

Managing Central Bank Risk— the Micro, the Macro, and the Nano

Dr. Peter Stella

Presentation at the 12th Central Banks Risk Managers' Conference:
Economic Capital Framework of Central Banks
Mumbai, 17 November 2016

Contact information pstellaconsult@gmail.com



Outline of the Presentation

1. Introduction

Discussing central bank equity and risk

2. Micro Risk

The hybrid nature of central bank “business” models

3. Macro Risk

Balance sheet vulnerabilities

3.1 Foreign exchange management

3.2 ELA and UMP operations

4. Nano Risk


A virus most deadly

5. Conclusion



Section 1. Introduction

Discussing central bank equity and risk



Central Bank Equity and Risk Management— issues rather badly understood

“I am aware that there are those who do not fully understand, from an economic perspective, why the central bank should be concerned about the soundness of its capital base.”

*Mr. Toshihiko Fukui, Governor of the Bank of Japan,
speech at the Spring Meeting of the Japan Society of Monetary Economics,
Tokyo, June 1, 2003*



A difficult subject...

- *“We found no widely accepted, analytically based criteria to show whether a central bank needs capital as a cushion against losses or how the level of such an account should be determined.”*

United States General Accounting Office (2002)

- *“A large negative net worth...is likely to compromise central bank independence and interfere with its ability to attain policy objectives.”*

Stella (1997) Do Central Banks Need Capital? IMF WP/97/83



Policy objectives ultimately shape risk management

- *The reputation of the central bank rests largely on the attainment of policy objectives. Financial reporting...the last section of the “Annual Report”.*
- *Traditional central bank financial reporting is, in form, quite similar to the way in which privately owned banks report even though one might argue that presenting a profit and loss account for an entity legally assigned public policy objectives is nonsensical.*
- *Functional financial reporting, explaining the efficiency with which the bank has worked toward its various objectives, provides stakeholders a richer understanding of central bank operations than the “bottom line”.*
- *Diverse objectives, governance, and accountability arrangements*



Those enviable halcyon days are over...

- *“The Bundesbank profit is a residual issue for me and my colleagues...I don't enter into any strategic considerations about Bundesbank profits, neither in the morning, afternoon or evening.”*

Axel Weber (former Bundesbank president) quoted by Reuters, March 15, 2005



Bank of Canada balance sheet

Bank of Canada
December 31, 2006
(in C\$ billions)

Assets		Liabilities	
Canadian Government Securities	48.3	Bank notes in circulation	48.8
Liquidity Providing Repos	2.9	Financial Institution (CPA) Deposits	0.0
Loans to CPA members	0.0	Government Operational Deposits	2.2
		Other liabilities net	0.2
		Equity	0.0
Total Assets	51.1	Total Liabilities	51.1

Source: Bank of Canada Financial Statements Annual Report 2006 and Author's calculations



Bank of Canada Act amended to augment capital with Special Reserve Fund

- In 2007 the Bank of Canada adopted IAS 39 and classified its t-bill portfolio as “Available for Sale”*
- Stress tests revealed that by 2017 the potential unrealized valuation loss might reach C\$ 400 million*
- Bank of Canada equity capped at C\$ 30 million since 1955*
- Act amended to permit the Bank’s Board of Directors to establish a special reserve fund up to C\$ 400 million*



What's so bad about negative equity anyway?

- *Canada decision logical and innocuous*
- *ECB non—IFRS solution, firm opinion on capital framework*
- *Czech Republic*
- *What do USA, Ecuador and Hungary have in common?*



Even when analytically demonstrated, requesting a recapitalization may entail significant risk

- *Following large foreign exchange revaluation losses, the Czech National Bank has large negative equity. It has chosen not to request additional capital as it believes, based on medium term balance sheet projections, that future profits will resolve the situation.*
- *CNB Board member wrote a paper (2005) justifying the approach and pointing to the dangers inherent in approaching the legislature for additional equity when it is not economically necessary.*
- *Until 2010 the Czechs believed that the ECB would allow the country to adopt the euro even though the CNB had negative equity. Subsequently the ECB, in the 2010 Convergence Report, stated that this was not possible.*



*National Bank of Hungary transferred net income to
Government in 1995!*

NBH
December 31, 1995
(in Hungarian Forint billions)

Assets		Liabilities	
Foreign Assets	1805	Foreign Liabilities	3240
Credit to Government	1130	Domestic Deposits	1466
Credit to Financial Institutions	287	Notes and Coins in Circulation	482
Other Assets	166	Other Liabilities	177
		Equity (35 percent of GDP)	-1978
Total Assets	3388	Total Liabilities	3387

Source: NBH Annual Report 1995 and Author's calculations



Section 2. Micro Risk


*The hybrid nature of central bank
“business” models*



Why do central banks have balance sheets?

- *Primarily to....*
- *Facilitate the secure, rapid and robust operation of wholesale and retail payments systems*
- *Execute foreign exchange management and financing*
- *Those two functions accounted for 95+ percent of the value of central bank balance sheets prior to Great Recession.*

Minimising Monetary Policy, BIS Working Paper # 330, Stella (2010)



The national payments system may be viewed as a public good with network externalities

Let us imagine at inception the treasury purchases a payments system and provides it to the central bank against an equity claim....

Central Bank Balance Sheet Micro Foundations #1

Assets		Liabilities	
Payments System Infrastructure	P	Equity (treasury claim)	P
Total Assets	P	Total Liabilities	P




Banks are provided reserves in order to enable real time gross interbank transfers

In order to make use of the payments system, banks constitute reserves at the central bank, usually borrowing them against collateral

Central Bank Balance Sheet Micro Foundations #2

Assets		Liabilities	
Repo Lending to Banks	R	Bank Reserves	R
Payments System Infrastructure	P	Equity	P
Total Assets	R + P	Total Liabilities	R + P




Retail payments are made with banknotes, the quantity demanded by the public is supplied by the central bank

Adding banknotes issued by the central bank, potentially an important part of the retail payments system, we complete the picture of the balance sheet

Central Bank Balance Sheet Micro Foundations #3

Assets		Liabilities	
Treasury Securities	B	CB Notes Outstanding	B
Repo Lending to Banks	R	Bank Reserves	R
Payments System Infrastructure	P	Equity	P
Total Assets	$R + P + B$	Total Liabilities	$R + P + B$



Microeconomic theory—public goods should be provided at marginal cost (close to zero)

- *Central banks would make chronic losses if.....*
- *The rate of return on banknotes were greater than or equal to the return on government securities (true in Eurozone today!)*
- *They provided credit at the deposit rate (or at lower rates)*
- *They did not cover the entire cost (average cost) of providing payments system services through charges*
- *They managed foreign reserves at zero net cost*




*In a steady state equilibrium, the treasury
prefunds operational expenditures in perpetuity*

In the steady state, the treasury provides just enough additional equity... through the provision of treasury securities to ensure a “balanced budget”. Interest on those securities covers operational expenditures (but not risk)

Central Bank Balance Sheet Micro Foundations #4

Assets		Liabilities	
Treasury Securities	$B + A$	CB Notes Outstanding	B
Repo Lending to Banks	R	Bank Reserves	R
Payments System Infrastructure	P	Operating Result (Σ)	$i(B + A) - dP - W \equiv 0$
		Equity	$P + A$
Total Assets	$R + P + B + A$	Total Liabilities	$R + P + B + A$



Any entity mandated by the state to provide a public good must be funded by the state

- *Payments systems services*
- *Research and statistics provided freely to the public*
- *Financial system regulation and supervision*
- *Consumer protection and education*
- *Fiscal services (if not separately charged)*




Furthermore, institutional and policy independence requires....

- *A balance sheet and framework of financial relations with its shareholders that enables the central bank to fund its operations directed at mandated policy objectives without ongoing government appropriations, without “creating money”, and without engaging in quasifiscal taxation*



Section 3. Macro Risk

Material balance sheet vulnerabilities

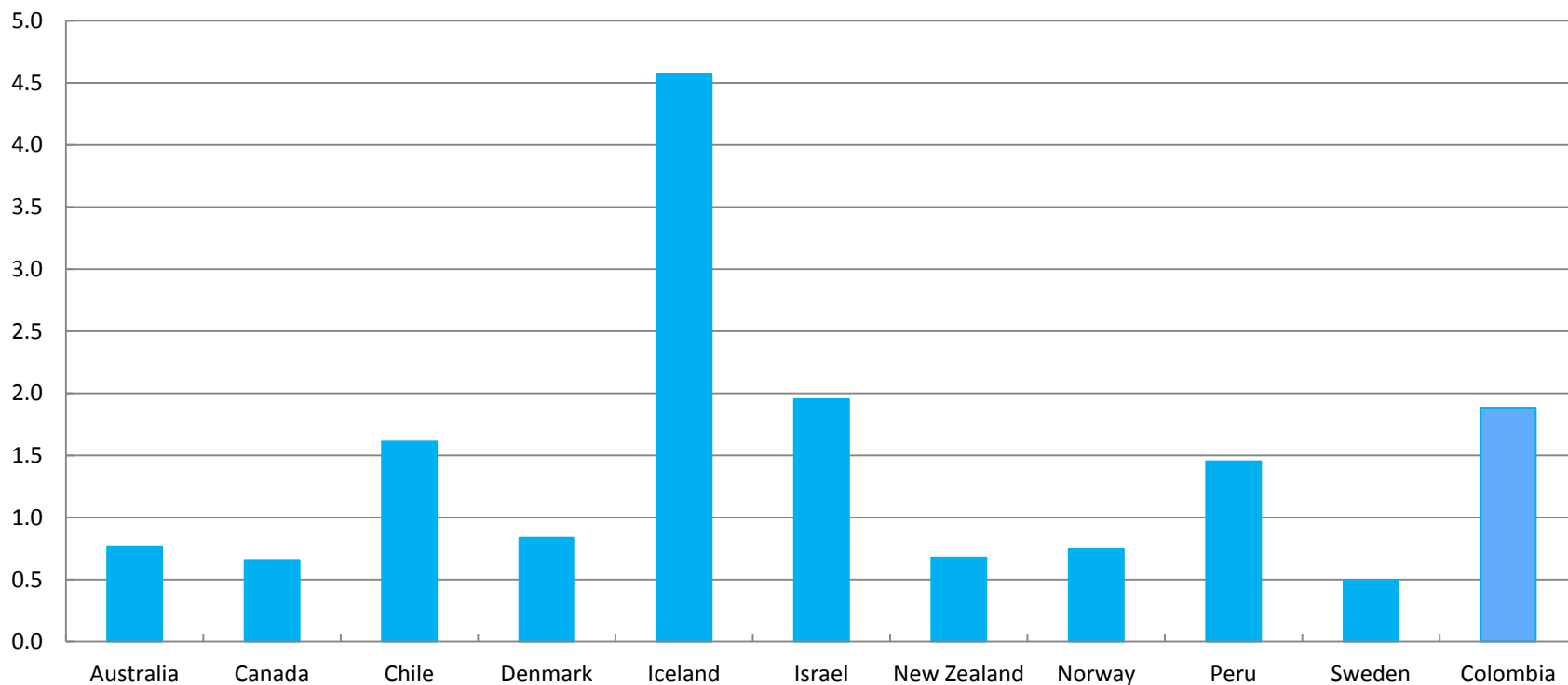


*Conventional monetary operations are small in normal times, so also might be the minimal size balance sheet
(median 1 percent of GDP)*

MMPA in percent of GDP assuming $r = i$ and $r = 4$ percent

(Data from 2012)

[Methodology: Stella(2010) BIS Working Paper #330]

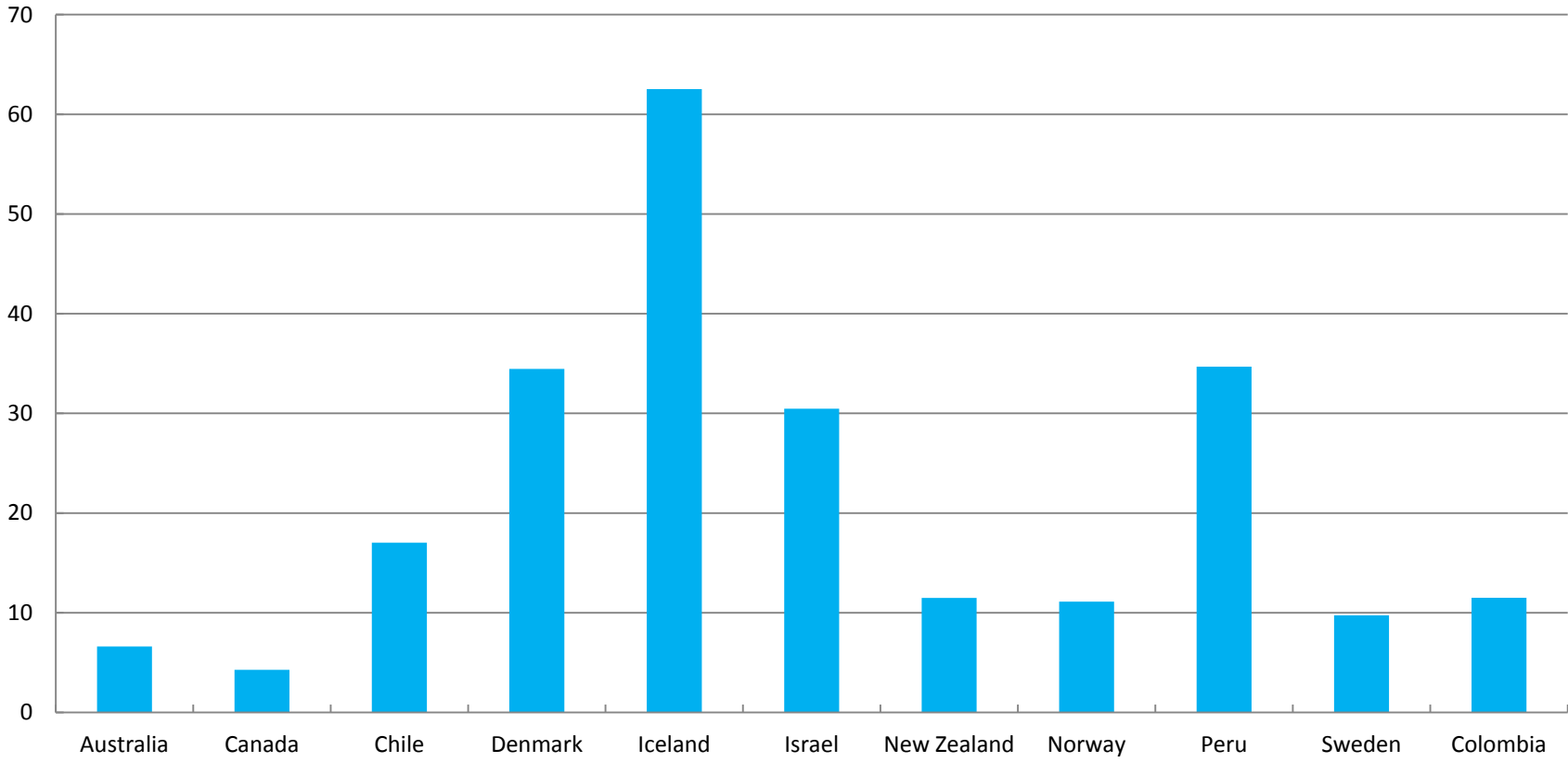




Why then are balance sheets so large?

(median of 12 percent of GDP)

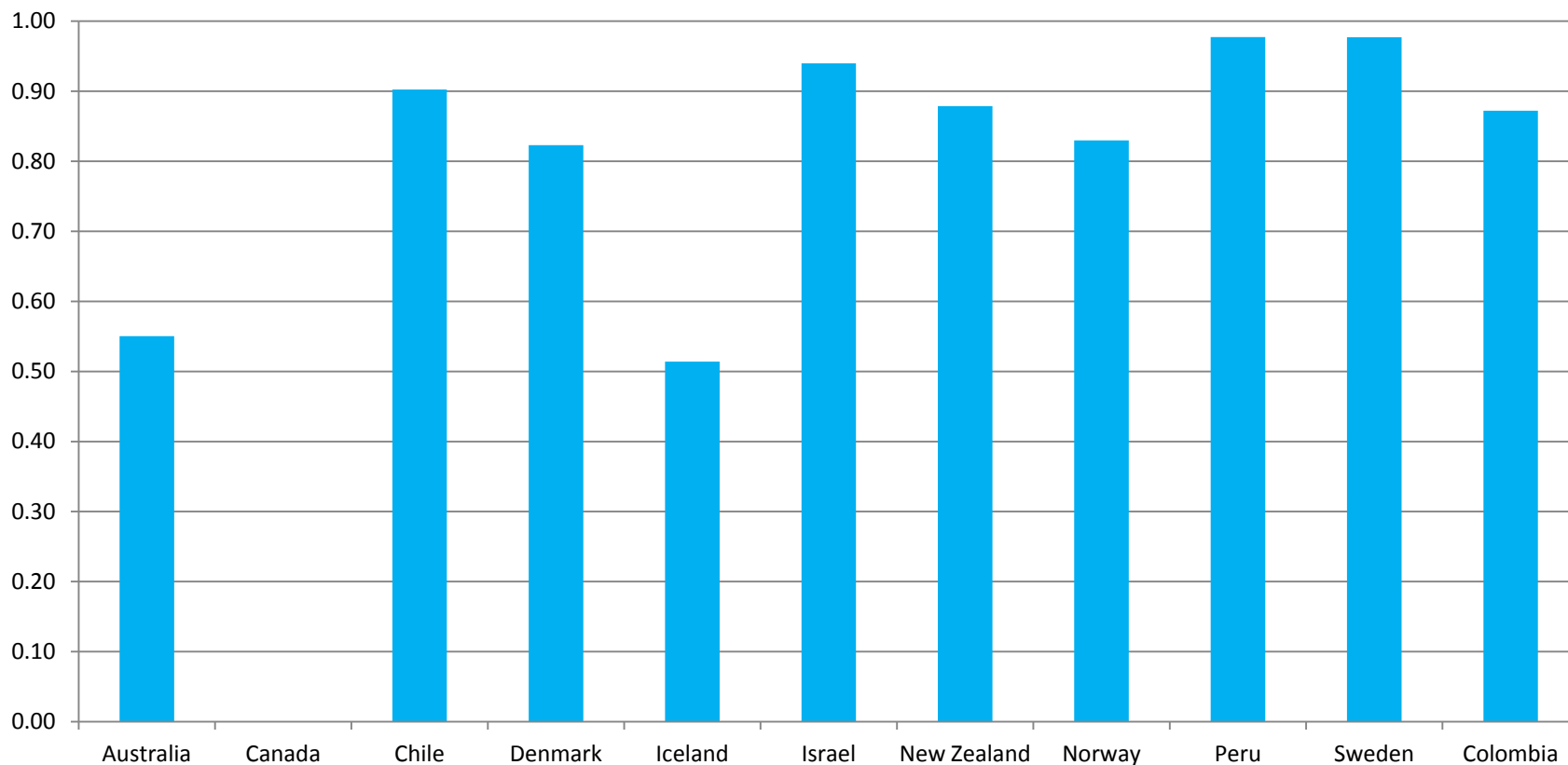
Ratio of Total Central Bank Assets to GDP
(2012 apart from Perú (2013))






Balance sheets are large owing to the consequences of banking crises and foreign asset accumulation

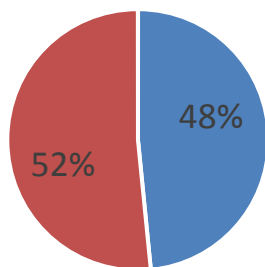
**Ratio of Central Bank Foreign Exchange Assets to Total Assets
(2012 apart from Perú (2013))**





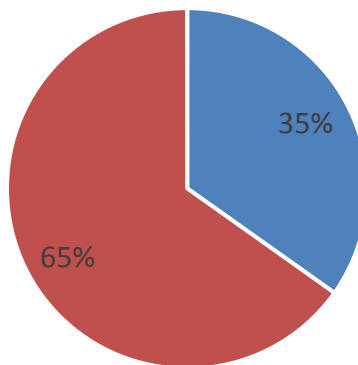
*As world foreign reserves have grown, central bank balance sheets have increased in size
(SDR 3 trillion in 2005, SDR 8 trillion in 2015)*

2005



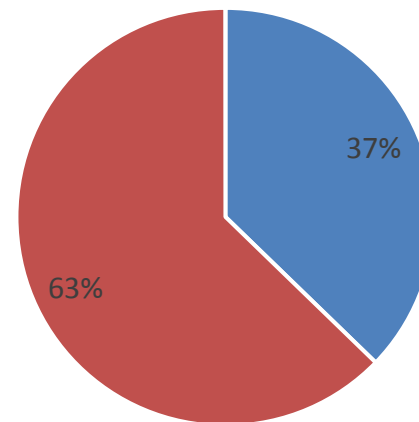
■ Advanced Economies
■ Emerging/Developing

2010



■ Advanced Economies
■ Emerging/Developing

2015



■ Advanced Economies
■ Emerging/Developing

Source: IMF International Financial Statistics



Section 3.1. Macro Risk FX

Material balance sheet vulnerabilities
Foreign exchange operations



How has central bank foreign exchange exposure been handled in some countries?

- Remove foreign reserves from the balance sheet—move the assets and funding cost to the sovereign balance sheet.*
- Reconfigure the balance sheet and treasury central bank relations to move the entire funding cost to government.*
- Reconfigure the balance sheet so that the revaluation gains/losses are hedged with treasury taking the risk according to agreed parameters.*
- Inject equity into the central bank*
- In any event, important to discuss with government the appropriate foreign reserve target and agree on risk management and communications strategies explaining the target and how it will be financed.*



Foreign reserves off balance sheet?

In Canada, foreign reserves are held by the Exchange Fund Account (Treasury). Reserves approximately US\$ 81 billion.

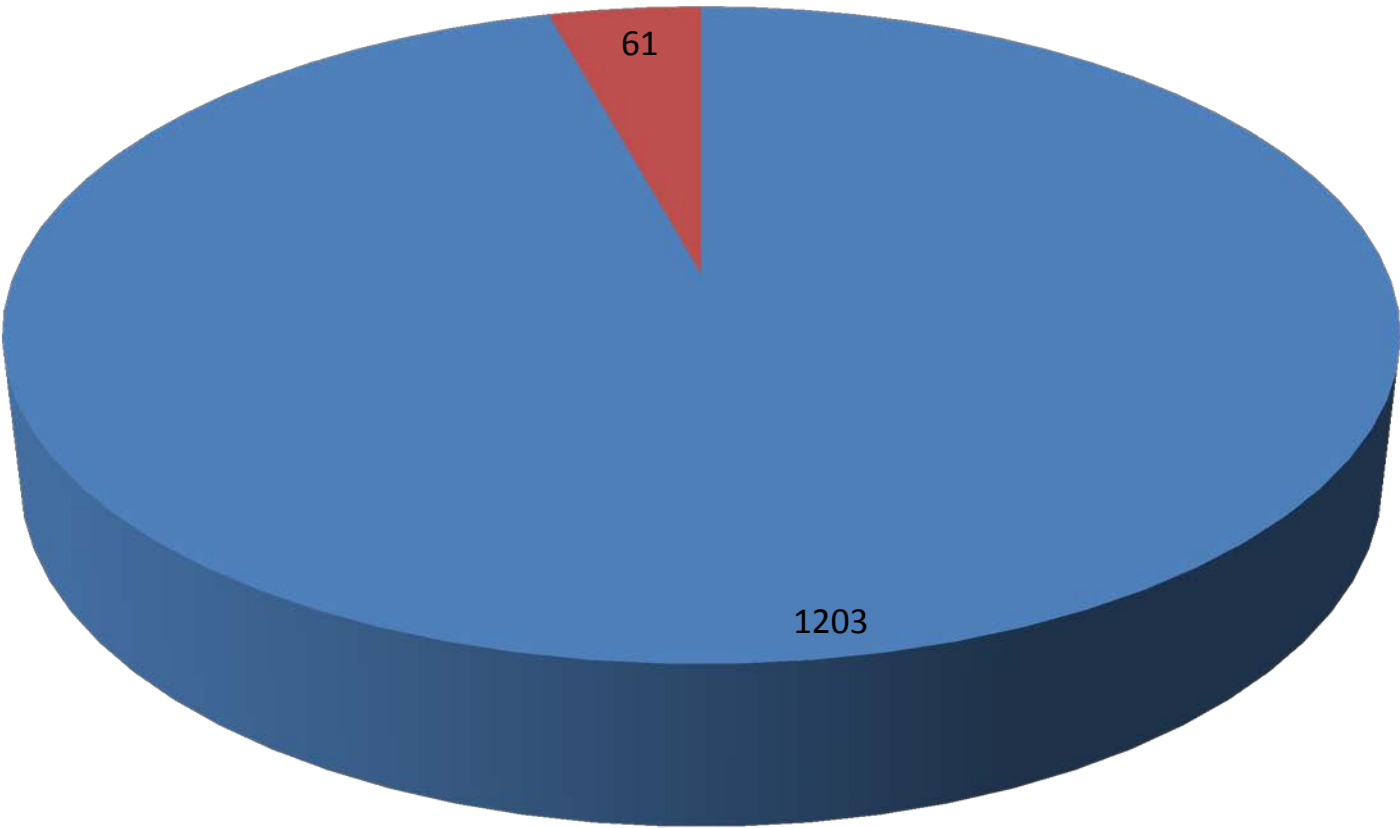
In USA, most of the reserves are held by the Treasury in the Exchange Stabilization Account.

In both Japan and UK, vast bulk of reserves held by Treasury.



Japan—foreign reserves

as of end March 2016 (in USD billions)



■ Foreign Exchange Assets held by BOJ



Canada's situation

Foreign reserve portfolio owned by the Federal government, who bear the financial costs and associated risk

“This has considerably simplified the management of the Bank’s balance sheet and its inherent risks. It also makes it easier to hedge the risks associated with foreign reserves through the government’s own borrowing programs.”

Johnson and Zelmer (2007)

But Canada has had a floating exchange rate regime since 1970!



On the asset side, many countries have established ancillary foreign exchange accounts

- *Chile, Korea, Norway, Russia, Qatar, Singapore, have funds managed to a different benchmark than foreign “reserves” as classically understood.*
- *Financial performance of those funds is judged against global benchmarks, in foreign currency, and not integrated with other accounts.*



Switzerland has a different view as the foreign assets are not viewed as net national wealth


Unlike a situation where foreign assets have been accumulated through the export of natural resources or result from a fiscal surplus, in the Swiss case the public sector would have to issue debt to finance the accumulation of the SNB's assets

Swiss National Bank Accountability Report 2015 (page 75)



Norway, Sweden, and Finland have all considered additional foreign reserves for financial stability purposes (not monetary or forex policy)

- *Very early in the crisis a number of central banks found themselves in an unusual situation—needing to provide liquidity to their “domestic” banks in “foreign” currency.*
- *The Federal Reserve provided swap agreements in dollars; the ECB in Euro; and the Swiss National Bank in Swiss Franc (Austrian banks were exposed to mortgage lending in Hungary denominated in Swiss Francs)*
- *But what if these facilities were not available in the “next” crisis?*



In Sweden a very lengthy discussion about the quantity, timing and modalities of augmenting foreign reserves for financial stability purposes

- *“The Riksbank has noted the risks entailed in the banks’ short-term borrowing in foreign currencies with regard to the Riksbank’s possibility to provide liquidity assistance in a crisis situation since the financial crisis 2008-2009. In spring 2009 the Executive Board of that time decided to reinforce the foreign exchange reserves...to increase the Bank's capacity to provide liquidity support if necessary. This was done by means of the Swedish National Debt Office borrowing this amount on the Riksbank’s behalf.*
- *“ As the interest rate the Swedish government has to pay to borrow exceeds the interest rate on the assets in which the funds are invested, which are largely US and German government securities, this reinforcement entails certain costs...this reinforcement was considered to provide a suitable balance between on the one hand the need to have a larger buffer to use for liquidity assistance within the space of a couple of days and on the other hand the need to protect Swedish taxpayers from paying for actions by the banks that create stability risks.”*
- Source: Reservation entered at the December 6, 2012 Executive Board meeting by DGs Karolina Ekholm and Lars E. O. Svensson against the Riksbank decision to increase its foreign exchange reserves.



ECB view on Swedish central bank financial independence

“The report [2013 Swedish Commission of Inquiry] proposes... Sveriges Riksbank should be given the right to finance its lending in foreign currency by borrowing to the extent required, without limits. This would ensure a sufficient supply of emergency liquidity to banks in distress when financial stability is threatened....”

Source: Opinion of the European Central Bank of 24 July 2013 on the financial independence of the Sveriges Riksbank (CON/2013/53)




Hong Kong and Chile: Surplus government funds enabled Treasury to be LOLR in foreign exchange

- Hong Kong: government fiscal reserves, approximately 25 percent of the balance sheet of the Hong Kong Monetary Authority, were available to place with domestic banks to ease liquidity concerns.*
- Chile: resources from the Economic and Social Stabilization Fund (held abroad) were temporarily placed with domestic banks providing them with foreign exchange liquidity support*
- Note: The rate paid by the HKMA on the fiscal reserve account is equal to the average annual investment return on the HKMA Exchange Fund portfolio over the past 6 years or the average annual yield of 3 year HKMA liquidity-absorbing notes for the previous year, whichever is lower (subject to a minimum interest rate of zero)*

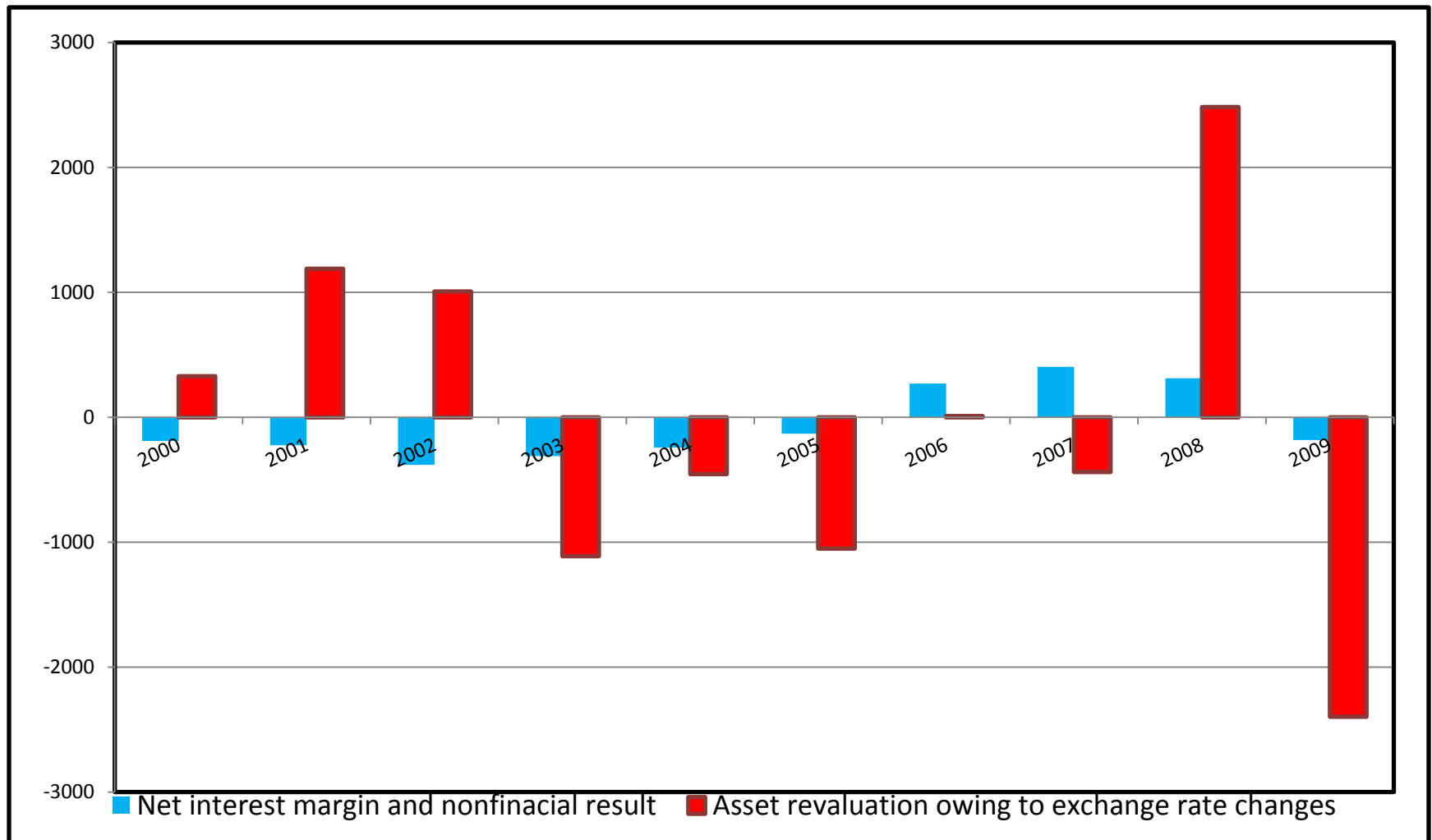


Central bank liability management often lags behind the expansion in the balance sheet—issuing domestic debt may cause debt market fragmentation & inefficient policy

- *Central banks with large debts (borrowing from the market) tend to have greater challenges in monetary management and run the risk of conflict with government debt management. Structural excess liquidity makes monetary policy more difficult. The “normal” situation is a domestic liquidity shortage but these countries must cope instead with structural excess liquidity*
- *They may additionally undertake inefficient operations owing to profit or loss concerns (high unremunerated reserve requirements placed on banks).*
- *Domestic debt market split between treasury and central bank*
- *They may also be less aggressive in raising interest rates to fight inflation (see Does Central Bank Capital Matter for Monetary Policy? IMF WP/12/60)*



Large foreign reserves financed with local currency debt combined with IFRS—leads to a high degree of earnings volatility: Central Bank of Chile 2000-2009





Sharing the cost/risk of foreign reserve holdings with government: various options

- *Treasury finances foreign reserve accumulation through local debt issuance directly (as in the cases of Korea and Japan) or by holding government deposits at the central bank for that purpose (India, Mexico, Israel, Singapore, Peru, Brazil*)*
- *Treasury finances foreign reserve accumulation through issuance of foreign currency debt thereby allowing central bank to avoid exposure to foreign exchange risk (Denmark, Sweden and New Zealand)—gains (losses) passed directly to the government accounts.*



Section 3.2. Macro Risk ELA, UMP

*Material balance sheet vulnerabilities:
Emergency liquidity assistance &
Unconventional monetary operations*



The aftermath of the global financial crisis has witnessed an enormous increase in the size of central bank balance sheets

- *Intervention in the financial system has been extremely large and the potential financial gains and losses from these interventions are large*
- *In order to contain the systemic crisis, the interventions have largely been designed to transfer risk (credit, counterparty, funding and interest rate) from the private sector to the central bank balance sheet*
- *In many cases the interventions have been directed at providing assistance to particular markets and/or institutions to maintain financial stability*



Policy response to the global crisis raised the prominence of quasifiscal risk and associated governance issues

- *“Measures to take on individual credit risk such as corporate debt are extraordinary steps for a central bank since they come close to ...fiscal policy which deals with resource allocation at the micro level....since it is in essence close to the realm of fiscal policy, a clear understanding of which authorities are taking on the risk involved is indispensable.”*

Bank of Japan Governor Shirakawa (2009)

- *“Our lending programs...run contrary to a long-standing and sound Fed practice of trying to minimize the effect of its actions on the allocation of credit across market segments....My...final suggestion is to draw a clear distinction between monetary policy and fiscal policy to ensure the Federal Reserve retains its independence to conduct sound monetary policy.*

FRB Philadelphia President Plosser (2009)



Governance issues related to financial risk remain under active discussion

US “Dodd-Frank” legislation (2010) restricted both the Federal Reserve and Treasury powers to intervene in future financial crises

Various Swiss referenda had the potential to seriously restrict SNB flexibility




Best risk management is to avoid banking crisis

The last time Bank of Canada provided Emergency Liquidity Assistance (ELA) was 1986

In Canada, ELA is restricted to banks having in place a credible recovery and resolution framework and....

....is limited to six months and effectively structured as an overnight loan that is rolled over provided the bank is recovering

....must be collateralized



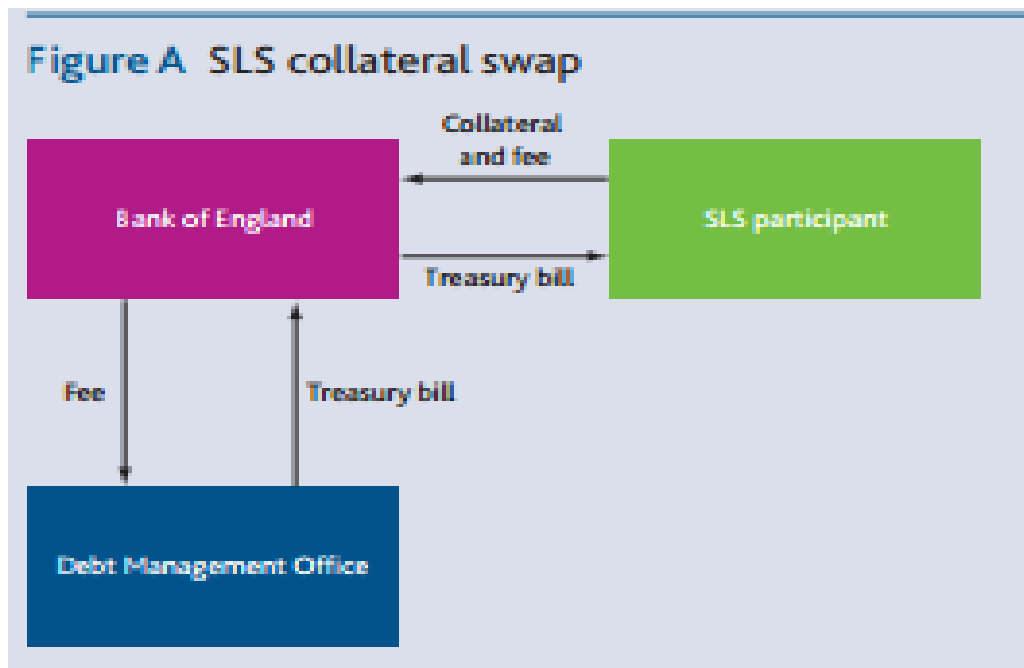
Since Bank of England equity is negligible, the UK authorities have adopted schemes where the risks are largely off balance sheet or shared with Treasury


- *UK Special Liquidity Scheme—The Bank of England, acting as an agent for the UK Treasury (HMT), swapped treasury bills borrowed from HMT for mortgage backed securities held by the market. HMT indemnified the Bank for any losses that might result. This was a collateral swap and was entirely off balance sheet. (April 2008)*
- *The Bank’s current “Funding for Lending Scheme” is also off balance sheet*
- *UK Asset Purchase Scheme—In cooperation with the Treasury, the Bank of England established the Bank of England Asset Purchase Facility Fund Limited. The APFF was designed to undertake outright purchases of private sector assets funded by a loan of cash and treasury bills from the Bank of England. Treasury indemnity for any losses. (January 2009). Loan on the BOE balance sheet.*



UK SLS Collateral Swap


After considerable discussion, Eurostat agreed with the UK authorities that the SLS operation would be reflected on neither the Bank of England nor UK public sector balance sheets. Consequently, UK Treasury debt outstanding was unaffected by the scheme





Norway: Operations implying a fiscal or quasi-fiscal risk must be assumed by the central government

- *Norway Government Asset Swap Scheme: at the outset of the crisis Parliament approved a government financed auction of treasury bills for mortgage backed securities held by Norwegian banks.*
- *Although the scheme was suggested by Norges Bank, the government assumed the risk of these extraordinary liquidity operations onto its own balance sheet:*
- *“...funding support for banks came from the government’s balance sheet, not as loans from Norges Bank. This provided transparency...The Norwegian measures were designed in such a way that Norges Bank’s balance sheet has not increased to the same extent as that of a number of other central banks.”*
- *Source: Norges Bank Governor Svein Gjedrem, “Experiences with the financial crisis”, presentation given at the Norwegian School of Management, 30 September 2009.*



*Similar programs adopted by the US Treasury and Fed—
but quite different governance structures*

- *US Treasury Government-Sponsored-Enterprise Purchase Program: Treasury purchased asset backed securities issued by or guaranteed by GSEs. Purchases were financed by issuance of US Treasury debt so measured US debt outstanding increased.*
- *The US Treasury program was essentially identical to the policy being followed by the Federal Reserve at the same time—but the Treasury was subject to Congressional oversight and budgetary restriction while the Federal Reserve was not....a different governance structure entirely.*
- *Treasury program constrained by Congressional debt limit*

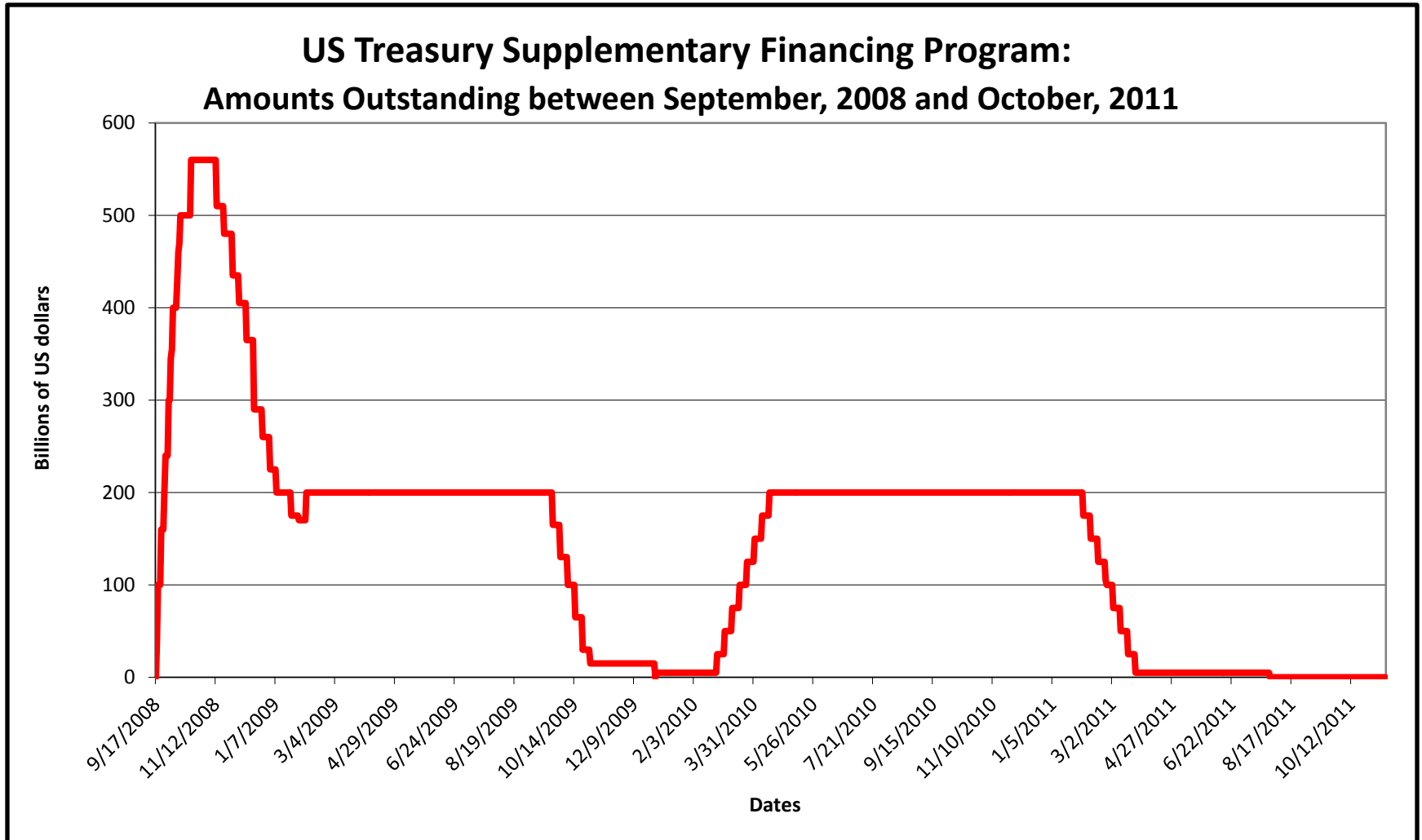


The US Treasury was effectively conducting liquidity operations while constrained, at times, by the US Congressional debt limit

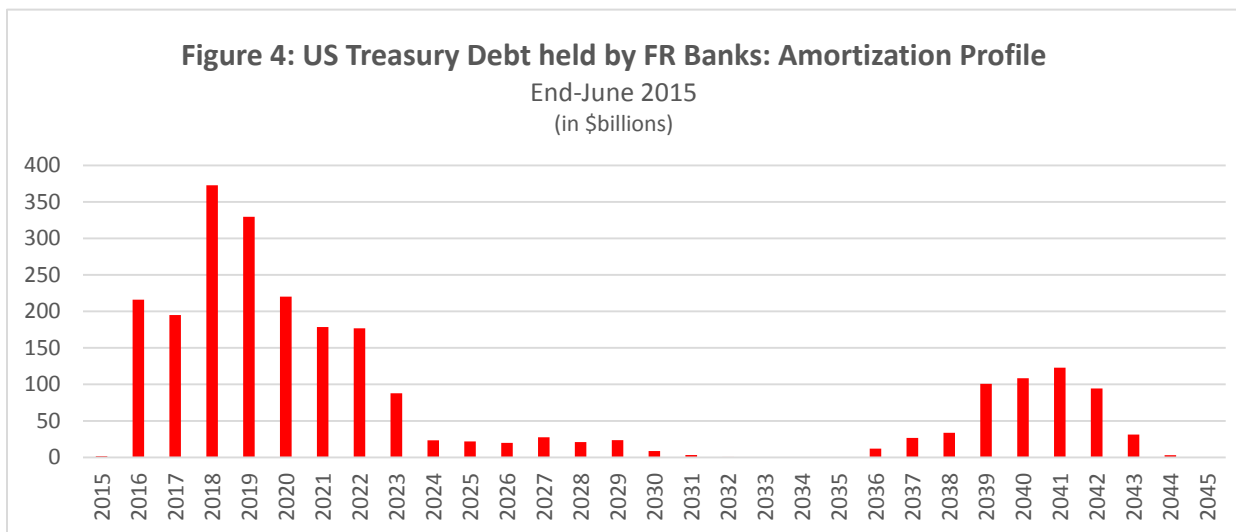
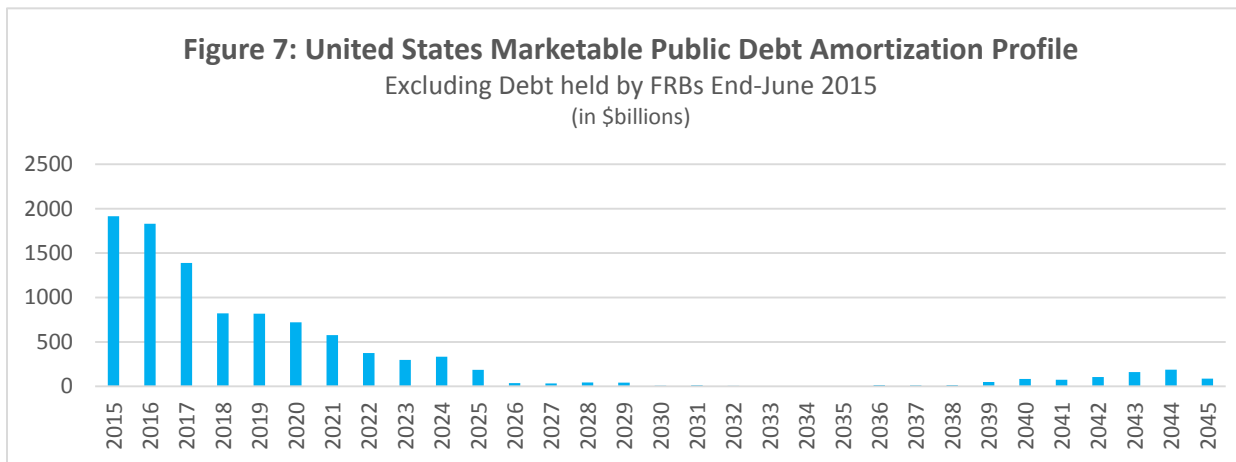
- *Since the US Treasury came up against the Congressional debt limit on two occasions it was forced to use its deposits to finance expenditure. Once the debt limit was raised, the Treasury increased the deposit (withdrawing liquidity). This meant that both Congress and Treasury were close to implementing monetary policy—a potentially dangerous precedent.*
- *This points to the benefits of arranging financial relations in advance of a crisis. More broadly central bank policy at the zero lower bound—buying long term debt and selling short term can be undone by Treasury debt management operations.*



US Treasury sterilization of FR crisis liquidity



LSAPs with Treasuries aimed to take duration (interest rate risk) out of the market

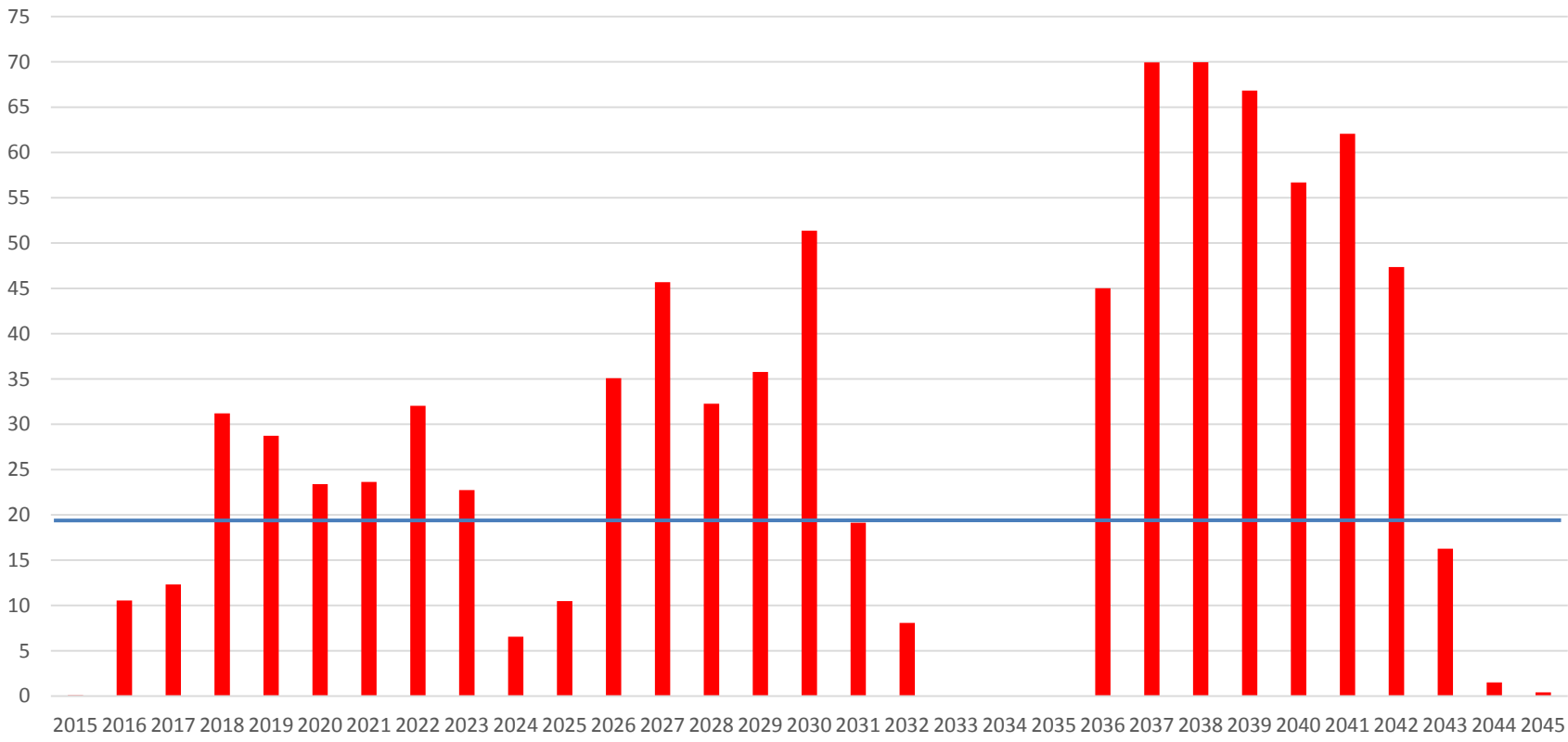


Source: Stella (2015) *Exiting Well*



Duration subtracted from the market was added to Fed portfolio

Figure 6: Proportion of US Marketable Public Debt held by FRBs by amortization date
End-June 2015
(in \$billions)





Federal Reserve balance sheet just prior to Lehman

Table F1: Consolidated Balance Sheet of the Federal Reserve Banks
September 10, 2008
(in US\$ billions)

Assets		Liabilities	
US Treasuries	480	FR Notes Outstanding	798
MBS and Federal Agencies	0	Bank Deposits	32
Term Auction Credit	150	Reverse Repos	44
Liquidity Providing Repos	127	US Treasury Deposits	5
Foreign Exchange Swaps	62	Equity	40
Net Other Assets	101		
Total Assets	920	Total Liabilities	920

Source: Stella (2016) Larger for Longer: Managing Large Central Bank Balance Sheets



*At present, excess bank reserves US\$ 2.3 trillion
(12.5 percent of GDP)*

Table F2: Consolidated Balance Sheet of the Federal Reserve Banks
September 14, 2016

(in US\$ billions)

Assets		Liabilities	
US Treasuries	2558	FR Notes Outstanding	1424
MBS and Federal Agencies	1854	Bank Deposits	2349
Net Other Assets	-29	Reverse Repos	317
		US Treasury Deposits	253
		Equity	40
Total Assets	4383	Total Liabilities	4383

Source: Stella (2016) *Larger for Longer: Managing Large Central Bank Balance Sheets* [FRB Release H.4.1]



Using short term treasury debt during the “exit”

- *“.... the Treasury could resume its recent practice of issuing supplementary financing bills and placing the funds with the Federal Reserve; the issuance of these bills effectively drains reserves from the banking system,...”*

*Federal Reserve Policies to Ease Credit and Their Implications for the Fed’s Balance Sheet
Speech by Chairman Ben S. Bernanke at the National Press Club Luncheon
National Press Club, Washington, D.C., February 19, 2009*

Debt swap with FRBs—trade existing FRB long-duration portfolio for treasury bills or a portfolio representative of the current market portfolio




The Case of México—Asset and Liability Transformation

- *Although Banco de México has adopted a floating exchange rate regime, by law it must buy all of the foreign exchange earnings of the state petroleum company, PEMEX.*
- *The increase in petroleum product prices that began 10 years ago led to a large increase in foreign exchange inflows and, on the other hand, generated high peso liquidity in the Mexican financial system.*
- *The Banco de México used to issue its own bonds, called “BREM’s” to conduct monetary policy, that is to say, to absorb the excess liquidity caused by the foreign exchange purchases.*
- *Since the interest rates that the central bank paid on its debt were much higher than the yield obtained on its foreign reserves, the central bank made large losses and suffered from negative equity.*

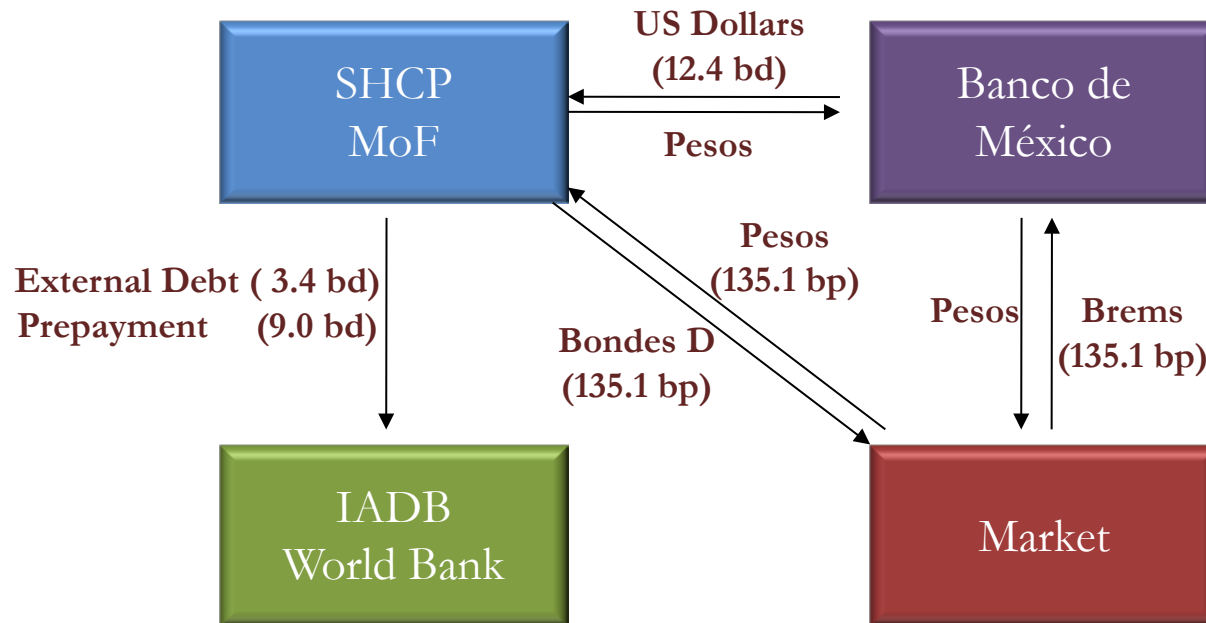


México: The Transaction

- *In June 2006, the Ministry of Finance bought US\$12.4 billion from the Banco de México using pesos that it had obtained from a special auction of a series of the its main domestic financing instrument (BONDES D).*
- *The Ministry of Finance used the foreign exchange obtained from the central bank to prepay debt owed to the World Bank, the Inter American Development Bank (US\$9 billion) and to buyback sovereign debt trading in the international capital market (US\$3.4 billion).*
- *Simultaneously, the Banco de México used the pesos obtained from the Ministry of Finance to buy back an equivalent amount of its monetary policy bonds (BREMS), which had very similar characteristics to the BONDES D. Furthermore, the central bank announced that going forward, it intended to use only government debt in its monetary operations.*



Reshaping the central bank balance sheet to improve the efficiency of macroeconomic policy



Source: Julio Santaella, Banco de México, "Central Bank Capital and Earnings within a consolidated Public Sector Balance Sheet: the case of México" April 23, 2012 Washington, D.C.




México: The Results

- *The central bank realized a reduction in its sterilization costs greater than the reduction in interest income caused by its lower foreign reserves (sold to the treasury). Consequently, its losses fell. That is to say it saved the difference between the interest rate it paid on its domestic debt and the rate it received on its foreign reserves (multiplied by US\$12.4 billion).*
- *The Ministry of Finance obtained a superior debt profile (in terms of exposure to exchange rate risk) and a reduction in the cost of its debt—the rates on its external debt were higher than the rate paid on its domestic debt (BONDES D).*



México: Current Mechanism dealing both with forex sterilization and monetary management

- El Banco de México is provided freely with treasury bonds (BONDES D) and bills (CETES) to conduct sterilization operations*
- The proceeds of the BdM auctions are placed in a blocked Treasury account...same mechanism as in Colombia and Israel*
- Every quarter the Treasury and BdM hold a joint meeting announcing their issuance strategy for BONDES D and CETES*
- BdM uses bond issuance primarily to sterilize foreign exchange purchases*
- For short term operations, Banco de México uses bills (CETES)*



How have countries responded successfully to these challenges—resolving the inherited problem

- *Brazil—legal changes—prohibition of central bank debt issuance; fiscal responsibility for financial cost of sterilization operations; development of deep domestic debt market and central bank repos*
- *Singapore, India, Israel, México—ongoing central bank use of newly issued short term government debt for monetary operations. The government, in the latter three cases, is provided a restricted deposit at the central bank earning exactly the cost of the treasury debt*



India: an earlier transaction very similar to México's

- *In February 2003, the government of India prepaid external debt with an average maturity of 9.3 years amounting to US\$ 3 billion*
- *The foreign exchange was obtained by the government from the central bank (RBI) in exchange for an equivalent amount of marketable domestic debt through a private placement*
- *The RBI received a significant stock of domestic debt thereby enhancing its power to sterilize liquidity inflows while also achieving a reduction in its exposure to foreign exchange risk*



India: monetary stabilization bonds

- *Strong and persistent capital inflows led to a shortage of Reserve Bank of India (RBI) sterilization instruments. The RBI law did not permit it to issue its own debt.*
- *Monetary Stabilization Bonds (MSB) were created as government instruments to absorb long-term surplus liquidity beyond what could be accomplished through the conventional daily RBI repo operations*
- *Proceeds of the MSB auctions are credited to a Market Stabilization Fund account at RBI (no interest in paid)*
- *The maturity, amount, and timing of the MSB auctions is decided by the RBI in consultation with Treasury depending, inter alia, on the expected duration and size of the capital inflows*



Section 4. Nano Risk

A virus most deadly



Electronic payments systems security--a worsening risk with global implications

“...it is already clear that it will be necessary to guard the computer systems used for settlement purposes as carefully as the gold at Fort Knox is guarded today.”

Mervyn King (2016) *The End of Alchemy*



*The central bank balance sheet is the fundamental
cornerstone of advanced financial civilizations*

“Money is Memory”

Kocherlakota (1998) Journal of Economic Theory, Volume 81



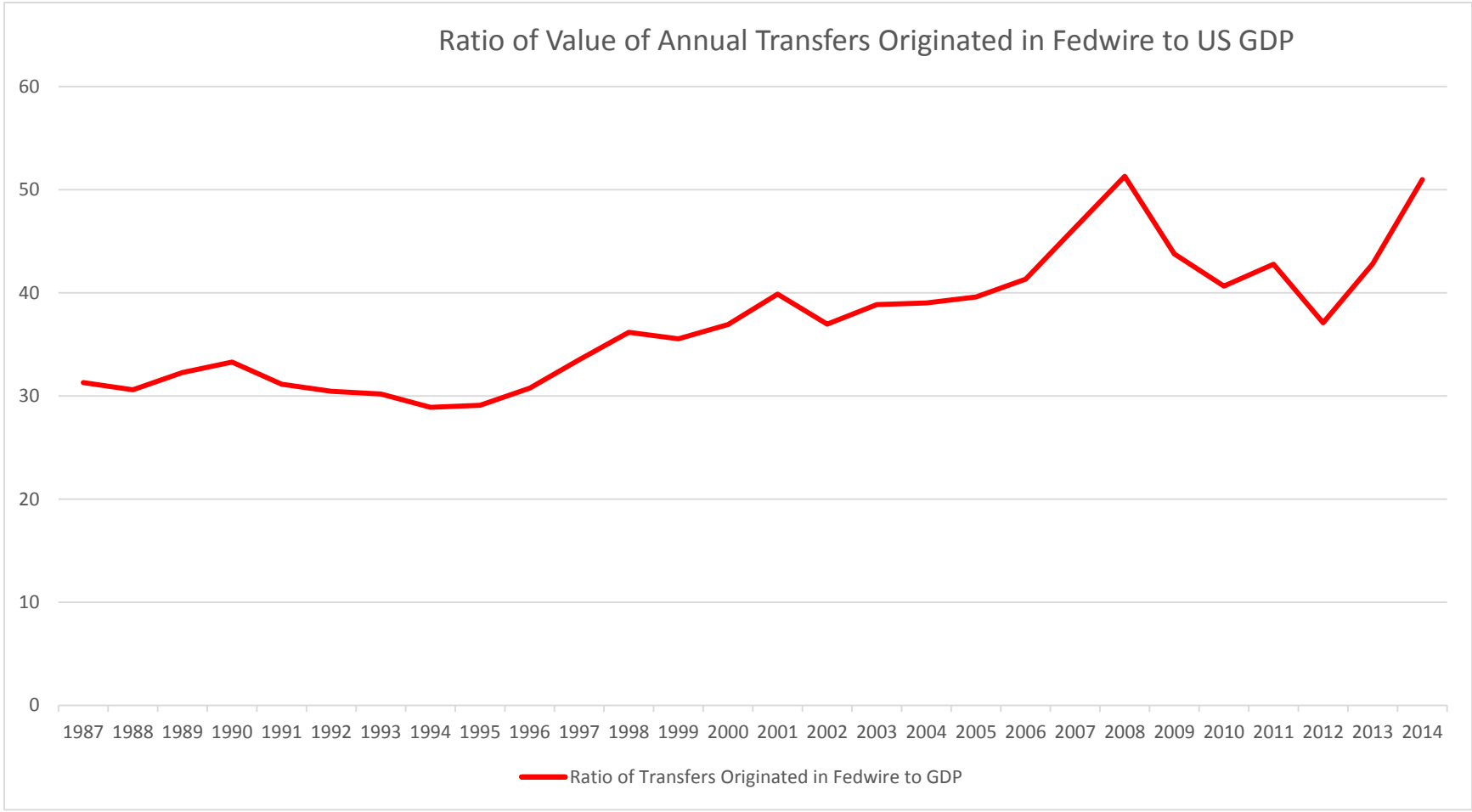
US, UK, Switzerland—all racing to enhance cyber security—“21st century counterfeiting”

“The SIC [Swiss Interbank Clearing] system, which began operations in 1987 is being redeveloped to keep pace with technological advances. The main goal of the SIC4 project is to redesign the IT architecture of the SIC system. Among other things, a Swiss security solution will be used for encrypting and authenticating SIC messages.”

Swiss National Bank Accountability Report 2015 (page 71).



The annual value of transfers taking place through US Fed's Fedwire alone is close to one quadrillion dollars





Effective cybersecurity requires the latest technology and highly skilled personnel

Central banks are accustomed to the difficulties attracting, retaining and compensating skilled finance professionals

The criticality of the technical infrastructure and the rapid rate at which it is evolving has magnified those traditional staffing issues as they relate to IT professionals...legislators must be made to understand the importance of this issue and its budgetary consequences.



5. Conclusion—Micro Risk

Owing to the public good nature of the services central banks provide, it is important that micro risk—a robust framework for treasury central bank financial relations be properly managed...this is a perpetual challenge



5. Conclusion—Nano Risk

Nano risk, an existential issue for modern financial systems, must be curtailed and managed even though it be costly to do so—this reinforces the criticality of explaining what central banks do and how they do it



5. Conclusion—Macro Risk

- *Since the start of the global financial crisis, central bank balance sheets have expanded by about US\$ 7 trillion—raising risk exposure exponentially.*
- *Although I believe this to be a temporary phenomenon, as either the balance sheets will shrink or, more likely, be transferred to other public entities not yet imagined, managing macro risks in the meantime will be extraordinarily complex and demanding.*
- *The key challenge is to design institutional frameworks so that we never again find ourselves “making it up as we go along”.*
- *Let us exchange experiences and ideas during this event!*