Dual liquidity crises under alternative monetary frameworks – a financial accounts perspective

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The usual disclaimer applies

Introduction

Liquidity crisis:

- Households/investors reduce their exposure / do not roll over loans to banks and the government because they fear they will not be able to sell their claims in the future (break-down of the market)
- Concerns about solvency of banks and governments are a key reason. Emphasis is on “concerns”.

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- Research questions
  - How do dual liquidity crises unfold?
  - How can policies manage those crises successfully?

- Motivation
  - Dual liquidity crises – i.e. funding crises that encompass both the private and the public sector of a country – have particularly devastating consequences for the real economy of the country concerned if crisis management fails

- What the paper does
  - it captures triggers and mechanics of dual liquidity crises within a closed system of financial accounts
  - it identifies the system's constraints to absorb liquidity shocks
  - it links the analytical framework to concrete historical crises cases

Contribution to the literature

- Narrative literature on the unfolding and containment of liquidity crises (Thornton (1802), Bagehot (1873), Priester (1931), King (1936), James (1984), Kindleberger and Aliber (2005))
- Literature on funding and market liquidity crises (Brunnermeier and Pedersen 2007)
- Literature on the central bank as a lender of last resort (as summarized in Goodhart and Illing 2002)

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- Monetary frameworks and crises cases
  - Flexible exchange rate, paper standard – US subprime crisis / Lehman default 2007-2010
  - Fixed exchange rate with free capital mobility (two-country representation)
    - Gold standard – German banking and currency crisis 1931
    - Paper standard – Asian crisis 1997 (not explored in detail due to significant overlaps to gold standard case – with one notable exception)
  - Monetary union (euro area style, two country representation) – Euro area periphery crisis 2010/2011

Introduction

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- Liquidity shocks
  - Domestic shocks (demand for cash / high-powered money)
    - Classical bank run
    - Run on (government) securities
    - Deposit shifts between banks within the national banking system
  - Asymmetric shocks within a fixed exchange rate system and a monetary union: Run on deposits and government securities issued by the financially distressed country in favor of deposits and gov. securities issued by the safe haven country within the system
  - Asymmetric shocks within a fixed exchange rate system: Run on money issued by the financially distressed country in favour of gold or money issued by the safe haven country

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- Constraints on the elasticity of liquidity provision by the central bank facing a dual liquidity crisis
  - Domestic constraints (potentially applicable under any monetary framework)
    - Collateral constraints
    - Monetary financing prohibitions (government securities)
    - Limits on bank borrowings
  - External constraints: (applicable in a fixed exchange rate system, but not under flexible exchange rates and in a monetary union)
    - Gold coverage ratio / fx reserves
    - Availability of inter-central bank credit, i.e. credit provided by the safe haven country central bank to the central bank of the financially distressed country

Why? Raising interest rates to attract funding / capital inflows, while being the standard economic mechanism in normal times, fails to equilibrate demand and supply in a confidence crisis as higher interest rates make it less likely that borrowers will be able to serve the debt, thus reinforcing solvency concerns that trigger the shocks in the first place. Thus, financially distressed country unable to absorb liquidity shocks on its own.

Introduction

Monetary framework	Flexible exchange rate	Fixed exchange rate		Flexible exchange rate
	Paper standard	Gold standard	Paper standard	Monetary union
	Domestic liquidity shocks	Asymmetric liquidity shocks among countries forming the exchange rate system / monetary union		
Historical crisis cases	US 2007/2008	German crisis 1931	Asian crisis 1997	Euro area periphery crisis 2010/2011
Shocks				
Classical bank run				
Run on government securities				
Deposit shifts between banks within the national banking system				
Deposit shifts between banking sectors of system members				
Shifts between government bonds issued by system members				
Demand for gold				
Demand for cash issued by the safe haven country				
Constraints to central bank liquidity provision				
Collateral constraints				
Monetary financing prohibition				
Limits on bank borrowing				
Gold coverage ratio				
FX reserves				
Availability of inter-central bank credit				
Results				

1 = due to limited data availability analyzed together

Financial accounts presentation - introduction

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- Simple, but rigorous framework: 4 sectors, 4 assets
- One household/investor sector (also in two country case, capturing free capital mobility)
- Government, banking sector and central bank (in financially distressed and safe haven country when applicable)
- Common central bank in the euro area case
- Four assets:
  - Banknotes B
  - Bank deposits D
  - Government bonds S
  - Gold G

and implicitly: loans to the private corporate sector

Financial accounts presentation - introduction

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- “In the beginning” there is only the non-leveraged household/ investor sector holding real assets
- Household/investor sector diversifies into financial assets issued by the other sectors which are – for simplicity – fully leveraged
- Household/investor sector does not hold direct claims against the central bank and against the corporate sector – those are intermediated by the banking sector
- How does the central bank have to respond to liquidity shocks in order to prevent forced deleveraging and asset fire sales?
- What are the constraints to such a response?

Financial accounts presentation – introduction classical bank and securities run in a single country

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Households / Investors			
Real Assets	E - D – S - B	Household Equity	E
Deposits Bank 1	D - d		
Debt securities	S - s		
Banknotes	B + d + s		

Corporate / Government			
Real assets	$D + B + S$	Credits from banks	$D + B$
		Debt securities	S

Bank			
Lending to corporates	$D + B$	Household deposits / debt	D - d
		Credit from central bank	B + d

Central Bank			
Debt securities	s	Banknotes	B + d + s
Credit operations with banks	B + d		

Financial accounts presentation – the US crisis 2007-2010

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- Classical bank run not relevant
- Run on securities issued by the private sector (not on securities issued by the government sector)
- Interbank crisis – need to distinguish between safe haven banks (bank 1) and financially distressed banks (bank 2)
- Shock *k* = households/investors shift funds from “financial distressed banks” to “safe haven banks“
- Shock *y* = “safe haven banks” recue their interbank exposure to “financially distressed banks”

Financial accounts presentation – the US crisis 2007-2010

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Households / Investors			
Real Assets	E - D – S - B	Household Equity	E
Deposits Bank 1	D_1 -d/2 + k + s		
Deposits Bank 2	D_2 –d /2 -k		
Debt securities	S - s		
Banknotes	B +d		

Financial accounts presentation – the US crisis 2007-2010

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Bank 1	
Lending to corporates $D_1 + B/2 - Y$	Household deposits / debt D_1 + k + s – d/2
Deposits with CB max(0,-B/2+k+y+s-d/2)	Credit from central bank max(0,B/2–k–y– s+d/2)
Lending to Bank 2 Y-y	

Bank 2	
Lending to corporates $D_2 + B/2 + Y$	Household deposits / debt D_2 -k -d/2
	Credit from central bank B/2+k+y +d/2
	Liabilities to Bank 2 Y - y

Central Bank	
Debt securities s	Banknotes B+d
Credit oper. B/2+k+y+d/2 +max(0,B/2–k–y– s+d/2)	Deposits banks max(0,-B/2+k+y+s-d/2)

- Creditor status of central bank via the banking sector depends on magnitude of shocks *k* and *y*

Financial accounts presentation – the US crisis 2007-2010

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Three crisis phases:

- August 2007 – September 2008: Run on private sector securities other than deposits (not modelled in the system of accounts)
- October 2008 – January 2009: Interbank crisis following the Lehman default
- After January 2009: Large scale asset purchases (QE)

	ASSETS		LIABILITIES			Liquidity shocks - relative to 30 June 2007			
	Debt	Credit		Deposits	Other				
	Securities	operations	Banknotes	Banks	AF	s	d	a	k+y
30. June 07	790	20	775	19	16				
13. Sep 08	479	286	795	25	-45	-311	20	-61	-
07. Jan 09	495	852	848	846	-344	-295	73	-360	926,5
16. Nov 11	2625	38	1016	1578	79	1835	241	63	-

a = changes to other autonomous factors assumed to feed like banknote shocks (d) through the system

s = quantitative easing, i.e. no liquidity shock to US government securities

Source: Federal Reserve and authors' compilation

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Elasticity of liquidity provision by the Fed (constraints)

Constraints to central bank liquidity provision	
Collateral constraints	yes, but adjusted during the crisis
Monetary financing prohibition	no
Limits on bank borrowing	no
Gold coverage ratio	not applicable
FX reserves	not applicable
Availability of inter-central bank credit	not applicable

Result: Successful crisis management.

- The Fed, largely unconstrained in its provision of liquidity, has made use of the whole range of policy choices in containing the crisis by limiting forced deleveraging and asset fire sales.

Gold standard – key differences to the previous case

- New asset in the central bank balance sheet: Gold
- New shocks:
  - *g* = demand for gold
  - *k* = cross-country shifts of deposits from financially distressed to safe haven country triggering losses to gold reserves of financially distressed country (gold as international means of payment / store of value)
- New constraints:
  - gold coverage ratio, GCR = G/B (Reichsbank: 40%)
  - availability of gold loans from safe haven country
- Gold standard system presented as two country case: financially distressed and safe haven country

Financial accounts presentation – the gold standard

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Households / Investors			
Real Assets	$E - D_1 - D_2 - B_1 - B_2$	Household Equity	$E + G$
Gold	$G - G_{1,CB} - G_{2,CB} + g$		
Banknotes 1	B_1		
Banknotes 2	$B_2 - g$		
Deposits Bank 1	$D_1 + G_{1,CB} + k$		
Deposits Bank 2	$D_2 + G_{2,CB} - k$		

Bank 1 (safe haven country)			
Lending to corporates	$D_1 + B_1$	Household deposits / debt	$D_1 + G_{1,CB} + k$
		Credit from central banks	$B_1 - G_{1,CB} - k$

Bank 2 (financially distressed country)			
Lending to corporates	$D_2 + B_2$	Household deposits / debt	$D_2 + G_{2,CB} - k$
		Credit from central banks	$B_2 - G_{2,CB} + k$

Financial accounts presentation – the gold standard

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Central bank 1 (safe haven country)				
Gold	$G_{1,CB}$	+ k	Banknotes	B_1
Credit operations with banks	$B_1 - G_{1,CB}$	- k		

Central bank 2 (financially distressed country)				
Gold	$G_{2,CB}$ - g	- k	Banknotes	B_2 -g
Credit operations with banks	$B_2 - G_{2,CB}$	+ k		

With inter-central bank credit:

Central bank 1 (safe haven country)				
Gold	$G_{1,CB}$		Banknotes	B_1
Credit operations with banks	$B_1 - G_{1,CB}$	- k		
Gold loans to central bank 2		k		

Central bank 2 (financiall distressed country)				
Gold	$G_{2,CB}$ - g		Banknotes	B_2 -g
Credit operations with banks	$B_2 - G_{2,CB}$	+ k	Gold borrowing from central bank 1	k

Elasticity of liquidity provision by the Reichsbank (constraints)

Constraints to central bank liquidity provision	
Collateral constraints	yes, but adjusted during the crisis
Monetary financing prohibition	yes
Limits on bank borrowing	yes
Gold coverage ratio	yes
FX reserves	not applicable
Availability of inter-central bank credit	basically: no

Result: Severe banking and currency crisis (collapse of the gold standard)

- The Reichsbank had basically no tools at hand to contain the crisis as it faced severe domestic and external constraints in providing liquidity
- External constraints were key (also by influencing the degree of severity of the domestic constraints)
- Several (economic an non-economic) arguments why gold-rich central banks (basically) did not provide loans to the Reichsbank.
- Unique to the gold standard: fear by gold-rich countries of becoming illiquid (hitting their own GCR) at a later stage of the crisis

Financial accounts presentation – fixed exchange rates, paper standard

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- FX reserve constraint replaces gold coverage ratio constraint
- Availability of inter-central bank credit not limited by fear of illiqudity by safe haven country central banks (as they do not face an external constraint)
- However, as other arguments in favor of limiting those credits were often applied, crisis management capacities of financially distressed country central bank almost as limited as in the gold standard case

- Common central bank – in a flexible exchange rate setting – does not face external constraints (comparison with the Fed)
- TARGET 2: automatic counterbalancing of cross-border deposit shifts. No implication for the ability of the common central bank to contain a crisis
- Size of cross-border shifts determine length of balance sheet of common central bank (as in Fed case with deposit shifts within a national banking sector)

Financial accounts presentation – the euro crisis

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Households / Investors			
Real Assets	$E - D_1 - D_2 - S_1 - S_2 - B_1 - B_2$	Household Equity	E
Banknotes 1	B_1		
Banknotes 2	B_2		
Deposits Bank 1	$D_1 + k + s$		
Deposits Bank 2	$D_2 - k$		
Debt securities country 1	S_1		
Debt securities country 2	$S_2 - s$		

Corporates + sovereigns			
Real assets	$D_1 + D_2 + B_1 + B_2 + S_1 + S_2$	Credits from banks	$D_1 + D_2 + B_1 + B_2 + S_1 + S_2$

Bank 1 (safe haven country)			
Lending to corporates	$D_1 + B_1$	Household deposits / debt	$D_1 + k + s$
		Credit from home central bank	$B_1 - k - s$

Bank 2 (financially distressed country)			
Lending to corporates	$D_2 + B_2$	Household deposits	$D_2 - k$
Debt securities country 2	s	Credit from home central banks	$B_2 + k + s$

Financial accounts presentation – the euro crisis

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National central bank 1 (safe haven country)			
Credit operations with Bank 1	$B_1 - k - s$	Banknotes	B_1
Target claims	k + s		

National central bank 2 (safe haven country)			
Credit operations with banks	B_2 + k + s	Banknotes	B_2
		Target liabilities	k + s

Consolidated currency union central bank			
Credit op. with banks 1 and 2	$B_1 + B_2$	Banknotes	$B_1 + B_2$

Financial accounts presentation – the euro crisis

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Banking sectors with a liquidity surplus in a monetary union – a financial accounts presentation

Bank 1			
Lending to corporates	$D_1 + B_1$	Household deposits / debt	D_1 + k +s
Deposit with CB 1	$-B_1 + k + s$		

National central bank 1			
Target claims	k + s	Banknotes	B_1
		Deposit of bank 1	$-B_1 + k + s$

Consolidated currency union central bank			
Credit operations with banks	B_2 + k + s	Banknotes	$B_1 + B_2$
		Deposit of banks	$-B_1 + k + s$

Concerns about TARGET 2 balances similar to concerns about inter-central bank credit extension in fixed exchange rate systems:

- Macro risks (inflation) for the safe haven country
- Moral hazard with regard to financially distressed country
- Financial risks (default, exit of monetary union of financially distressed country)

But: TARGET 2 balances at the heart of monetary union, i.e. they make the difference between a traditional fixed exchange rate system and a monetary union

Comparison with Fed: No different „US dollars“ for the two groups of banks

Implications of the monetary financing prohibition:

The banking sector has to play the role of lender of last resort function for government securities if deleveraging and fire sales are to be avoided.

However, it is less effective due to collateral, liquidity, regulatory, and stigmatization constraints.

Moreover, there is a risk of diabolic solvency loops between the sovereign and the banks due to the additional exposure that banks load onto their books.

Elasticity of liquidity provision by the ECB (constraints)

Constraints to central bank liquidity provision	
Collateral constraints	yes, but adjusted during the crisis
Monetary financing prohibition	yes
Limits on bank borrowing	no
Gold coverage ratio	not applicable
FX reserves	not applicable
Availability of inter-central bank credit	yes (TARGET 2)

Result:
Successful crisis management restricted by monetary financing prohibition.

Results

Monetary framework	Flexible exchange rate	Fixed exchange rate	Flexible exchange rate
	Paper standard	Gold standard	Monetary union
	Domestic liquidity shocks	Asymmetric liquidity shocks among countries forming the exchange rate system / monetary union	
Historical crisis cases	US 2007/2008	German crisis 1931	Euro area periphery crisis 2010/2011
Shocks			
Classical bank run	no	yes	no / not analyzed
Run on government securities	no	yes	yes
Deposit shifts between banks within the national banking system	yes	not analyzed	no / not analyzed
Deposit shifts between banking sectors of system members	not applicable	yes[1]	yes[1]
Shifts between government issued by system members	not applicable	yes[1]	yes[1]
Demand for gold	not applicable	yes, but limited	not applicable
Demand for cash issued by the safe haven country	not applicable	no / not analyzed	not applicable
Constraints to central bank liquidity provision			
Collateral constraints	yes, but adjusted during the crisis	yes, but adjusted during the crisis	yes, but adjusted during the crisis
Monetary financing prohibition	no	yes	yes
Limits on bank borrowing	no	yes	no
Gold coverage ratio	not applicable	yes	not applicable
FX reserves	not applicable	not applicable	not applicable
Availability of inter-central bank credit	not applicable	basically: no	yes (TARGET 2)

1 = due to limited data availability analyzed together

green = similarities between EA and US
red = similarities between EA and Germany

Results

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- A central bank that operates under a paper standard with a flexible exchange rate and without a monetary financing prohibition and other limits of borrowings placed on the banking sector is most flexible in containing a dual liquidity crisis.
- Within any international monetary system characterized by some sort of a fixed exchange rate, the availability of inter-central bank credit determines the elasticity of a crisis country's central bank in providing liquidity to banks and financial markets.
- A central bank of a euro area type monetary union has a similar capacity in managing dual liquidity crises as a country central bank operating under a paper standard with a flexible exchange rate as long as the integrity of the monetary union is beyond any doubt.

Thank you for your attention