LIQUIDITY

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THE PROBLEM

- "When the music stops in terms of liquidity, things will get compliacted. But as long as the music is playing, you have to get up and dance. We are still dancing..", Charles Prince, CEO Citigroup, July 2007

- Excess market volatility may be due to contagion in expectations formation but perhaps institutional factors leading to a sudden drop in market liquidity are more important.

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INTRODUCTION

- Standard investments literature only considers liquidity in normal times
- Theoretical models to explain chaotic market behaviour
  - Heterogeneous expectations
  - Non constant risk aversion
  - Non-linear models
- Monetary theory concerned with banking and liquidity crises and the role of the FED
- Comprehensive theory linking market dynamics with banking dynamics

Liquidity in normal times

- Bid ask spread in liquid markets
  - Deepness markets
  - Asymmetric information (sheep or wolves)
- Market making and liquidity
  - Old idea central market place with licensed market makers is replaced by decentralized competing trading platforms
  - Deepness markets depends on IT technology and presence proprietary traders (without market making obligations)
  - Funding proprietary traders through banks. Capital at risk constraints do have an impact on liquidity (and bid ask spreads)

Liquid versus illiquid assets

- Standard theory requires premium for illiquidity
  - Holds for public markets domain (liquid vs illiquid stocks)
- However due to accounting requirements and additional regulations for public markets it is nor clear whether non-listed markets require additional premium vis à vis listed markets (e.g. PE)
- Investors are ambiguous: endogenous market risk in public markets looks bigger than in unlisted markets (e.g. loans vs bonds)

Liquidity crises:

- Financial markets crises
  - Endogenous risk vs exogenous risk
  - Speculative bubbles: rational vs noise investors
- Banking crises
  - Solvency issues (overexposure to lending)
  - Imbalances in the economy
  - External shocks
- Integrated approach
  - Endogenous crises
  - Symbiosis banks and markets

Unstable market dynamics

- Basic hypothesis: efficient markets following random world
  - Rational investors
  - Homogenous expectations
- Real world shows
  - Rational and noise investors
  - Trend extrapolation in expectations
- The importance of Pricing Model Uncertainty (W. Brock)
  - Investors are uncertain over relevant regime
  - Inability to quantify risks leads to pricing model uncertainty
  - Cycles in uncertainty

Unstable market dynamics (cont'd)

- Exogenous and endogenous risks
  - Endogenous risk much more important than exogenous risk
  - Excess volatility financial assets relative to underlying cash flows (time varying risk premia)
  - Exogenous shocks are rare (9/11) and relatively mild relative to endogenous shocks (IT bubble, credit crunch)

- Empirical evidence
  - Stock market volatility rather stable over long periods of time
  - Frequency extreme events much higher than to be expected given simple random walk models
  - Markovian regimes model seems more appropriate

Expectations formation

- Rational versus noise investors
  - Fundamental value investors
  - Extrapolative expectations: noise investors
  - Adjustment fundamental expectations in a positive feedback way
- Slope and position capital supply curve depends on (unstable) mix of rational and noise investors
  - Rational investors should be able to benefit from noise investors, unless taking arbitrage positions too risky due to length of positive feedback cycle

Risk aversion

- Stable risk aversion
  - Textbook case
- Behavioral finance: procyclical risk aversion
  - Overconfidence and herd behavior
  - Regret theory
  - Positive feedback mechanism
- Institutional factors leading to procyclical risk aversion
  - Solvency constraints
  - Positive feedback mechanism

Market equilibrium in non-linear world is unstable:

- Market price clears supply and demand
- Positive feedback mechanisms in supply and demand can lead to self-reinforcing process of market clearing prices
- Non linear process can give rise to chaotic price movements: bubbles and crashes

Market bubbles

- Examples
  - ICT/IPO bubble
  - PE and RE: leverage
  - Credit bubble: credit spreads
- Speculative bubbles
  - This time is different argument (role of analysts)
  - Implicit extrapolation historic returns (CRA's)
  - Cheap credit and procyclical solvency requirements feed the bubble
  - "But as long as the music is playing, you have to get up and dance. We are still dancing.."
- Bursting of the bubble
  - Rational specualtive bubble: bubble factor in price should grow over time to compensate for probability that bubble will burst (duration dependence)
  - External trigger leads to sharp market correction: bubble factor goes back to zero and price goes back to fundamental value
  - High price volatility
  - Liquidity dries up

Banking crises

- Not a new phenomenon
  - Demise individual banks
  - Spill-overs to other banks: loss of trust
- Common causes
  - Overexposure to bad loans (country risk, stock market risk etc)
  - Excess leverage
  - Duration/funding gap
- In case of market distress interaction of risk management and funding liquidity makes things worse
  - VAR limits dictate reduction exposures
  - Higher counterparty risk leads to quantity rationing

POSITIVE FEEDBACK MECHANISMS: SOME EXAMPLES

- Marked to market valuations as trigger for actions
  - Increasing exposure in build up phase possible under traditional VAR models
  - Perceived increase in market liquidity results in lower volatility estimates and lower VAR estimates
- Expectations formation
  - Risk assessment new structured products based on short history of prices
  - Herd behaviour and ignoring signals
- Short term financial incentives
- In distress markets it works the other way round: forced deleveraging and quantity rationing

Phases in financial crisis (Borio)

- Build-up phase
  - Overextending balance sheet
  - Self reinforcing proces:
    - Prices shift in profitable direction plus perceived increase in market liquidity
    - Traditional indicators of leverage (debt to capital, risk exposure) not meaningful
    - Short term bonus system makes things worse
  - Unsustainable level asset prices (equity prices, spreads)
  - Market liquidity not tested in adverse times
- Eruption phase
  - Triggers: monetary policy surprises; other shocks
  - Volatility rises, liquidity evaporates, bid/ask spreads explode
  - Dynamics of market distress take on life of their own: interaction of risk management and funding liquidity constraints
    - VAR limits dictates reduction exposure
    - Counterparty risk: quantity rationing and higher margin calls

Phases in financial crisis (II)

- Aftermath phase
  - Legacy of reduced liquidity in affected market segments and higher liquidity premia
  - Protracted periods of dimished market liquidity (Asian crisis (1997), current crisis
- Counterparty risk likely to be the clue to market failure: quantity adjustment instead of price adjustment
  - Normally higher bid ask spreads will take care of asymmetric information between traders
  - Once there is the risk that counterparty cannot settle than sound risk management sets l;ower limits: quantity adjustment

Banking crises and the FED

- Fed founded in 1913 as lender of last resort plus deposit insurance
- Response FED fairly standard: generate liquidity for banking sector
  - Provide immediate liquidity (direct lending)
  - Lower federal funds rate
- Fear of counterparty risk can cause financial gridlock:
  - FED has to orchestrate ad-hoc solution and encourage banks to continue lending to each other
  - Long Term Capital Management, Bear Stearns
- Why not prevent asset price bubbles?
  - Pricing Model uncertainty: judgement ought to be left to the market
  - Lack of adequate instruments: monetary policy too blunt
  - Adjustment solvency requirements?

Market and banking crisis compared

- Similar phases: build-up, eruption and aftermath
  - Build-up phase characterized by positive feedback loops
  - Eruption phase: market distress, lack of liquidity plus forced selling
  - Aftermath phase looks more protracted for banking crisis: why? Price adjustment versus quantity adjustement?
- Conclusions
  - Risk of distress is endogenous to financial markets: result of collective behaviour of economic agents
  - Markets and banks live in symbiotic relationship
  - Banks provide liquidity to markets in normal times
    - Are they in a position to fulfill that role in times of market distress?

Integrated approach: banks and financial markets interrelated (Borio)

- Banks and financial markets live in symbiotic relationship
- Markets rely on banks for funding market makers, supply of hedging products and liquidity services
- Banks provide liquidity by
  - Stock based lending for market makers, hedge funds
  - Funding off-balance constructs and conduits
  - Leveraged loans to PE and opportunistic RE
- Banks rely on markets for funding and hedging
  - Liquidity funds providers of short term capital
  - Equity capital and junior debt
  - Banks have adopted 'Originate to Distribute Model'
- Traditional view that the growth of tradable instruments reduces the funding and liquidity risk should be questioned

Liquidity crises: cases

- Equity market crash: 1987
  - Exogenous shock to banking system
  - Huge volatility caused immediate liquidity problems at investment banks
  - FED supplied additional liquidity to banks, lowered discount rates
  - Portfolio insurance schemes failed on a large scale and were widely blamed for causing the crash
  - FED intervention was quite successfull: fast recovery liquidity
- Asian debt crisis (1998)
  - Chang and Velasco (Fed Res Bank of Atlanta): the liquidity crisis caused the fundamental economic problems not vice versa (fiscal deficit and current account were roughly in good shape before the crisis)
  - Cause: liberalization capital flows with local banks exposed to international financial markets and beyond reach local supervisor (compare funding through thinly capitalized shadow banking system in current credit crisis)
  - Built-up phase:
    - Leveraged positions local banks with maturity and currency mismatch (borrow in USD)
    - Overvalued local currencies increased short term profitability local banks
  - Eruption phase
    - Sudden lack of trust: loans were called back plus credit rationing
    - Local central banks could not act as lenders of last resort: speculation against the currency: bank-run at the country
  - Liquidity crisis brought these countries on their knees: Malaysia was right in blaming the international financial markets and the hedge funds in particular
  - NB Iceland case looks similar except for help other Nordic central banks

Liquidity crises (II)

- Russian crisis (1998)
  - Falloing oil price was trigger
  - LTCM was victim
    - Highly leveraged arbitrage strategy
    - Due to liquidity stress price dislocations only increased to the point where LTCM was forced to liquidate positions
    - Fear for systemic risk led Fed Res Bank of NY to orchestrate rescue action (small club of investment banks)
- 9/11
  - Outside shock
  - Huge systemic risks
  - Immediate liquidity support by FED
  - Banks were encouraged to maintain lending (patriotic plight)
  - Immediately succesfull

THE CURRENT CREDIT/BANKING CRISIS

- Build-up phase
  - Cheap money used for creating thinly capitalized shadow banking system of off-balance products, leveraged loans, CDS, etc. Maturity mismatch. Lack of transparency.
  - Lower credit spreads and higher asset prices led to self reinforcing process of higher solvency ratio's.
  - Reduced risk perception (more capital for restructuring, distressed debt funds should imply fewer defaults and lower risks)
  - Short term incentives stimulated herding behaviour
- Eruption phase
  - Mechanisms by now well known: sheer size was surprising: size of shadow banking and of symbiosis between banks and markets plus maturity mismatch
  - Lack of transparency (asymmetric information) led to complete evaporation of trust and to rationing in interbank lending market

The current credit/banking crisis (II)

- Aftermath phase
  - PMU: market has no clue of true fundamental price, especially in mortgage market
  - Self reinforcing process due to lack of market liquidity (dependence on banks for providing liquidity)
  - Protracted period due to rot within the banking system
- Lessons to be learnt
  - Complete failure standard risk management: long on techniques, short on economic behaviour
  - Is this growing pain due to fast liberalization capital markets or does this imply that financial markets should be tightly regulated?

Confessions of a risk manager (The Economist, August 9th, 2008)

- Why did banks become so overexposed in the run-up to the credit crunch?
- Inadequate risk identification
  - Trading book: market risk and marked to market
  - Bank portfolio of loans: credit risk and accrual accounting
- Position risk manager not strong enough
  - Not earning money for the bank
  - Last minute involvement
  - Best risk managers step over to the 'front line'

Stability: regulation or markets

- Instruments to increase inherent stability
- Crisis mitigating instruments
- Rethinking bank regulation: till Angels govern
- A market based scenario

Inhaerent stability

- Anticyclical capital requirements
  - Solvency requirement depends on growth rate lending activities (Kremers and Schoenmaker)
  - VAR (stress) test based on recent growth history (what goes up can go down: challenges validity standard risk models)
- Integrated micro and macro supervision
  - Isolated micro measures are selfdefeating on macro level (see Kremers and Schoenmaker)
  - Central banks responsible for prudential supervision (Dutch model)
  - Monetary policy should also take into account asset price inflation (still disputed point of view)

Mitigating instruments

- Anticyclical solvency requirements
  - Relaxing marked to market valuations as base for solvency measurement
- Accommodating monetary policy
  - Including liquidity providing
- Central banks taking over funding role
  - MORAL HAZARD!!!
  - Risk of future losses
- Can taking over loss making positions help stop crisis?
  - That is what they do in a currency crisis, mostly futile. It works only if it signals that the prices are near or below true fundamental prices

Mitigating instruments (II)

- Stimulate risk takers to step in
  - Long term investors will only step in if prices are near or below true fundamental prices (PMU)
  - In equity market crash, companies buying own shares give some credibility to the market; PE buying its own debt is comparable case
  - Pension funds are no longer long term investors
- Governments stepping in as ultimate risk bearers (nationalization)
- Market abuse
  - Speculating on trigger points in CDO's
  - Idem on underwritten share emissions by investment banks
- Transparency on positions two sided sword
  - Lack of transparency creates distrust
  - Transparency on positions makes institution vulnerable for speculative attacks

Rethinking bank regulation

- Change of institutional system
  - Narrow banking
- Stricter regulation and supervision
  - Solvency requirements should apply for all kinds of financial institutions
  - Stricter rules on off-balance products
  - Rules on incentive systems
- Does it work: till angels govern?

A MARKET BASED SCENARIO

- Normal working financial markets requires transparency and trust (limited asymmetric information risk)
  - This holds a fortiori for the banking sector
- Key question is: does normal working financial markets requires ever increasing levels of external supervision?
  - Prudential supervision (moral hazard reduces market discipline)
  - Market behaviour rules
- Increase transparency and reduce role OTC markets?
  - Transparency is two sided sword
  - Banks are providers of derivatives but have to hedge those products in OTC markets
  - Role of rating agencies, auditing firms and analysts

NO MARKET LIQUIDITY WITHOUT FUNDING LIQUIDITY

- Role banks key in funding market makers and other liquidity providers
- If liquidity dries up we face discontinuity in asset prices
- Futures and options markets depend on investment banks which construct and maintain these products
  - Relies on possibility to hedge via the market (continuous prices)
- Hedging transactions depend on
  - Liquidity and implied volatility quotes
  - Willingness bankers to accept counterparty risk

Investment strategies under 'incomplete' markets

- Definition completeness
  - Theoretical concept underlying intertemporal equilibrium models
- Empirical evidence incomplete markets: fat tails and price jumps undermine concept intertemporal equilibrium
- Path dependence financial markets and path dependent investment strategies
  - The risk of traps in a Markovian world
- The need for robust investment strategies

SURVIVORSHIP RISKS FOR FINANCIAL INSTITUTIONS IN A MARKOVIAN WORLD

- Markovian process with two states of the world (normal, bankruptcy)
- Probability distribution annual return in normal state gives a high probability on positive return and a small tail risk leading to invoking the stop loss condition and transition to bankruptcy state
- Transition probabilities in unstable markets not constant over time but follow cyclical pattern
- Probability distribution in bankruptcy state depends on restructuring possibilities: in liquidity squeeze high risk of bankruptcy (= death). If restructuring is succesfull transition to normal state

Survivorship risks for LT financial institutions

- Empirical analysis of birth and death processes not very encouraging: investment banks, banks etc.
- Financial institution has an exposure to financial markets with a stop loss condition attached to it
  - If stop loss position is reached the institution gets into a financial restructuring trap
- Pension funds are structured in such away that they are increasingly exposed to this trap risk
  - Solvency ratio has a lower critical value
  - Below that value forced derisking
  - Pension fund ceases to function as a long term saving vehicle