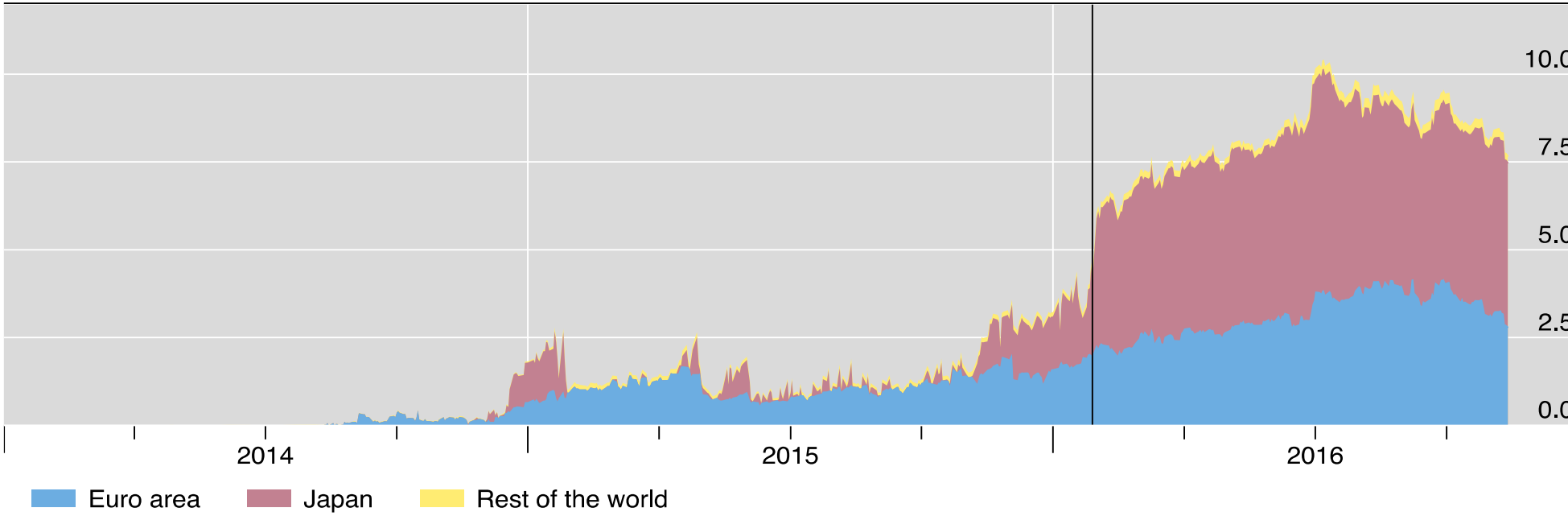
Data sources: IMF, World Economic Outlook; OECD, Economic Outlook; national data; BIS; BIS calculations.
Source: BIS. 2017. "*87th Annual Report*."

$7.5 trillion of Sovereign Bonds Trading at Negative Yields – *Caruana, (Nov 2016)*

Stock of government bonds with negative yields[1]

In trillions of US dollars

Graph 1



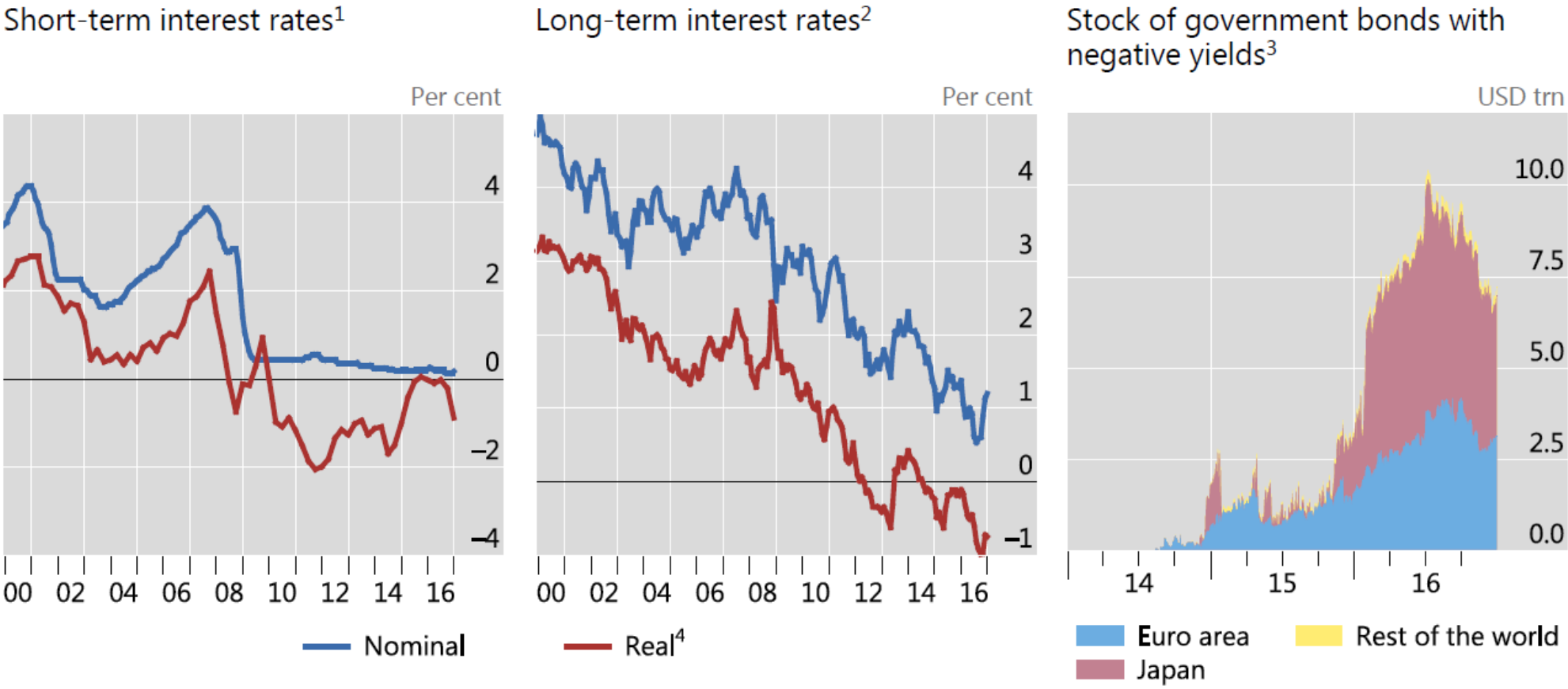
[1] Analysis based on the constituents of the Bank of America Merrill Lynch World Sovereign index. The vertical line indicates 29 January 2016, the date on which the Bank of Japan announced its move to negative interest rates on reserves. Data as of 11 November 2016.

Sources: Bank of America Merrill Lynch; Bloomberg; BIS calculations.

Dow and several equity markets hit record high with low interest rates

Low Interest Rates in Core Advanced Economies

– Borio & Hofmann, BIS (April 2017)

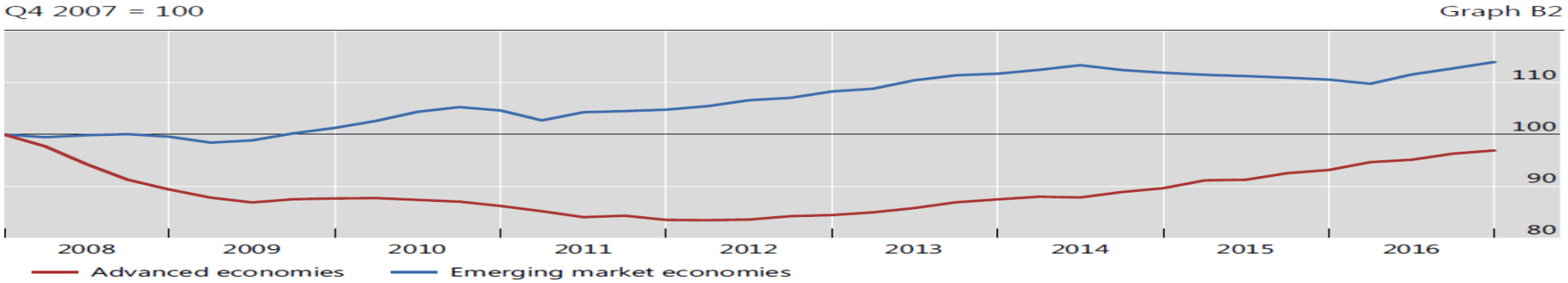


1 Simple average of Japan, euro area, the United Kingdom and the United States. 2 Simple average of France, the United States and the United Kingdom. 3 Based on the constituents of the Bank of America Merrill Lynch World Sovereign index. 4 Nominal policy rate minus CPI inflation (for the United States, PCE inflation); long-term index-linked bond yield. Data sources: Bank of America Merrill Lynch; Bloomberg; Datastream; BIS calculations; national data.

Source: Borio & Hofmann. 2017. "*Is monetary policy less effective when interest rates are persistently low?*" BIS Working Papers 628.

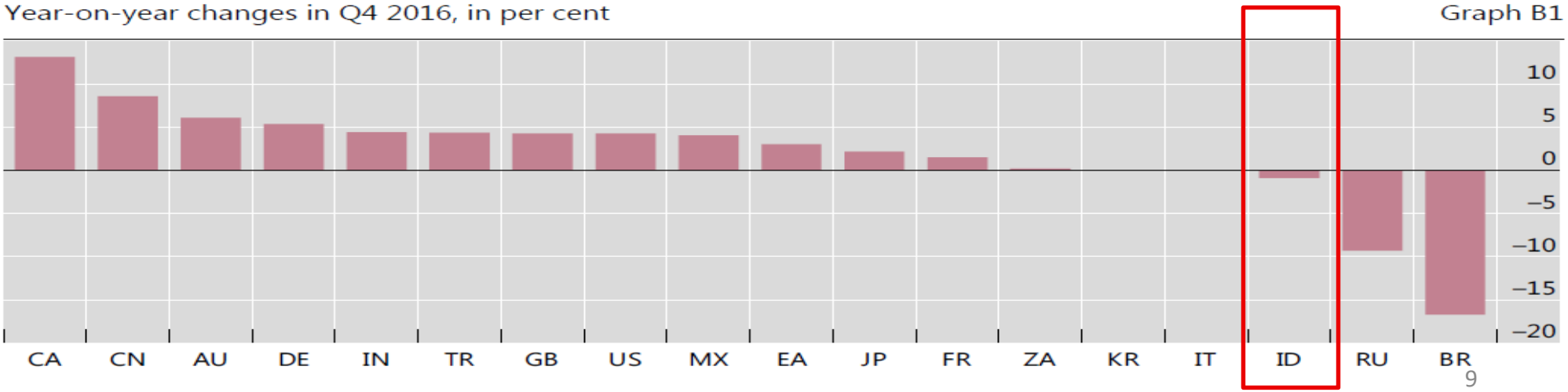
Residential Property Prices Increased Significantly in Almost All AEs during 2016 – *BIS (June 2017)*

Aggregate development, in real terms, of residential property prices in AEs and EMEs since the Great Financial Crisis of 2007–09



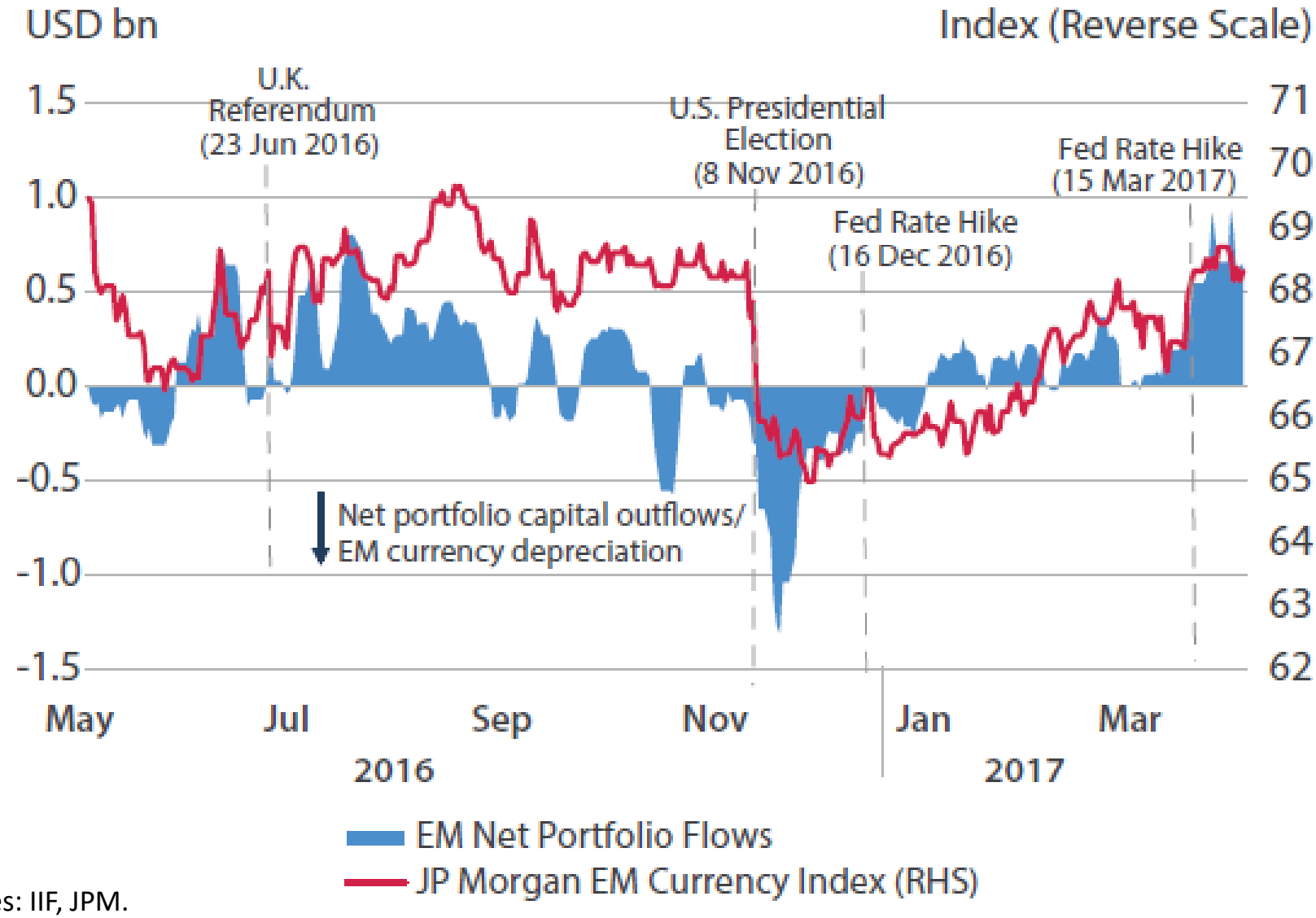
Estimated weighted averages based on rolling GDP and PPP exchange rates.

Real residential property prices in selected countries in 2016



Source: BIS. 2017. "*Highlights of the BIS International Statistics.*" BIS Quarterly Review June 2017.

Capital Flows to EM Waiting for Fed

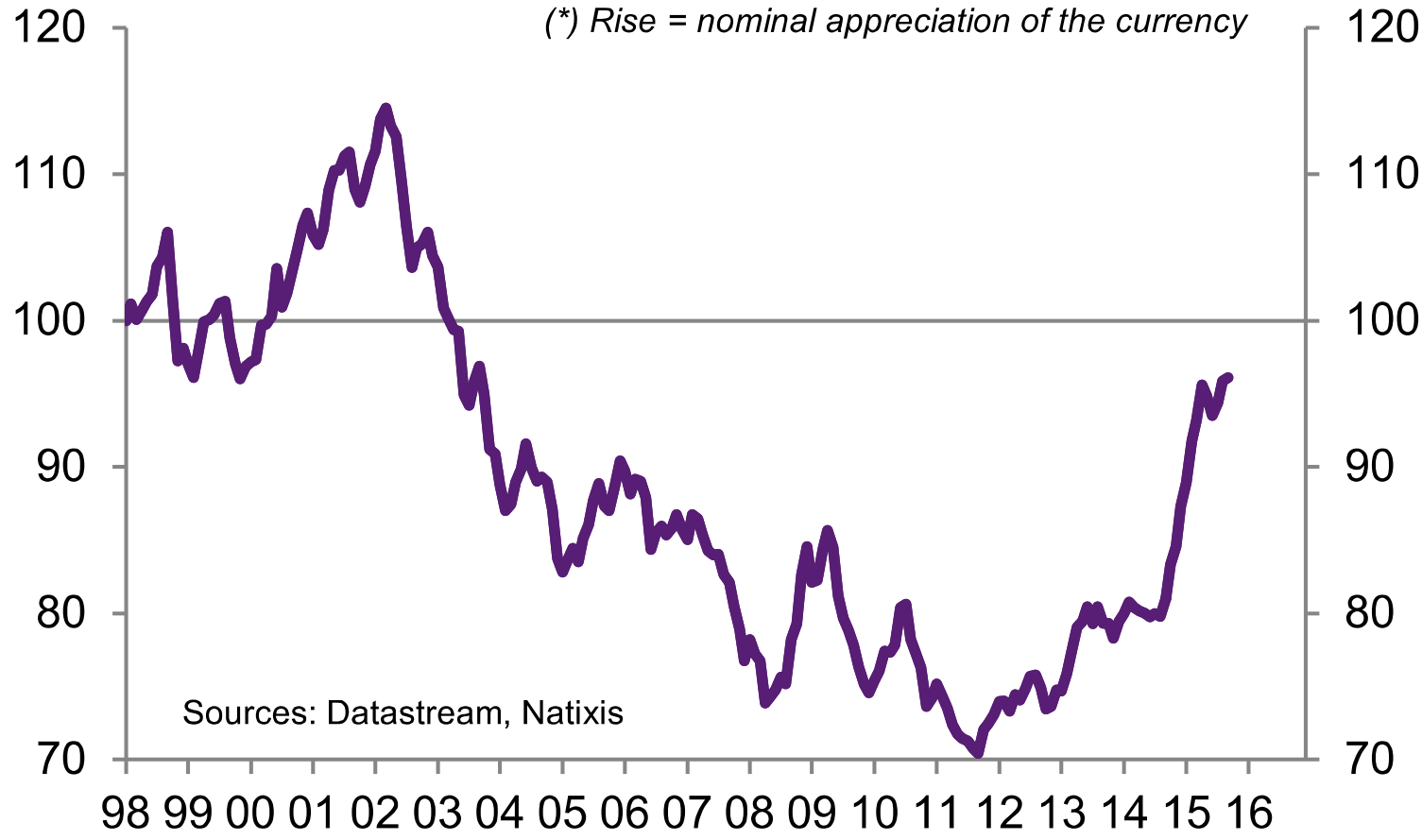


Data sources: IIF, JPM.

Source: AMRO. 2017. "*ASEAN+3 Regional Economic Outlook 2017*."

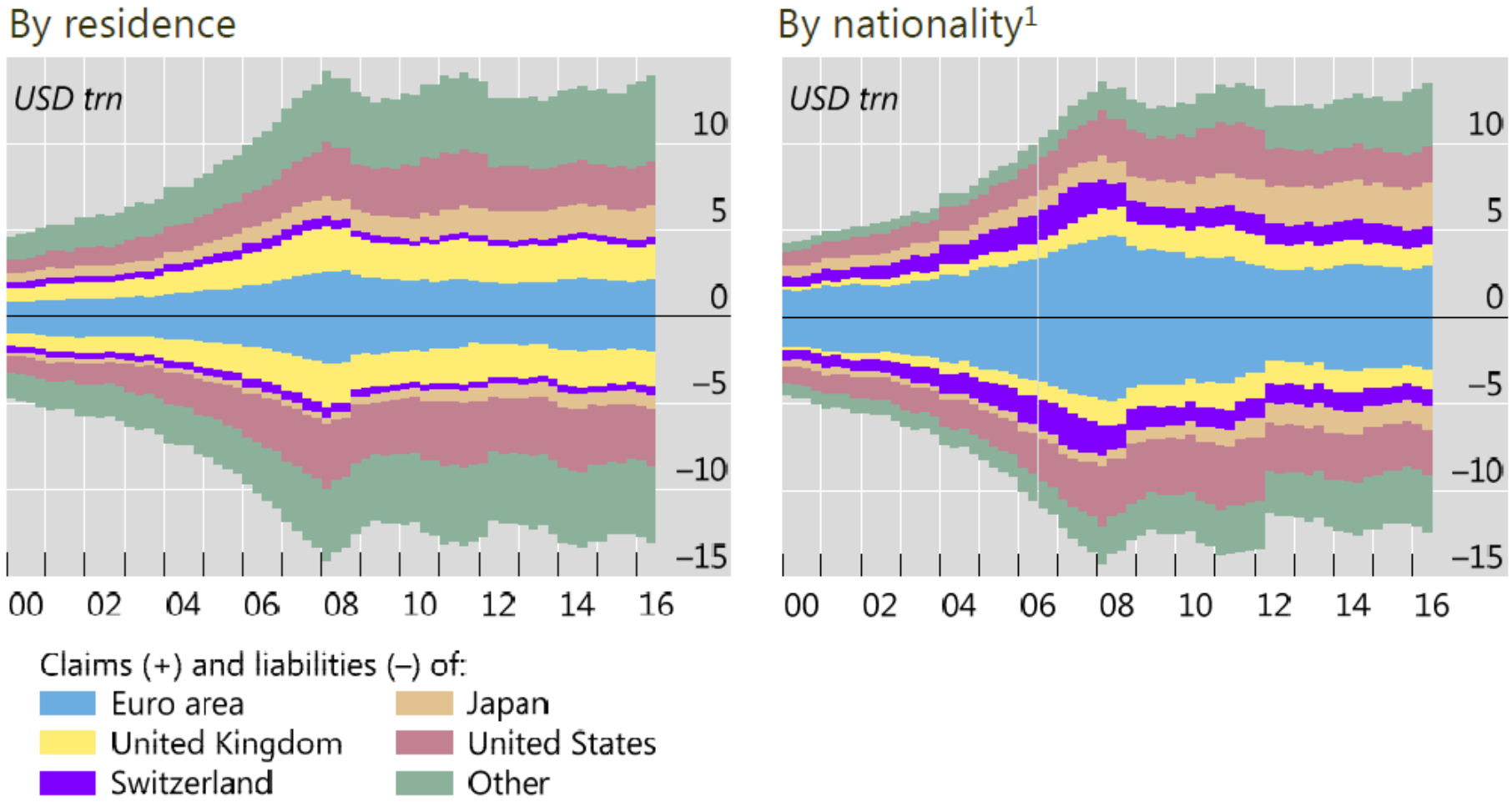
Strong Dollar = Global Crisis, 1998-2017

United States: Nominal trade-weighted exchange rate* (1998:1 = 100)



Dollar Funding has Become Very Important for Both Onshore and Offshore Debt – *Hyun Shin, BIS (July 2017)*

Cross-border US dollar-denominated credit, all sectors



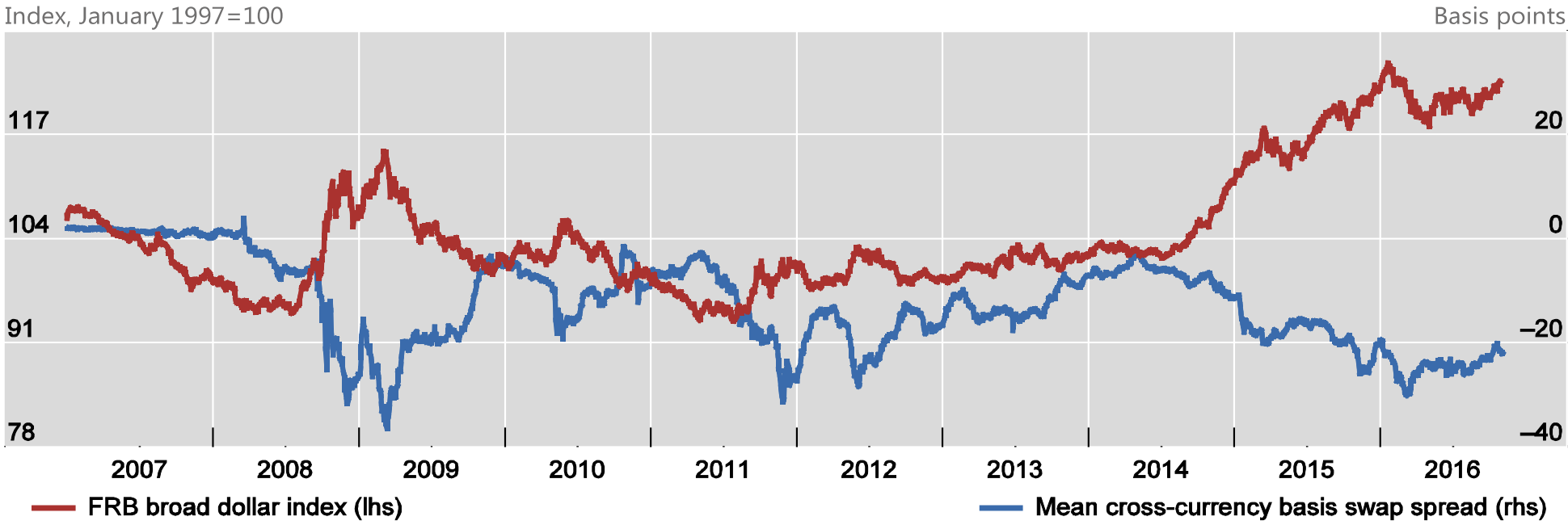
1 The break in series between Q1 and Q2 is due to the Q2 2012 introduction of a more comprehenseive reporting of cross-border positions. For more details, see www.bis.org/publ/qtrpdf/r_qt1212v.htm. Data source: BIS locational banking statistics, Tables A5 (by residence) and A7 (by nationality).

Source: Hyun Song Shin. 2017. "*Globalisation: Real and Financial*." BIS 87th Annual General Meeting.

When Dollar Strengthens, Credit Costs Widen (Covered Interest Parity Fails) – *Hyun Shin, BIS (Nov 2016)*

US dollar broad index and the cross-currency basis

Graph 3



The red line shows the Federal Reserve Board's US trade-weighted broad dollar index, with higher values indicating a stronger US dollar. The blue line is the simple average of the five-year cross currency basis swap spreads for AUD, CAD, CHF, DKK, EUR, GBP, JPY, NOK, NZD and SEK vis-à-vis the US dollar.

Sources: Board of Governors of the Federal Reserve System; Bloomberg.

Source: Hyun Shin, Bank/Capital Nexus goes global, BIS, Nov. 2016

Implications of Low Interest Rates and Yields on Capital Flows (Business Models)

- Historical long-term real returns on long-only portfolios:
  - Equities 6.7%; Bonds 3.0%...60/40 allocation = 5.2%
- Reasonable expectations today
  - Equities 3.6%; Bonds 0.6%...60/40 allocation = 2.6%

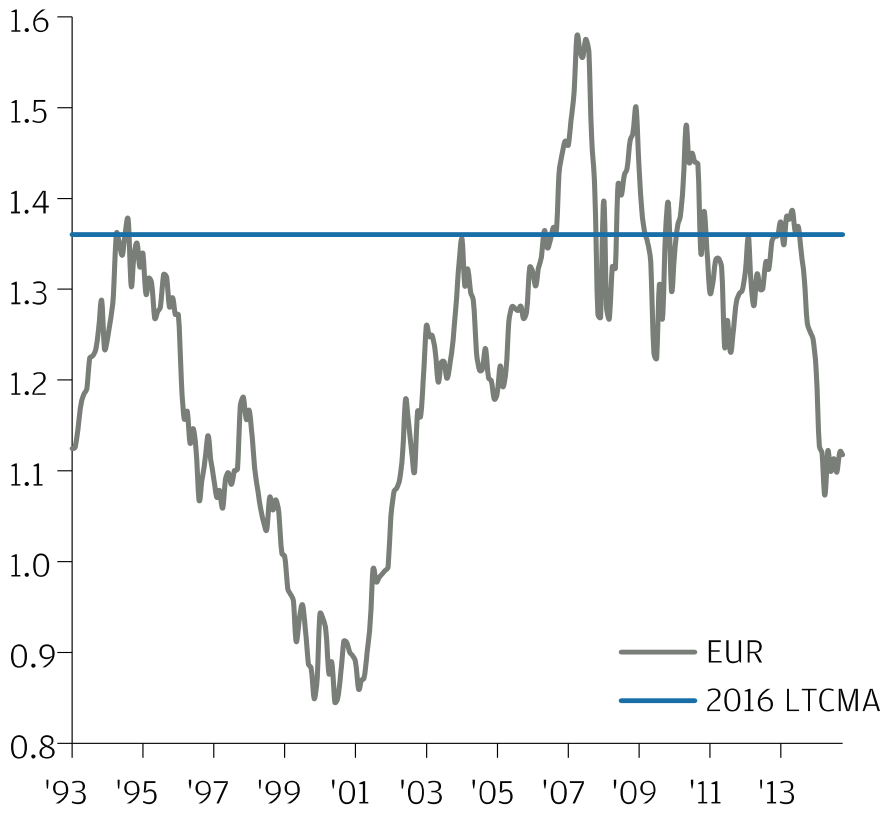
Implications:

- For pension fund – half pension or double costs
- For local investor – seeking alpha abroad (capital outflow)

Exchange Rate Movements Outweigh "Normal" Returns

Many developed market exchange rates have moved away from our long-term forecasts

EXHIBIT 2: SELECT EXCHANGE RATE HISTORIES RELATIVE TO 2016 LTCMAS



If Expected Exchange Rate Depreciation Larger than 3.25% p.a., Capital will Move

Equity assumptions	U.S.	Europe ex-UK	UK	Japan	China
Revenue growth	6.1	4.8	5.0	4.0	10.0
Margins impact	-0.5	1.6	2.0	-0.7	-1.4
Earnings growth	5.5	6.5	7.2	3.3	8.5
Gross dilution	-2.0	-2.0	-2.0	-2.0	-4.1
Buybacks	2.5	0.7	0.2	3.7	0.5
EPS growth	6.0	5.1	5.2	5.0	4.6
Valuation impact	-0.9	-1.1	-1.4	-0.8	2.6
Price return	5.0	4.0	3.7	4.2	7.3
Dividend yield (DY)	2.0	3.0	3.5	1.5	3.0
Total return, local currency	**7.00%**	**7.00%**	**7.25%**	**5.75%**	**10.25%**

Source: J.P. Morgan Asset Management; estimates are as of September 2015.

Policy Recommendations for Growth in Asia

– IMF (April 2017)

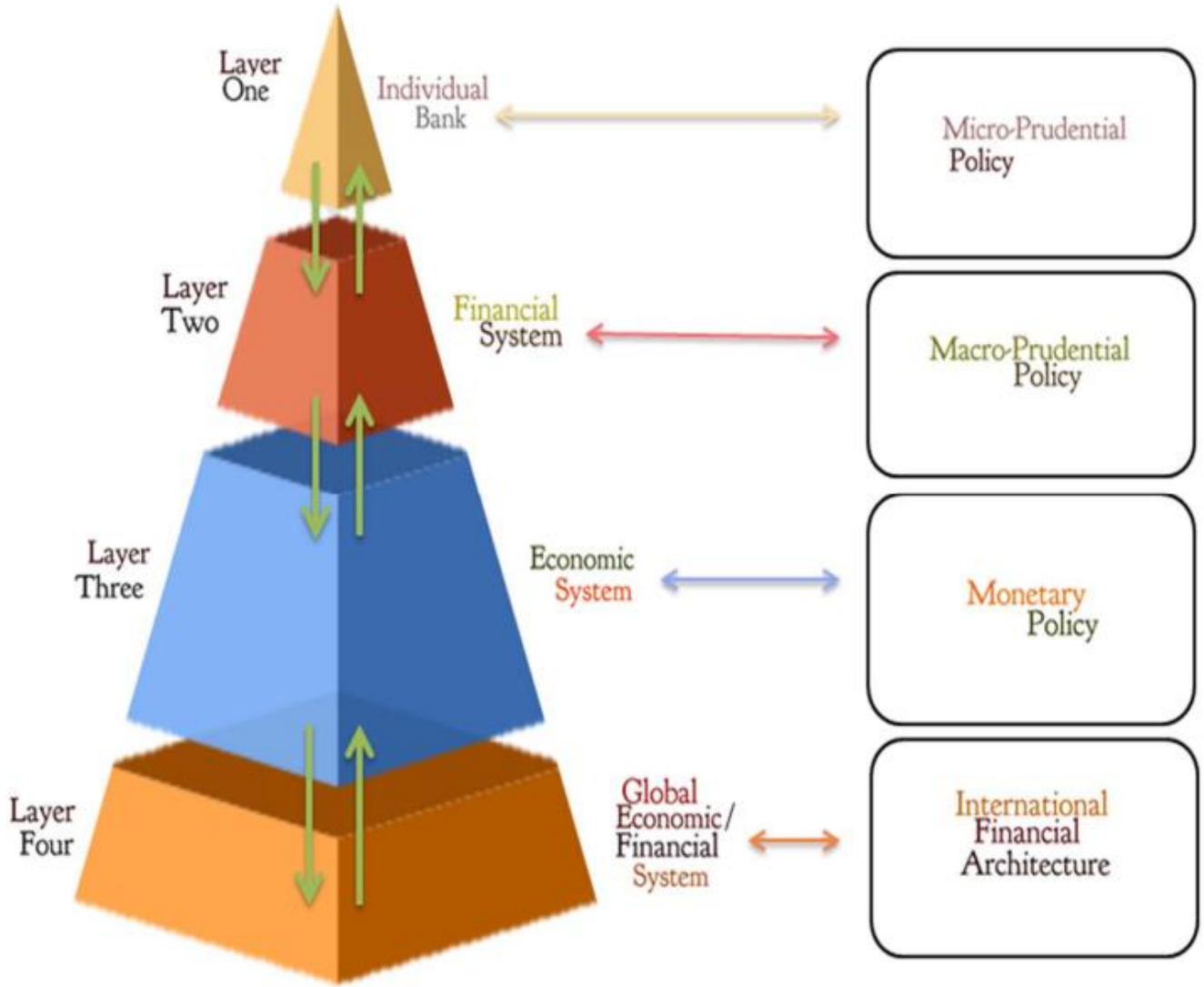
- Policies should remain flexible and focused on addressing vulnerabilities and rebuilding buffers where needed
- Reducing domestic and external imbalances while safeguarding against external shocks
- Preserving the gains from trade integration through balanced growth, trade initiatives and inclusive policies
- Sustaining long-term growth through structural reforms to deal with challenges from demographic transition and to boost productivity

Source: IMF. 2017. "*Regional Economic Outlook: Asia and Pacific Preparing for Choppy Seas April 2017*."

Section 2 Regulatory Trends

Megatrends in Geopolitics, Technology and Business models – KNOW YOUR CONTEXT

Financial Regulation Needs to Be Systemic and Not "Silos" – *Haldane (2015)*



Source: Haldane, 2015. "On Microscopes and Telescopes."

Systemic Risks

– FSB/BIS/IMF work since 2009

- Systemic risks defined as risk of disruption to financial system and real economy – focus on big issues and Black Swans
- Systemic importance related to size, substitutability and interconnectedness, with respect to financial vulnerabilities. Focus on transparency, leverage, market participant behavior, information asymmetry and moral hazard
- Solution was to monitor trigger events, macro and micro events, liquidity stresses, counterparty exposure, feedback loops, market co-relations, increase risk-mapping, stress tests, cluster analysis, portfolio approaches, new data collection

Securities Regulators' Role in Systemic Risks
– IOSCO (Feb 2011)

- 2007/9 global financial crisis exposed inadequacies of traditional role in transparency and disclosure, integrity, efficiency and fairness of securities markets and protecting investors from insider trading, market manipulation through business conduct regulation and corporate governance
- Post-crisis, recognition that there was need to monitor, manage and mitigate systemic risks
- Need to identify macro-prudential issues
- Need better understanding of business models and incentives that generate systemic risks

Where Regulation has Succeeded

- Higher capital ratios – aggregate common equity tier one ratio for all G-SIBs, more than 11% at end-2015, double 2009 ratio (FSB)
- Defined liquidity standards
- Pushing Total Leverage Ratios
- Corporate Governance changes
- Greater attention on conduct, especially AML, Terrorist Funding, Sanctions, Corruption and Cyber-security

Where Regulation has Flaws – Talk Macro; Act Silo

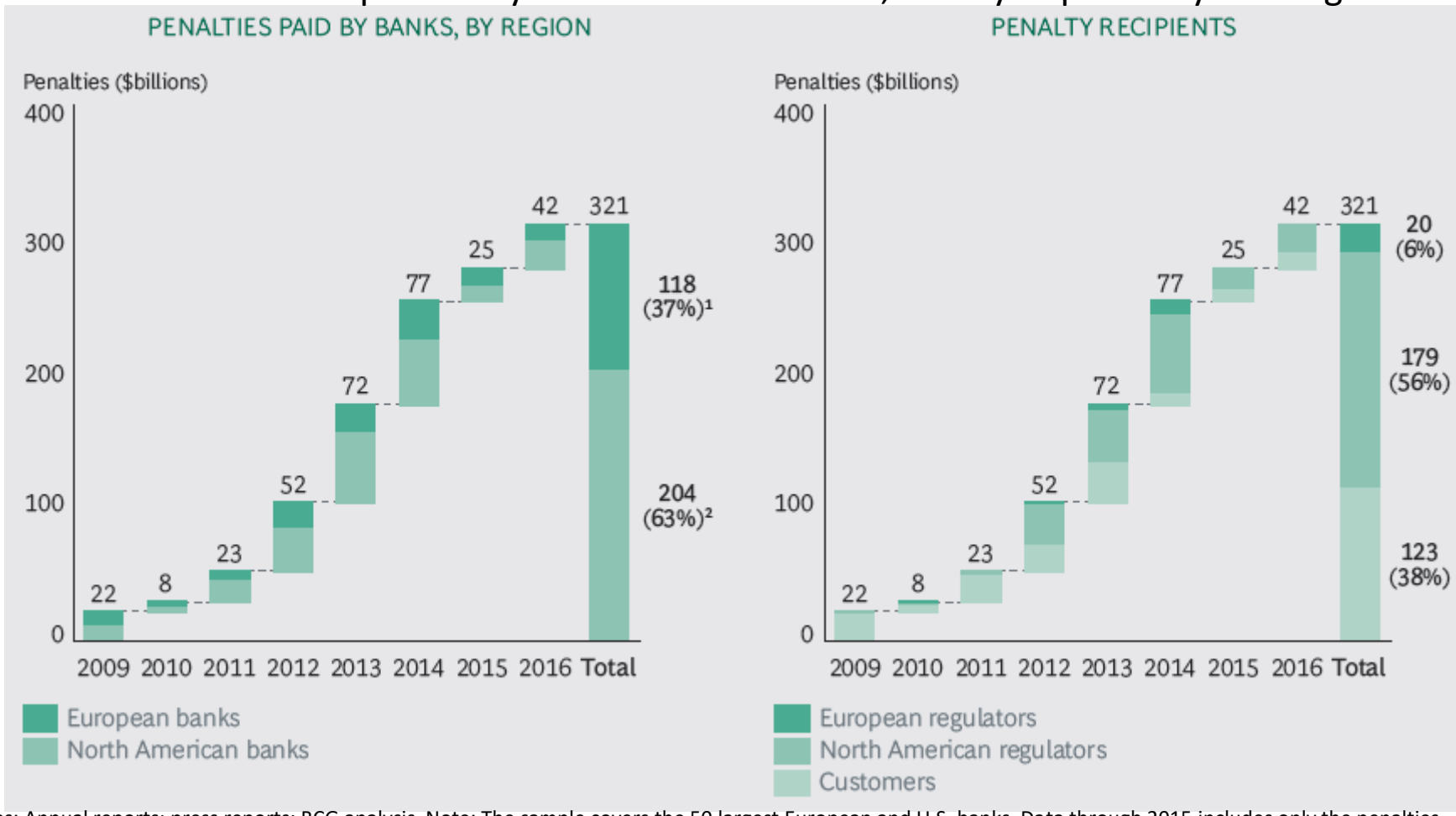
- Traditional finance business model under stress as ZIRP and negative interest rates + FinTech disrupt Net Interest Margins
- Currently applied regulation pro-cyclical – causing market fragmentation, illiquidity in patches, de-leveraging even as real economy needs funding for structural change
- Bankers are micro-managed, huge reputational risks with no such restraints on remuneration outside banking – loss of talent to FinTech and non-regulated sectors
- Operational risks – banks have huge obsolete legacy IT systems, inefficient and prone to cyberattacks, failure and non-interoperability
- Not enough room for outsourcing of back-office to efficient operators
- Cybersecurity – another case involving system-wide attention

Blindspots and Perimeter Issues

- Role of NBFIs (securities regulators as primary regulators) in assisting banks to generate systemic risks
- Inter-connectedness of global market place (and role of large capital flows)
- Regulatory arbitrage into areas of less oversight
- Product innovation and complexity
- Conflict of interests
- Procyclicality of markets
- Concentration, Liquidity and contagion risks in OTC markets
- Accumulation of risks in Off-balance sheet and Offshore entities – who and how to monitor

Capital Raised Since GFC Went to Fines – Mostly about Sanction-breaking!

Penalties for noncompliance by banks have escalated, mostly imposed by U.S. regulators



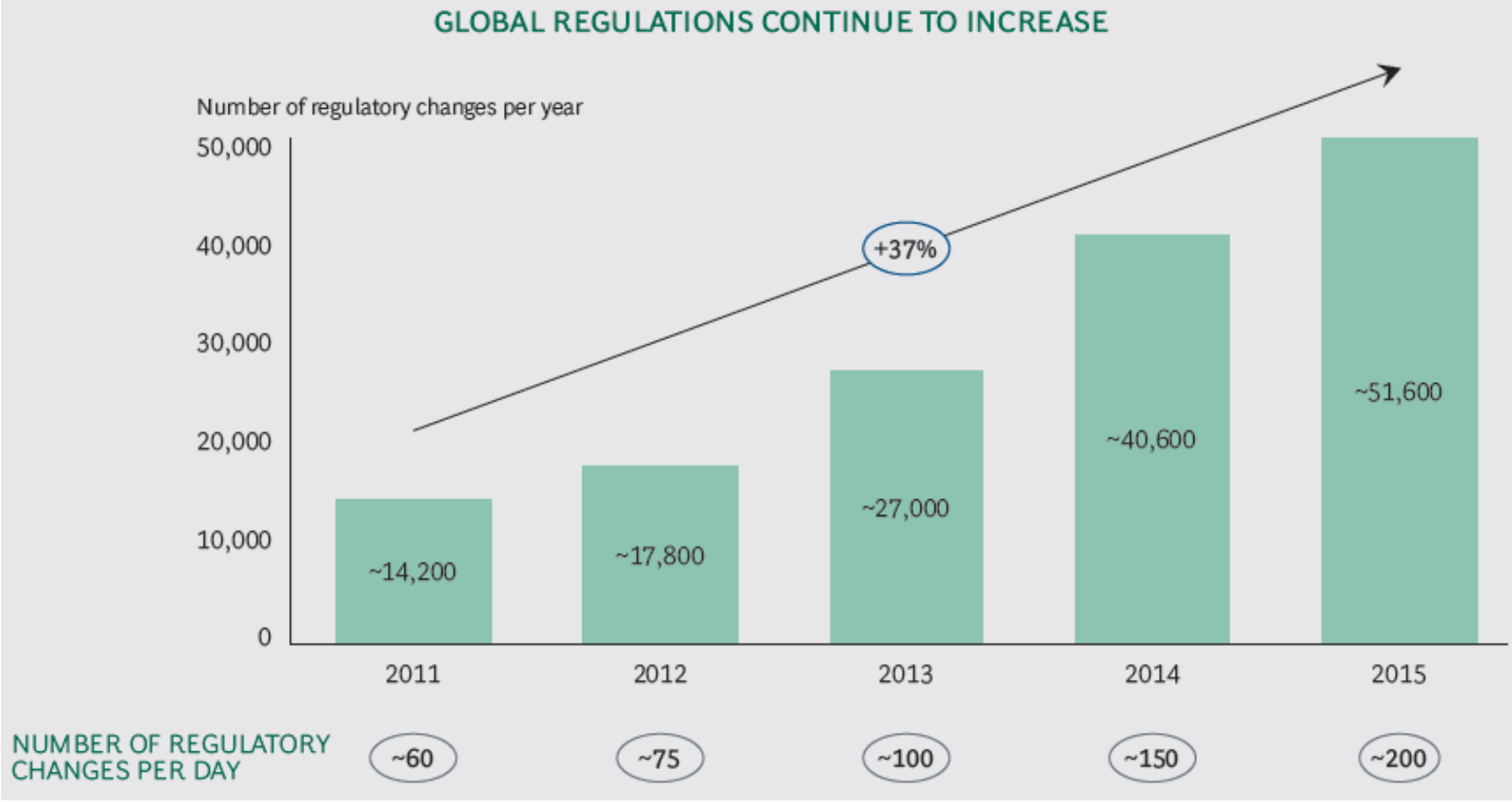
Data sources: Annual reports; press reports; BCG analysis. Note: The sample covers the 50 largest European and U.S. banks. Data through 2015 includes only the penalties, fines, and settlements that surpass $50 million; data since 2015 includes only the penalties, fines, and settlements that surpass $20 million. Values may not add up to the totals shown because of rounding. 1 56% of these costs stem from U.S. regulators' legal claims. 2 85% of these costs stem from U.S. regulators' legal claims.

Source: BCG. 2017. "*Global Risk 2017: Staying the Course in Banking*."

Global Regulations have Tripled in Four Years!

– BCG analysis (2017)

Banks must adapt to greater regulatory changes, which have more than tripled over four years



Data sources: Thomson Reuters; BCG analysis. Note: Regulatory change is defined broadly here to include any new local, national, or international policy, ruling, reform, action, law, ban, comment, announcement, publication, or speech that the compliance department of a bank would be expected to note and monitor.

Source: BCG. 2017. "*Global Risk 2017: Staying the Course in Banking*."

US Treasury Review of Financial Regulations
– (June 2017)

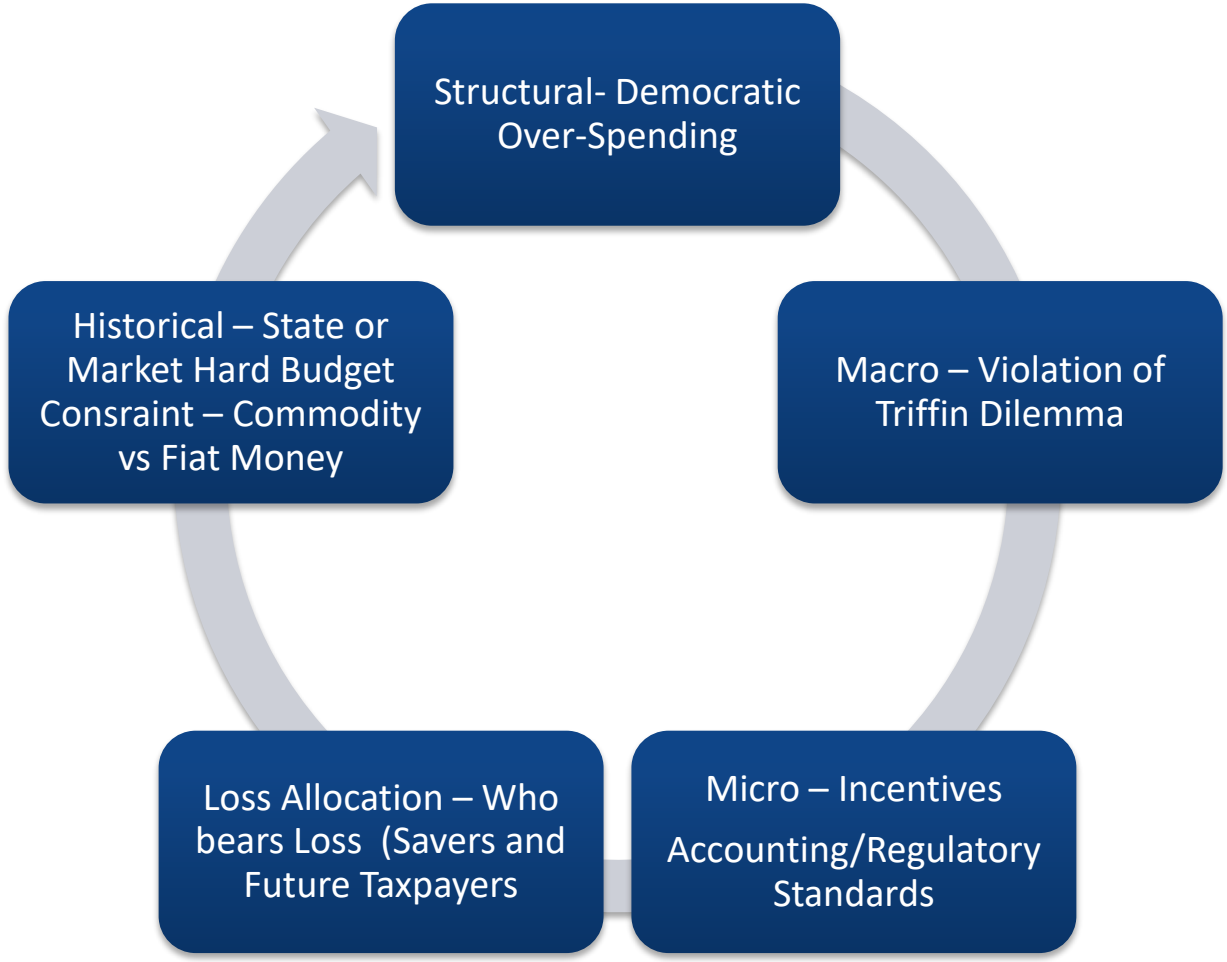
Core Principles:

1. Empower Americans to make independent and informed choices in marketplace, save for retirement, and build individual wealth
2. Prevent taxpayer-funded bailouts
3. Foster economic growth and vibrant financial markets Enable American companies to be competitive with foreign firms in domestic and foreign markets
4. Advance American interests in international financial regulatory negotiations and meetings
5. Make regulation efficient, effective, and appropriately tailored
6. Restore public accountability within Federal financial regulatory agencies and rationalize the Federal financial regulatory framework

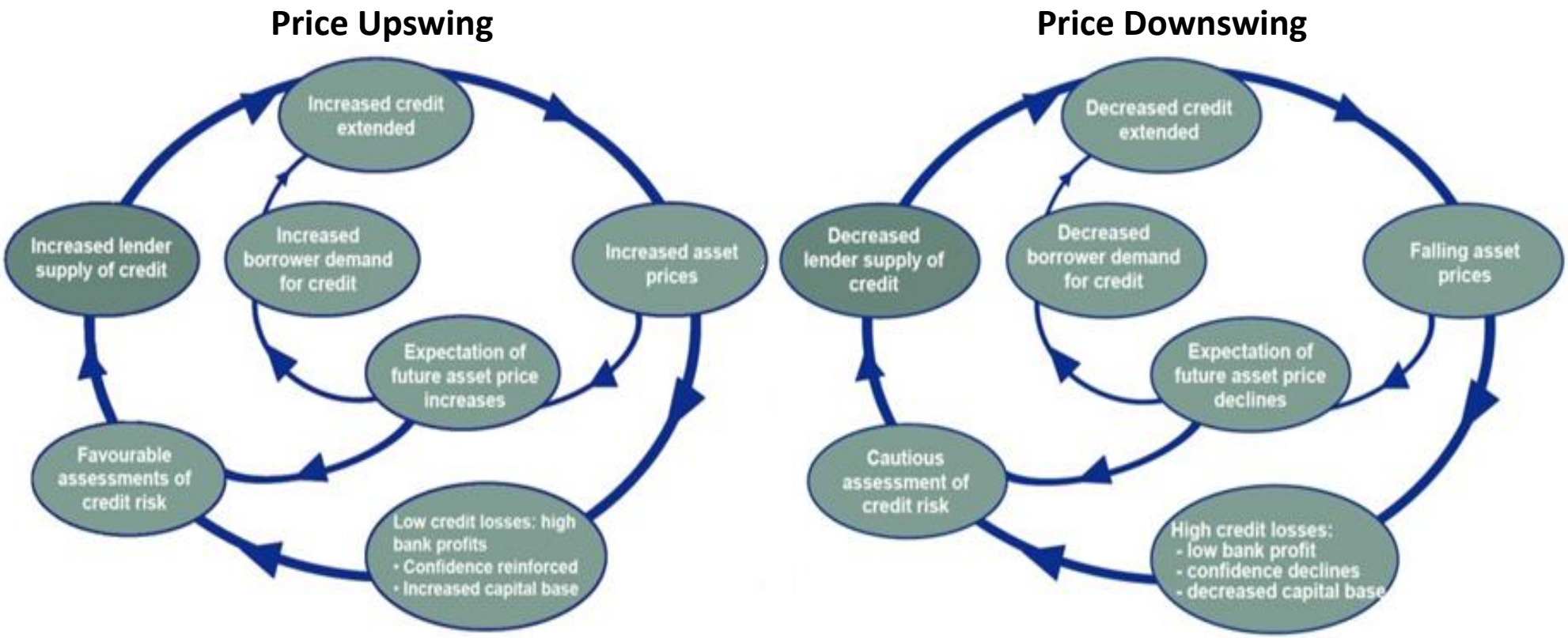
Alignment of Regulation with Core Principles – *Best Fit, Not Best Standards!!!!*

- Breaking the Cycle of Low Economic Growth
- Better fulfilling Credit needs of Consumers & Businesses
- Aligning the financial system to help support US economy
- Reducing regulatory burden by decreasing unnecessary complexity
- Tailoring regulatory approach based on size & complexity
- Aligning regulation to support market liquidity, investment & lending in US economy
- Preventing Taxpayer-funded Bailouts and Maintaining Safety & Soundness of Financial System, through:
  - Explicit, measurable capital & liquidity standards
  - Supervised stress-testing tailored to complexity
  - Actionable living wills

Crisis Must be Seen from Complex, Interconnected, Interactive Systemic View



Financial Market Systemic Risks Originate from Dynamic Interactions Among Domestic & Global Participants – *Adair Turner*



Source: Turner, et. al. 2010. "The Future of Finance: The LSE Report."

Elephant in Room is Real Estate (3 times GDP)

– Wealth Loss Shock Create Solvency Crisis Exacerbated by Liquidity Crisis

- 2007-2009 – US real estate value (Flow of Funds data) dropped $7.5 trillion or 18.7%
- Real estate value dropped from 282% of GDP in 2007 to 232% of GDP in 2009, decline of 50% of GDP
- Financial sector capital in 2009 was $5.6 trillion
- Hence, not surprising some banks went under
- Since 2007, many countries still do not have balance sheet data on property market!
- Concentration creates balance sheet fragility! Crowded exits can only be solved by central bank liquidity, but shifts credit risk to central bank

Global Imbalance Shifting: Between 1997-2014, surplus countries shifted from China + Oil Producers to Europe

%World GDP		1997	2007	2014			1997	2007	2014
Deficit countries	Assets	48.7	70.5	69.1	Surplus countries	Assets	12.3	22.6	18.3
	Liabilities	55.1	87.9	81.6		Liabilities	15.0	18.1	21.6
	NIIP	-3.2	-7.6	-13.3		NIIP	5.0	7.8	9.0
US	Assets	17.9	36.5	31.6	China	Assets	3.0	4.3	8.2
	Liabilities	20.5	38.8	40.6		Liabilities	2.1	2.2	6.0
	NIIP	-2.6	-2.3	-9.0		NIIP	0.9	2.1	2.3
Euro area except Germany	Assets	20.6	17.6	25.8	Japan	Assets	9.3	8.9	10.0
	Liabilities	21.2	27.1	25.7		Liabilities	6.1	5.4	6.3
	NIIP	-0.3	-4.4	-4.2		NIIP	3.8	4.2	4.4
UK	Assets	10.2	16.3	11.7	Germany	Assets	n/a	9.4	n/a
	Liabilities	13.4	22.0	15.2		Liabilities	6.8	10.6	9.4
	NIIP	-0.3	-1.0	-0.1		NIIP	0.3	1.5	2.3

Notes: 2013 data for Euro area exc Germany, UK, and Germany in 2014 due to delay in reporting by Eurostat.
Data sources: US BEA, China SAFE, Japan MoF, Eurostat, Deutsche Bundesbank, World Bank.

Changing Business Model of Investors and Intermediaries

- Systemic risks are often related to market risks – sudden shifts in sentiment, driven by uncertainty
- The fundamental systemic risk is: *If credit free risk (sovereign debt) is zero, who is going to pay banks, fund managers, pension funds 1-1.5% intermediation fees, without incurring substantial additional risks?*
- As equity and bond returns get lower with lower interest rates (largely managed by central banks using QE or UMP), FX market volatility become attractive as asset class, but FX market is highly leveraged through margined trading and causes large capital flows

FSAP Key Recommendations on Indonesia

– IMF (June 2017)

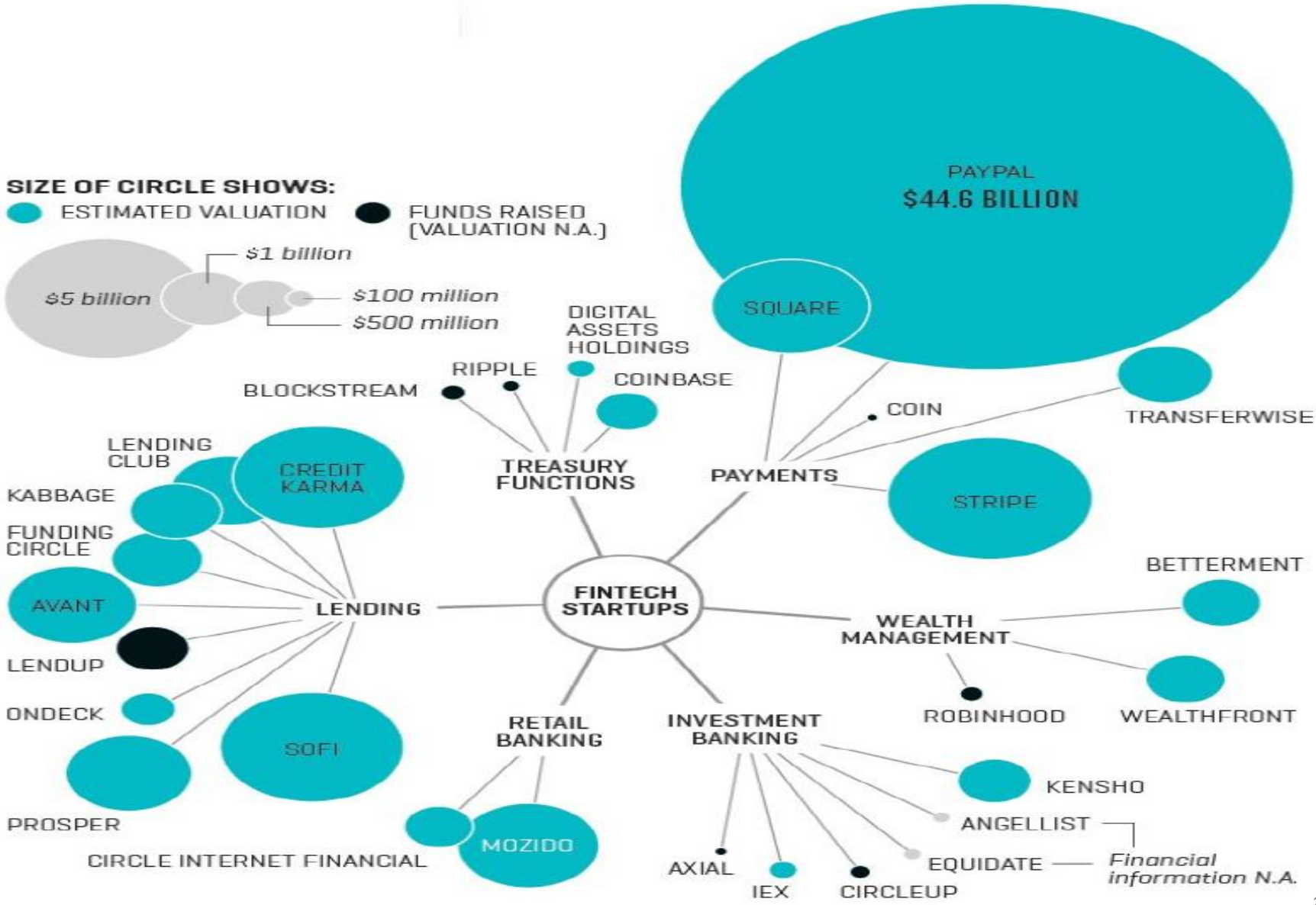
1. Institutional and legal arrangements – Revise OJK Law, BI Law and LPS Law to safeguard financial stability and macropru mandate. Amend Insurance Law to specify policyholder protection
2. Systemic risk monitoring and prudential policy
3. Financial sector oversight – Reduce OJK's silo structure
4. Governance of financial conglomerates
5. Crisis management and resolution, and safety nets
6. Financial integrity
7. Financial deepening and inclusion

Source: IMF. 2017. "*Financial System Stability Assessment—Press Release And Statement by the Executive Director for Indonesia*." IMF Country Report 17/152.

Section 3 Disruptive Technology on Finance

Changing Business Model, Disruptive FinTech, Impact on financial institutions from foreign and macro issues, Asian finance structural issues
KNOW YOUR BUSINESS

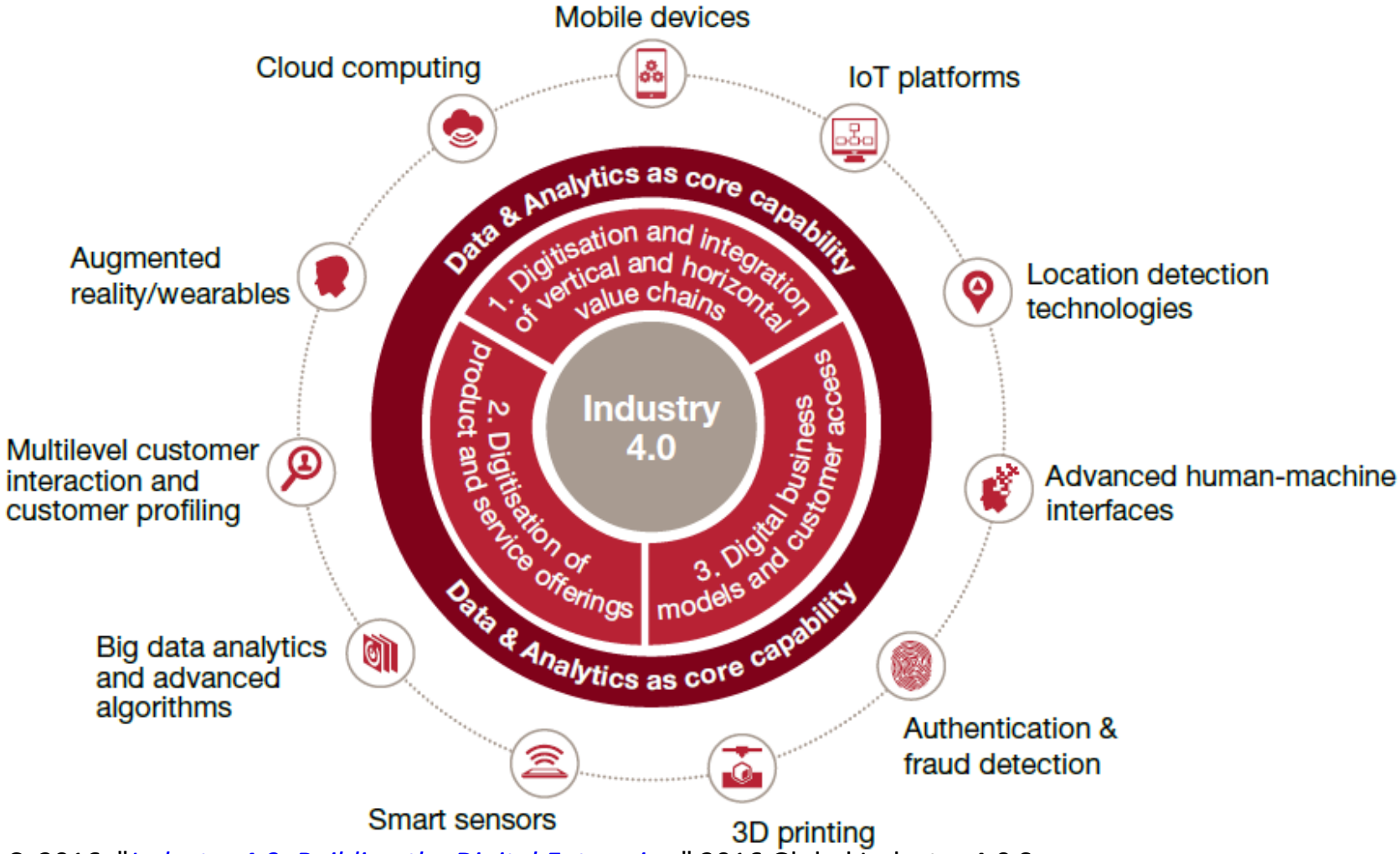
Disruption Everywhere



Note: Market data as of June 10, 2016. Data sources: CB Insights; Crunchbase; Funderbeam; Bloomberg, June 2016.
Source: OICU-IOSCO. 2017. "*IOSCO Research Report on Financial Technologies (Fintech)*."

Industry 4.0: Digitization as the New Business Model – *PwC 2016*

Industry 4.0 framework and contributing digital technologies



Source: PwC. 2016. "*Industry 4.0: Building the Digital Enterprise*." 2016 Global Industry 4.0 Survey.

Automation to Reach 50% of All Activities by 2037

Productivity growth from the steam engine

0.3%

1850–1910

Productivity growth from early robotics

0.4%

1993–2007

Productivity growth from IT

0.6%

1995–2005

Productivity growth from automation

0.8 to 1.4%

2015–2065

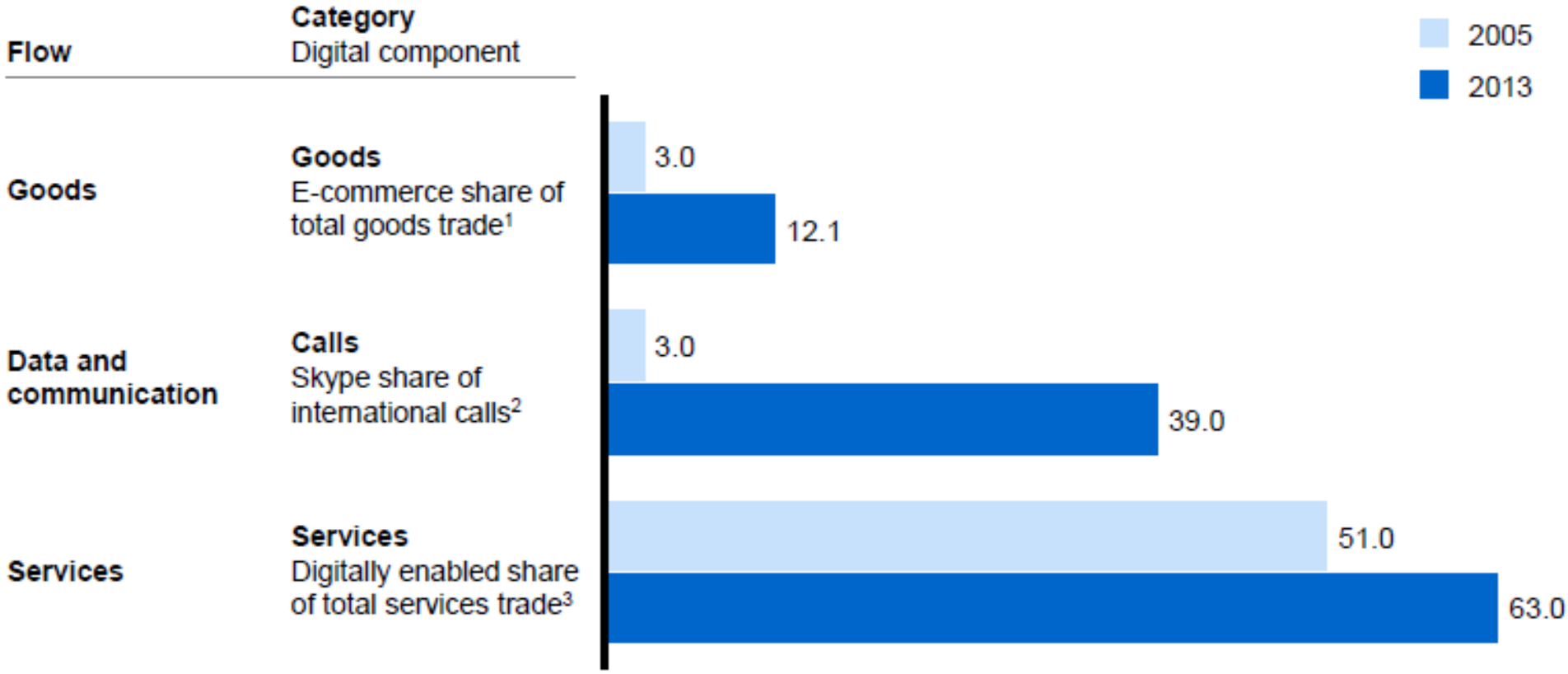
Adoption of robotics, artificial intelligence, and machine learning could give a bounce to the global economy, at a time of lackluster productivity growth and aging in many countries

Data source: McKinsey Global institute analysis.

Source: Manyika. "*Technology, Jobs, and the Future of Work*." McKinsey.

Digital Component has Growing Share of Global Flows

Share of selected cross-border flows that are digital, %



Note: 1 Based on China data; 2 Excludes other VOIP minutes; 3 Based on US data.
Sources: iResearch; Telegeography; OECD; US Bureau of Economic Analysis; McKinsey Global Institute analysis

Source: McKinsey Global Institute. 2014. "Global Flows in a Digital Age."

IOSCO: Global FinTech Landscape Mapped Across 8 Categories

Payments

- Payment processing, Money transfer Mobile payments, Forex, Credit cards, Prepaid cards, Reward programs

Examples: AliPay, Transferwise, PayPal, Square, Klarna, Lightspeed

Insurance

- Broking, Underwriting, Claims, Risk tools

Examples: Oscar, Insureon, Lemonade, Knip, Analyze, ClearRisk

Planning

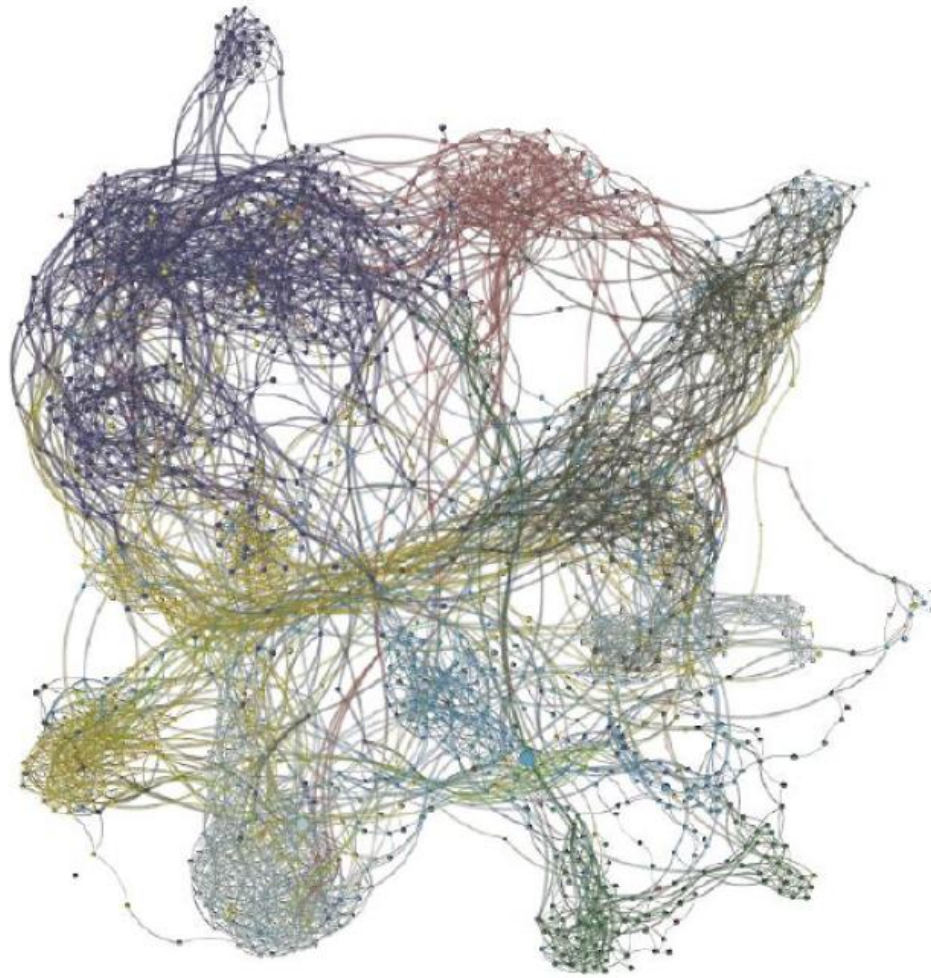
- Personal finance, Retirement planning, Enterprise resource mgmt., Tax & budgeting, CRM, Compliance & KYC, Data storage, Infrastructure services

Examples: Strands, Slice Techologies, Mint

Lending / Crowdfunding

- Crowdfunding platforms, Peer-to-peer lending, Mortgages & corporate loans

Examples: Avant Credit, SoFi, Asset Avenue, Lending Club, Funding Circle, DianRong, Kabbage



Blockchain

- Digital currency, Smart contracts, Payments & settlement via blockchain, Asset tracking, Identity mgmt., Blockchain protocol developers

Examples: Coinbase, Ripple Labs

Trading & Investments

- Investment mgmt., Roboadvisory, Trade pricing & algos, Trading IT, Trading platforms, Brokerage, Clearing

Examples: Succession Advisory, Wealthfront, Motif Investing, Nutmeg, Fuscent

Data & Analytics

- Big Data solutions, Data visualization, Predictive analytics, Data providers

Examples: Credit Benchmark, Solovis, Zenefits, DocuSign, Kreditech

Security

- Digital identity, Authentication, Fraud mgmt. , Cybersecurity, Data encryption

Examples: Bit9, Veracode, TeleSign

Visualization based on ~1,800 FinTechs receiving the highest amount of private funding. Dataset mapped with Quid and allowed to cluster based on similar products, technologies, customers etc. 1) Data based on over 8,800 companies which were discovered across over 10 data sources. Total funding based on date of funding. Total companies based on founding year. Data as of November 2016. Data source: Fintech Control Tower, Expand, November 2016.

Source: OICU-IOSCO. 2017. "*IOSCO Research Report on Financial Technologies (Fintech)*."

All Financial Intermediaries Under Pressure

Pressure points and value are shifting across the securities industry
Total value captured 2016 $BN, Outlook to 2019

		Banks & Broker Dealers	Traditional Asset Managers	Hedge Funds & Alternatives	Market Infrastructure[1]	Boutiques & specialists[2]
Investment management	Retail service[3]	--	$30 - 35BN	< $2BN	--	~ $10BN
	Research, solutions, active management	~ $15BN	~ $105BN	~ $60BN	~ $25BN	~ $5BN
	Beta provision and administration	--	~ $80BN	~ $8BN	~ $50BN	--
Trading	Financing	~ $35BN	< $2BN	--	< $2BN	< $1BN
	Market connectivity	~ $35BN	$8 - 10BN	$20BN	~ $20BN	--
	Risk warehousing and recycling	~ $65BN	--	< $2BN	--	~ $5BN
Liability generation & advisory	Issuer risk transfer	~ $15BN	--	--	--	--
	Origination	~ $35BN	--	--	< $2BN	< $2BN
	Corporate advisory	~ $20BN	--	--	--	~ $10BN
Total value captured		~ $225BN	~ $225BN	~$90BN	~$100BN	~$35BN

Strong growth | Modest growth | Modest pressure | Severe pressure

1. Includes Inter Dealer Brokers, Exchanges, Central securities depositories, Custodians, Data providers. 2. Defined as organizations that participate in only one activity within this table, to include Non-Bank Liquidity Providers, specialist data providers and independent corporate advisory firms. 3. Represents the incremental costs borne by retail investors to access Asset Management services, not including retail distribution fees Data source: Oliver Wyman analysis.

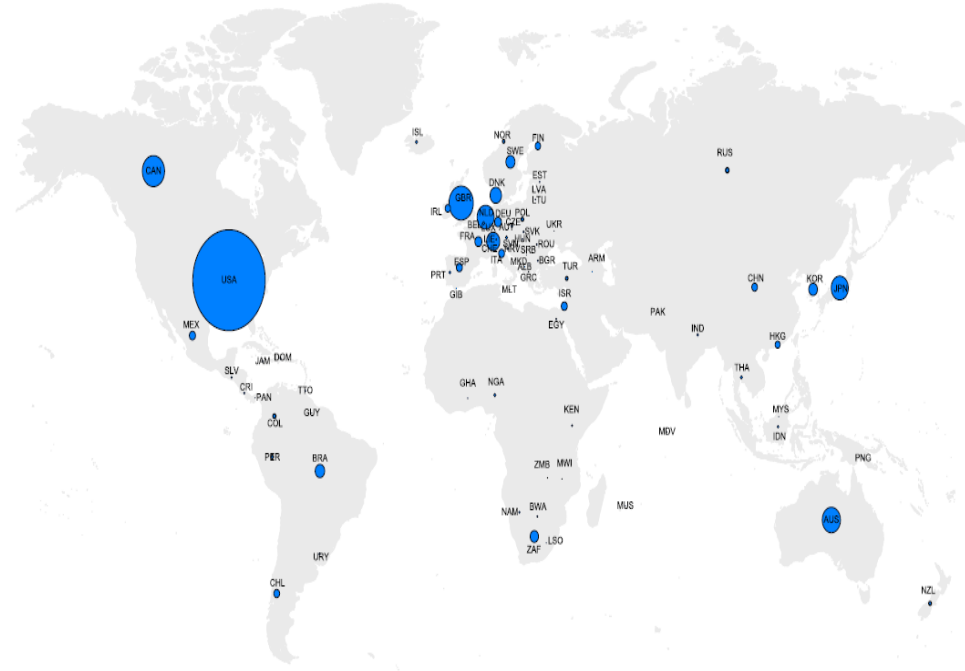
Source: Oliver Wyman & Morgan Stanley. 2017. "*The World Turned Upside Down*."

Asia Puts Large Part of Their Savings in Bank Deposits and Real Estate, Small Pension Funds

Market depth by countries, 2016

Data source: McKinsey.
Note: Includes outstanding equity, financial and corporate bonds, government bonds and securitized products.

Size of global private pension investments, 2015



Data source: OECD Global Pension Statistics.

Source: Roman. 2017, April 12. "*Deeper Capital Markets Hold Key to Asia's $800 Billion Question*." Bloomberg.; OECD. 2016. "*Pension Markets in Focus*."

What Business are You In?

1980s – Global Banking?

1990s – Finance Supermarket? – still only financial services

2000s – Platform for Cross-selling + Finance

– Clicks moving faster than bricks

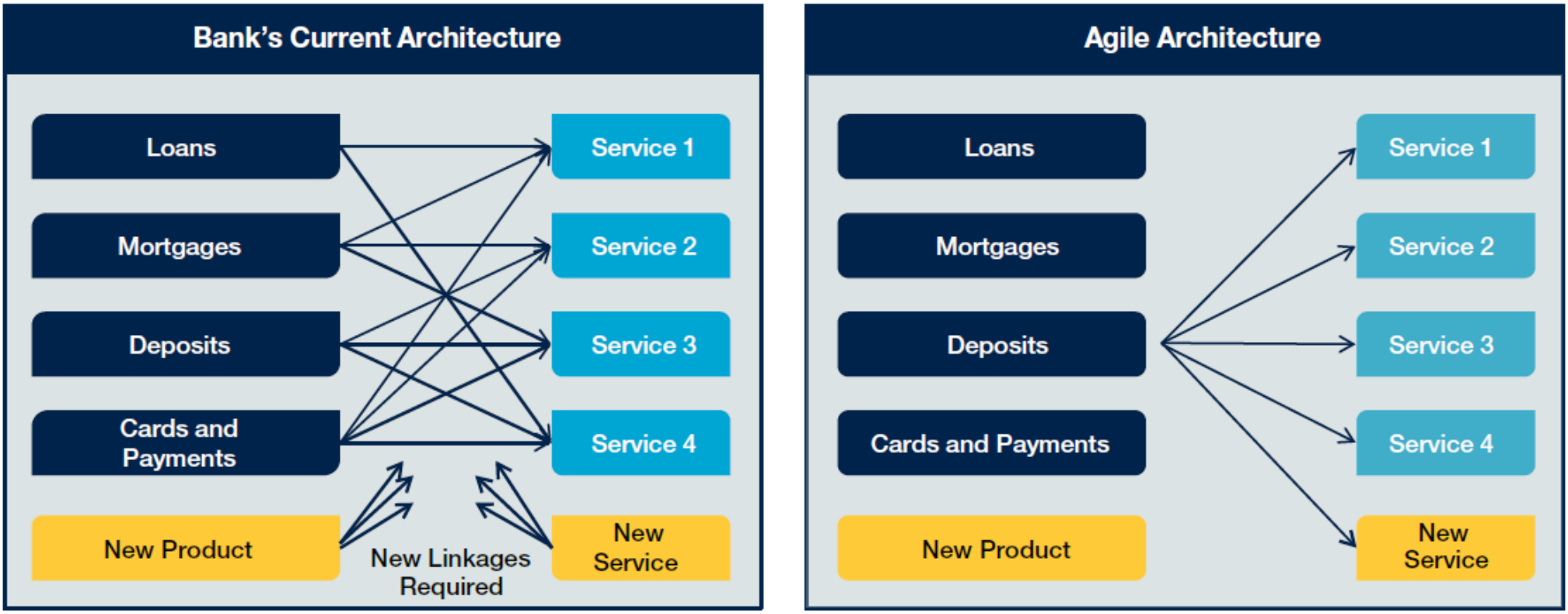
2020 – Information business? How much time do bankers spend on understanding their customers?

How do you make money from Digitization of services, when Net Interest Margin declining under NIRP?

Central bankers are taking away your lunch; regulations are squeezing your lunch; Fintech is eating your lunch and some of you may still be out at lunch

Increasing Pressure for Banks to Migrate Legacy Systems to More Agile Architectures

Agile Architecture Illustration



Data source: Capgemini Financial Services Analysis, 2015; "Simplifying the Banking Architecture", Capgemini, November 2015.

Source: Capgemini. 2016. "*Top 10 Trends in Banking in 2016: What You Need to Know*."

Risks Arising from Digital Currencies…

– BIS CPMI (2015)

- Future value of digital currencies (DC)
  - DC do not have intrinsic value but instead depend upon user perceptions of value
  - Greater volatility and risk of loss in value
- Risk of fraud – if codes used to access digital wallets are stolen, consumers are likely to suffer loss
- Operational risk – divergence between nodes in network in relation to the ”agreed” version of the ledger
- Legal risk – liability issues in event of fraud / counterfeit
- Settlement risk – managing liquidity in digital currencies
- Used for money laundering and other criminal activities

Source: Committee on Payments and Market Infrastructures. 2015."*Digital Currencies*." BIS.

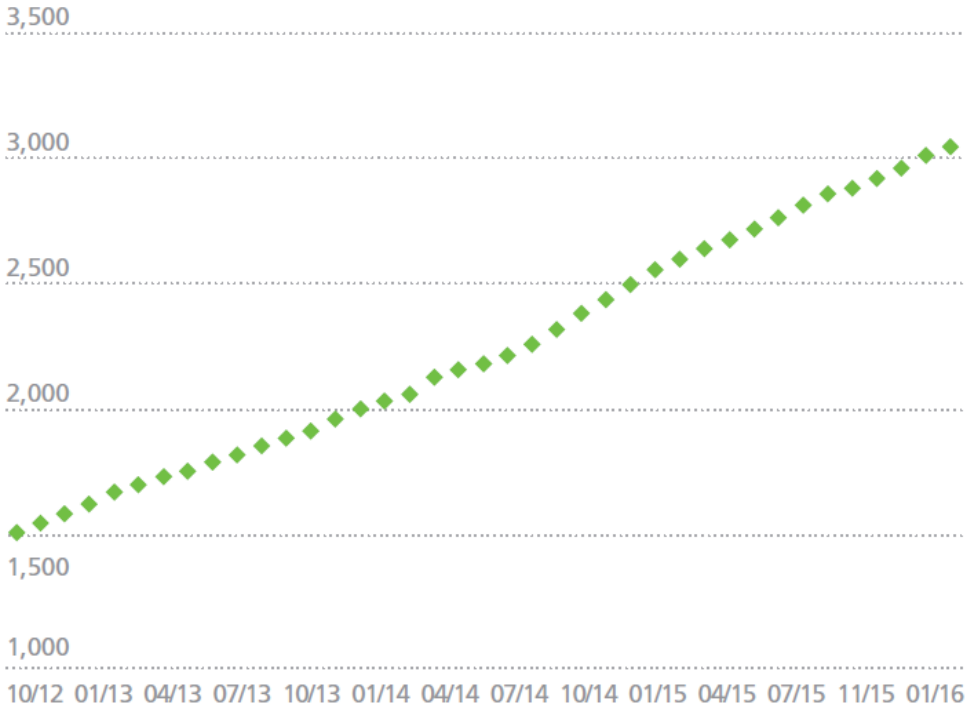
Regulatory Approaches to Digital Currencies

- Globally coordinated approach important for regulation to be fully effective
- Three aspects: Consumer protection, prudential rules for stakeholders, specific operating rules for payment mechanism
- Five categories of national action:
  1. Information / moral suasion to highlight risks
  2. Regulation of specific entities
  3. Interpretation of existing regulations
  4. Broader regulation
  5. Prohibition

Source: Committee on Payments and Market Infrastructures. 2015."*Digital Currencies*." BIS.

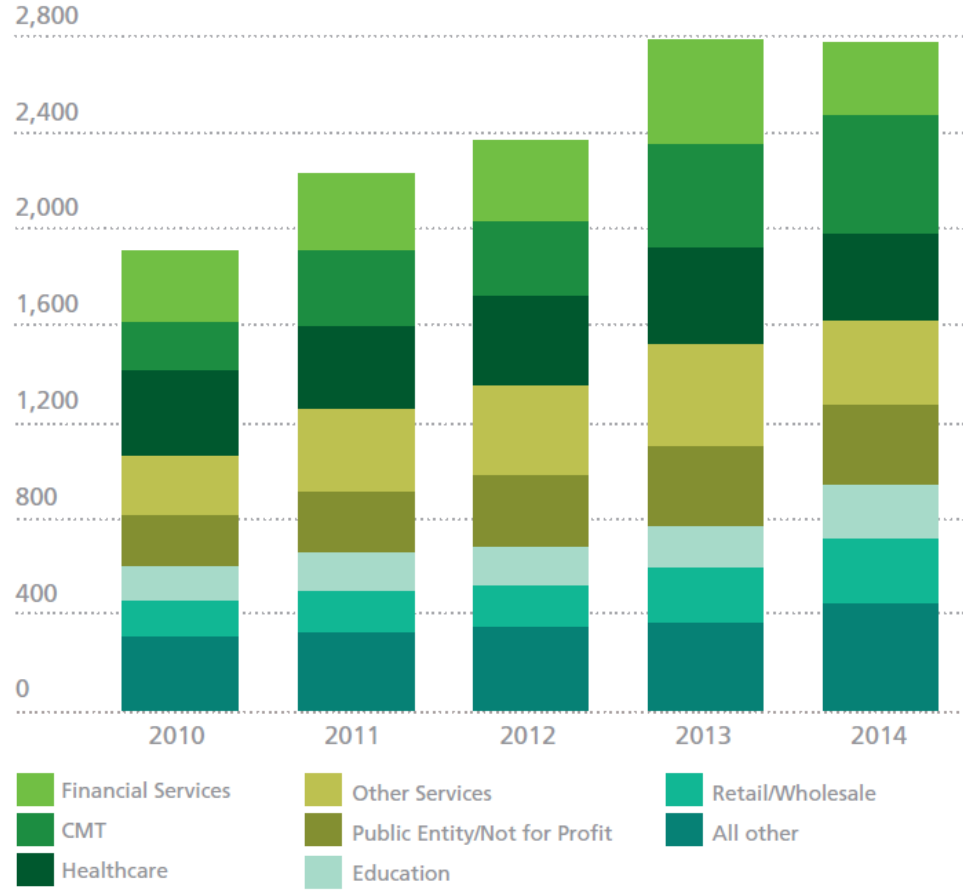
Cyber Incidents Worldwide Estimated to Increase Dramatically

Index of Cyber Security, October 2012 to December 2015



Data source: Index of Cyber Security.

Cyber incidents per industry



Data source: Advisen

Source: TheCityUK & Marsh. 2016. "Cyber and the City: Making the UK Financial and Professional Services Sector More Resilient to Cyber Attack."

World Faces Three Levels of Cyber Threat

1. **Fraud**. Majority of cyber incidents today. **E**xtortion, identity theft and crimes targeting customers or employees. 75% of fraud estimated to be cyber-enabled
2. **Firm take-down**. Large-scale data theft, system disruption and damage, where a firm is targeted for personal or political reasons. **P**erpetrator may be hostile state, terrorist, anti-capitalist, disaffected employee or mischief-maker
3. **System failure**. Incident affecting multiple institutions, e.g., concerted attack on several firms, failure of payments system or a failure of national infrastructure that the financial sector relies on (e.g., power grid). **S**econdary exposure to attacks on sectors where they have balance sheet positions. 'Blackout' or 'cyber hurricane' scenarios create huge reputation or actual damage

Source: TheCityUK & Marsh. 2016. "Cyber and the City: Making the UK Financial and Professional Services Sector More Resilient to Cyber Attack."

Concluding Remarks

- Finance Industry is already stressed by disruptive technology, complex geo-politics, social stress and onerous regulations
- Regulators need to move to stewardship – guiding them through these complex times and ensuring that the financial industry and markets enforce corporate governance
- We need to encourage Self-Discipline, Market Discipline, and Regulatory Discipline, plus good values
- Pick Important Problems, Fix Them and Tell everyone

Thank you

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