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## Systemic vs. Liquidity Risk: Some Thoughts

Roy D. Henriksson

## What is systemic risk?

Systemic risk refers to potential shocks to the financial system

- Systemic risk refers to the likelihood and potential severity of events that result in shocks to the financial system
- Systemic risk refers to potential events that result in market instability
  - Events that happen suddenly
  - Events that severely impact the markets
  - Events that are widespread across markets
  - Events that are unanticipated
- Widespread “tail risk”

## What is systemic risk?

Systemic risk relates to the integrity of the financial system

- Will contracts or trades be honored?
- Will the markets be able to function in the way that we have become accustomed to them functioning?
- Will the markets be able to continue to provide for the capital needs of worthy issuers?

## What is systemic risk?

### Market risk is different from risk to the financial system

- Systemic risk is related to, but not the same as the potential for large losses
- Systemic risk is related to, but not the same as increased levels of market volatility or uncertainty
- Shocks are something different
  - Micro vs. macro: bottom-up vs. top-down
  - Jumps vs. diffusion
- Difference between high volatility and sudden changes in volatility
- Nonstationarity of parameters

## What is systemic risk?

### Measuring a “systemic risk” premium

- Difficult, if not impossible to separate from other sources of risk premium
- Difficult to extract from historical data
  - Potential impact of rare (or yet-to-have-happened) events
  - The “yield-to-maturity” problem
- Nonstationarity: magnitude should probably change over time
- “Systemic risk” premium should span asset classes and markets
- Implications of “flight-to-quality”
  - What does it mean to have a negative “systemic risk” premium?
- Implications of two-sided markets

## What is systemic risk?

### Components that cause or result from systemic shocks

- Liquidity events
- Spikes in volatility or uncertainty
- Faulty assumptions and their unanticipated consequences
  - Models are tools – they will never be exactly right
  - Models are tools – sometime they will be terribly wrong

## What is liquidity risk?

### Liquidity definitions

- Difficult to precisely define, more difficult to precisely measure
- Sharpe: The cost of selling or buying a security “in a hurry”
- Chacko and Stafford: Gap between the fundamental value of a security and the price at which the security is actually transacted at
  - High liquidity → small gap
  - Less liquidity → bigger gap
- Problem: we never know the fundamental value exactly

## What is liquidity risk?

### Causes of liquidity events

- Increased uncertainty about fundamental value
  - What makes potential buyers wait?
- Forced transactions
  - Why don't sellers wait?
- Liquidity events can lead to systemic shocks
- All liquidity events do not lead to systemic shocks

## What is liquidity risk?

### Measuring a “liquidity risk” premium

- Potentially easier to separate from other sources of risk premium
- Has to be related to “bid/ask spread”
  - Spread will change over time (potentially can get very large)
  - Spread will differ depending on size of position
- “Liquidity risk” premium should reflect the short-term risk of “market-making”
  - Is the risk symmetric?
  - Is the risk biased?
  - Is the risk diversifiable?

## What is liquidity risk?

### Measuring a “liquidity risk” premium

- “Liquidity risk premium” should be negatively correlated with the accuracy of measuring fundamental value
  - Potential bias impacted by accuracy of fundamental valuation
  - Ease and cost of hedging impacts required compensation for risk
- “Liquidity risk” premium may also include compensation for the fact that the “bid/ask spread” could widen dramatically
- Liquidity depends on finding a buyer when you want or need to sell
- Nonstationarity of the cost of trading

## Systemic risk and liquidity risk

### Changes in risk premiums should be highly correlated

- Perception of increased likelihood of systemic shock should result in an increase in the risk premium required for investing in “illiquid” assets
- Liquidity events increase the likelihood of a systemic shock
- Anticipating the unanticipated
  - Both risk premiums should include compensation for unexpected events
  - Both risk premiums should include compensation for potential tail risk
- Nonstationarity caused by the potential impact of rare events

## Systemic risk and liquidity risk

### Absolute vs. relative measurement

- Potential pricing impact of both systemic risk and liquidity risk should span security markets
- Easier to isolate relative risk premiums or expected costs
- Implications for replication
  - Is there more exposure to liquidity risk in the underlying securities or the replicating derivative?
  - Is there more exposure to systemic risk in the underlying securities or the replicating derivative?
- It depends!

## Systemic risk and liquidity risk

### The case of a total return swap

- Total return swap on Morgan Stanley Emerging Markets Index
- Swap receives (pays) total return on index
- Swap pays (receives) LIBOR +/-
- Swap typically pays LIBOR – (25 – 50 bps)
  - Related to costs and difficulty of “going short”
  - Related to liquidity
- May 2006: Swap paid LIBOR – (125 – 150 bps)
  - Related to increased cost and difficulty of “going short”
  - Related to worsening liquidity
  - Related to increased systemic risk?

## Systemic risk and liquidity risk

### What can we learn from the past?

- “Forensic analysis” of what went wrong
- What happened?
- What were the faulty assumptions?
- What was unanticipated?
- Was the impact permanent or temporary?

## Systemic risk and volatility

### Measuring implied volatility

- Old VIX: VXO as proxy for volatility
- VXO: OEX Volatility Index
- Implied volatility of short-dated at-the-money exchange traded puts and calls on S&P 100 Index
- Average value since 1986  $< 20$

## Systemic risk and volatility

Four spikes in implied volatility in U.S. since 1986:  $VXO > 40$

- 2002: (WorldCom) peaked at **50** on July 23
- 2001: (9/11) peaked at **49** on September 20
- 1998: (LTCM) peaked at **48** on October 8
- 1987: (“The Crash”) peaked at **150** on October 19
- 2005 Comparison: peaked at 17 on April 20
- 2006 Comparison: peaked at 22 on June 13
- 2007 Comparison: peaked (so far) at 21 on March 5

## Systemic risk and fundamental value

1987

- Increased uncertainty about fundamental value
  - U.S. stocks up ~ 40% through August with minimal earnings growth
  - S&P 500 P/E increased from 16.3 to 23.4
- Sharp price increases starting to reverse
- Macro vs. micro: focus on P/E instead of E
- Competition of rising interest rates
  - Ten-year yield increases from 7.22% to 9.59% at end of September

## Systemic risk and forced selling

1987

- Stock price declines in October result in forced selling
  - October 14: S&P 500 down 3.0%
  - October 15: S&P 500 down 2.3%
  - October 16: S&P 500 down 5.2%
- Forced sellers
  - Systematic Trend Followers had to (try to) trade
  - Margin calls
  - Mutual fund redemptions
- Impact of attempting to trade without knowing the price

## Systemic risk and faulty assumptions

1987

- Faulty assumptions were many
- Assumed the trading system could handle the increased trading volume
- Did not appreciate the magnitude of potential trading costs
  - Importance of price impact
  - Price impact increases with volume of required trading
- Did not appreciate the potential price impact of momentum or systematic trend following trading
- Acted as if short-term volatility levels were easily predictable
- But, we can't blame it on the hedge funds

## Systemic risk and liquidity risk

1987

- Liquidity event created by combination of increased uncertainty of fundamental value and forced or systematic trading
- Liquidity event resulted in systemic shock driven by unanticipated breakdown in the trading system
- Problem magnified by faulty assumptions
- After-the-fact, impact of systemic shock was temporary

## Systemic risk

### Y2K

- There was no shock (after the fact), but the risk was real
  - What if the computers did not work?
  - Potential freeze of entire financial system
  - Billions spent to “correct” the problem
  - People working New Year’s weekend just in case
- Potential liquidity event from uncertainty of ability to rollover financing
- Liquidity premium easily identifiable in fixed income markets
- Implications of knowing the exact date of the potential event

## Systemic risk and the impact on liquidity

### Y2K

- Liquidity premium easily identifiable in fixed income markets
- Paper by Suresh Sundarassen and Zhenyu Wang
  - Found direct impact on pricing of financing carrying over into 2000
  - But the cost was small
- Example: 3-month LIBOR – 1-month LIBOR term spread
- 3-month LIBOR premium increased by 54.75 bps (annualized) on September 29; cost of ~ 14 bps
- 1-month LIBOR (reverse) premium increased 86.51 bps (annualized) on November 29; cost of ~ 7 bps

## Systemic risk and the impact on liquidity

### Y2K

- Liquidity premium cost were large relative to the typical spread fluctuations of the markets, but were small from an economic perspective
- Perspective: in 1999 (before decimalization), stocks typically traded in increments of  $1/8$
- $1/8$  as a percentage of a \$40 stock was  $\sim 31$  bps
- Why was the liquidity premium cost so small?

## Systemic risk and the impact on liquidity

### Y2K

- The Federal Reserve removed much of the (perceived) liquidity risk through their words and actions in 1999
  - Assured investors that liquidity would be available
  - Assured investors that financing would not be at risk
- Importance of knowing in advance when the “event” would happen
- Result: liquidity event related to Y2K was controlled and isolated
- Investor perspective as Y2K approached was that any systemic shock related to Y2K was unlikely and manageable

## The impact of reduced perception of systemic risk

### Y2K

- Example: November 1999 was all-time record month for U.S. IPOs with \$32.8 billion (second highest month was \$22.0 billion in November 1997)
- Example: 1999 was a good year for stocks
  - S&P 500 was up 21.0% for year and 5.8% in December
  - Russell 2000 was up 21.4% for year and 11.3% in December
- Example: No flight to quality as U.S. Treasury yields rose throughout 1999
  - 10-year yields increased from 4.65% to 6.44%
  - 3-month yields increased from 4.45% to 5.33%

## Systemic risk

### Y2K

- Modest liquidity event caused by potential systemic risk
- Potential systemic risk was identifiable and could be anticipated
- Federal Reserve played an important role in reducing perceived risk to the financial system
- We have done a good job of correcting previous problems

## Systemic risk and liquidity risk

### Some final thoughts

- Liquidity events can cause systemic shocks
- In most cases, liquidity events do not cause systemic shocks
- Systemic shocks are usually caused by something that is unanticipated
- Central banks can play an important role in moderating the impact of systemic shocks
- The impact of systemic shocks: temporary or permanent?
- The implications of two-sided markets: can shocks be positive?



Advanced Portfolio Management

**Roy D. Henriksson, Principal and Chief Investment Officer**

**Advanced Portfolio Management**

**375 Park Avenue, Suite 1904**

**(212) 838-4700**

**[rhenriksson@apmcap.com](mailto:rhenriksson@apmcap.com)**