Liquidity Risk

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Liquidity Risk and Pricing Risk

- Traditional models have emphasized price risk
- But liquidity risks are priced
  - Corporate bond yields include a liquidity component
  - Even older treasury bonds near maturity (off-the-run bonds) have a liquidity premium compared to recently issued bonds (on-the-run-bonds) that are more widely traded
    - Became a problem for Long Term Capital Managment
  - Credit default swaps are more widely traded than corporate bonds, but also have a liquidity premium
- Illiquidity of assets can create a value problem in itself

Liquidity Black Holes

- From Morris and Shin 2004, Review of Finance:
  - Endogenous feedback mechanism
  - Selling pressure sets off further downward pressure on asset prices, which induces a further round of selling, and so on.
  - Liquidity black holes gather momentum from the endogenous responses of the market participants.
  - Like a tropical storm, they gather more energy as they develop.
  - Portfolio insurance with dynamic hedging rules a well known example
- Overall market liquidity connected to liquidity premium in corporate bonds
  - Perhaps worthwhile having index of liquidity

Measures of Liquidity of Individual Assets

- Bid-ask spreads
- Number and volume of trades
  - Some corporate bonds maybe 1 per quarter
- Number of zero-return trading days per year
- Time since issue (for bonds)
- Amihud illiquidity measure:
  - $\text{average}_{\text{days observed}}$ {|daily return|÷[(closing price)*(shares traded)]}
  - Price impact of monetary volume
    - Less liquid securities have prices changed more by heavy trading
- Latent liquidity: sum over all funds holding the security of:
  - (% of fund in the security)*(last 12 months trading ratio of fund)
  - Indirect accessibility of market to security – higher means more liquid

Correlations of Liquidity Measures

	Latent Liquidity	Trade Count	Traded Market Value	Days traded	Age	Amount O/s
Latent Liquidity	1.00					
Trade Count	0.20	1.00				
Traded Market Value	0.25	0.72	1.00			
Days traded	0.34	0.52	0.51	1.00		
Age	-0.03	-0.11	-0.19	-0.25	1.00	
Amount O/s	0.34	0.31	0.35	0.64	0.01	1.00

Impact on Value of Bond of Liquidity Measures
Value Higher and Yield Lower with More Liquidity

	Basis (bps)					
Latent Liquidity	19.456					
	(9.05)**					
No. of trades (100)		1.430				
		(7.09)**				
Days Traded			0.454			
			(7.32)**			
Log (Market Value Traded)				1.511		
				(2.87)**		
Age (yrs)					-3.776	
					(11.26)**	
Log (Issue Size)						1.242
						(1.63)
Constant	33.507	37.524	31.043	15.653	57.974	25.861
	(19.61)**	(27.86)**	(15.37)**	(1.69)	(30.27)**	(2.70)**

Basis is component of spread on bond not due to default risk. All liquidity measures are related to this. All but age are higher with higher liquidity. Latent liquidity is significant even when other measures are included (next slide).

	Dependent variable : Average CDS-Bond basis			
Coupon	-15.043	-17.112	-8.808	-8.624
	(9.66)**	(11.62)**	(5.81)**	(5.14)**
Latent Liquidity	20.985	17.929	10.242	9.852
	(11.15)**	(10.70)**	(4.62)**	(4.91)**
No. of trades (100)	1.037	0.646	-0.941	-0.815
	(7.44)**	(5.53)**	(3.19)**	(2.75)**
Maturity (yrs)	-2.582	-2.481	-2.395	-2.394
	(13.44)**	(13.56)**	(12.46)**	(12.54)**
Age (yrs)	0.903	1.323	-0.152	-2.554
	(2.01)*	(3.13)**	(0.34)	(4.76)**
Log (Issue Size)	2.662	3.530	10.279	11.300
	(3.86)**	(5.72)**	(11.45)**	(6.96)**
S&P Rating	8.037	3.737	-0.616	-0.170
	(11.38)**	(7.89)**	(0.72)	(0.21)
CDS Vol		0.054	-0.011	-0.019
		(0.99)	(0.22)	(0.38)
CDS bid-ask		2.209	2.110	2.085
		(10.49)**	(11.43)**	(11.87)**
CDS percent bid-ask		-112.124	24.765	18.167
		(9.54)**	(1.75)	(1.32)
Leverage			68.699	55.460
			(6.63)**	(5.59)**
Tangible Assets			-9.749	-16.628
			(2.49)*	(3.30)**
Current Ratio			0.921	1.927
			(0.56)	(1.16)
Constant	32.711	73.168	-51.015	-42.200
	(3.17)**	(7.64)**	(4.33)**	(1.88)
Observations	28631	28364	14568	14568
R-squared	0.15	0.44	0.60	0.61

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Elements of Liquidity Risk

- Not enough cash available to pay liabilities due
- Being forced to post collateral
- Having to realize capital losses at a bad time
- Loss of investment opportunities
- Normally liquid assets becoming illiquid

Liquidity Risk Management

- Maintaining reserve of liquid assets, not just any assets
- Matching asset and liability cash flows, not just moments
- Pre-arranged credit lines to be secured with less liquid assets
- More reinstatements in reinsurance treaties

Modeling Liquidity Risk

- Include measures of liquidity in the model
  - Model potential changes in market liquidity
- Start with stress tests
  - A few quite adverse scenarios of price and liquidity movements
- Model relationship between price and liquidity
  - Several papers address this
  - Evolve both simultaneously in simulations
- Model potential for liquidity black holes
  - Model could include strategies of other players
  - Incorporate such scenarios in dynamic hedging outcomes
    - Rule like sell 1/4th when price hits 60 and ½ when it hits 55 might result in trying to sell at 55 and only getting 30

Recognize Off-Balance-Sheet Issues

- Potential for having to post collateral
- Capture embedded options
- Potential refunds for rating downgrades

Conclusion

- Interaction of price and liquidity risk is being quantified and can be modeled
- Scenarios need to take into account cash needs as well as value changes
- Not all risk is on the balance sheet
- Possible behavior of rest of the market needs to be in the model
- Risk management can also address liquidity