Class 17: Risk Management for Banks

Financial Markets, Spring 2020, SAIF

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Outline

- Why Risk Management?
  - Capital: a scarce resource, especially when it is most needed.
  - Banks' maturity transformation: short-term financing and long-term investing.
  - Vulnerability: the liquidity and risk mismatch between assets and liabilities.
- Key risk factors faced by financial institutions:
  - Market risk: interest rate, equity, currency, and commodity.
  - Counterparty credit risk.
  - Liquidity risk.
- Regulatory Requirements:
  - Risk-based capital ratios.
  - Supplementary leverage ratios.

The Economics of Risk Management

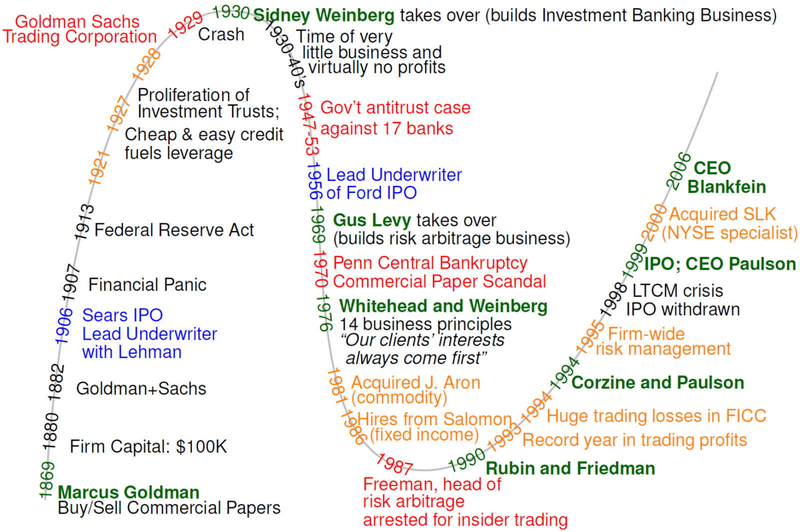
- In perfect capital markets, adding or subtracting financial risk has no impact on the market value of a publicly traded corporation or on the welfare of its shareholders.
- Capital markets are not perfect. Market imperfections underlie significant benefits to bearing and controlling financial risks.
- Capital — a Scarce Resource:
  - If new capital could be obtained in perfect financial markets, we would expect a financial firm to raise capital as necessary to avoid the costs of financial distress.
  - In such a setting, purely financial risk would have a relatively small impact, and risk management would likewise be less important.
  - In practice, however, capital is a scarce resource, especially when it is most needed.

The Leverage of Financial Firms

- Compared with other types of corporations, financial firms have relatively liquid balance sheets, made up largely of financial positions.
- This relative liquidity allows a typical financial firm to operate with a high degree of leverage.
- For example, major broker-dealers regulated by SEC frequently have a level of accounting capital that is close to the regulatory minimum of 8% of accounting assets, implying a leverage ratio on the order of 12-to-1.
- Ironically, in light of the relatively high degree of liquidity that fosters high leverage, a significant and sudden financial loss (or reduced access to credit) can cause dramatic illiquidity effects.

Liquidity Mismatch in Assets and Liabilities

The Evolution of an Investment Bank



Assets

in millions USD	2014	2010	2008	2007
Cash and cash equivalents	57,600	39,788	15,740	10,282
Cash and securities for regulatory and other purposes	51,716	53,731	106,664	119,939
Collateralized agreements:				
Repo Lending and federal funds sold	127,938	188,355	122,021	87,317
Securities borrowed	160,722	166,306	180,795	277,413
Receivables:				
Brokers, dealers and clearing organizations	30,671	10,437	25,899	19,078
Customers and counterparties	63,808	67,703	64,665	129,105
Loans receivable	28,938			
Financial instruments owned	312,248	356,953	328,325	452,595
Other assets	22,599	28,059	30,438	24,067
Total assets	**856,240**	**911,332**	**884,547**	**1,119,796**

Liabilities and Shareholders' Equity

in millions	2014	2010	2008	2007
Deposits	83,008	38,569	27,643	15,370
Collateralized financings				
Repo financing	88,215	162,345	62,883	159,178
Securities loaned	5,570	11,212	17,060	28,624
Other	22,809	38,377	38,683	65,710
Payables:				
Brokers, dealers and clearing organizations	6,636	3,234	8,585	8,335
Customers and counterparties	206,936	187,270	245,258	310,118
Financial instruments sold short	132,083	140,717	175,972	215,023
Unsecured short-term borrowings	44,540	47,842	52,658	71,557
Unsecured long-term borrowings	167,571	174,399	168,220	164,174
Other liabilities and accrued expenses	16,075	30,011	23,216	38,907
Total liabilities	**773,443**	**833,976**	**820,178**	**1,076,996**
Total shareholders' equity	**82,797**	**77,356**	**64,369**	**42,800**

Assets and Liabilities

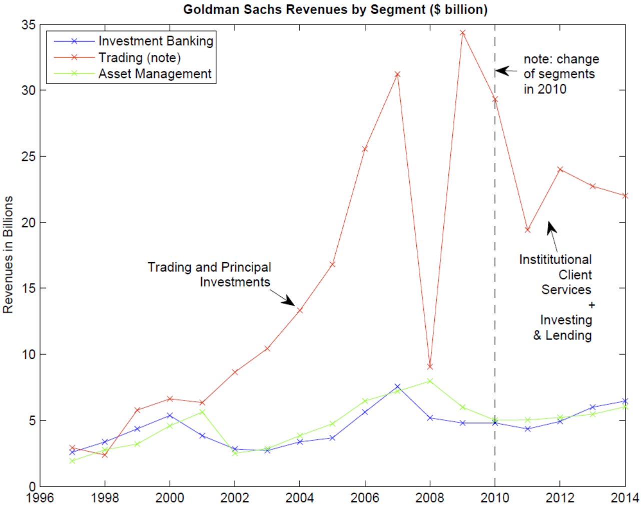
	2014	2010	2008	2007
assets ($m)	856,240	911,332	884,547	1,119,796
equity ($m)	82,797	77,356	64,369	42,800
assets-to-equity ratio	10.3x	11.8x	13.7x	26.2x
total liabilities ($m)	773,443	833,976	820,178	1,076,996
long-term borrowings ($m)	167,571	174,399	168,220	164,174
other long-term financings ($m)	7,249	13,848	17,460	33,300
% long-term financing	22.60%	22.57%	22.64%	18.34%
unsecured short-term ($m)	44,540	47,842	52,658	71,557
% unsecured short-term	5.76%	5.74%	6.42%	6.64%
repo financing ($m)	88,215	162,345	62,883	159,178
% repo financing	11.41%	19.47%	7.66%	14.78%

Financial Instruments, Long and Short Positions

from Goldman Sachs 2014 10-K form:

$ in millions	As of December 2014 Financial Instruments Owned	As of December 2014 Financial Instruments Sold, But Not Yet Purchased
Commercial paper, certificates of deposit, time deposits and other money market instruments	$ 3,654	$ —
U.S. government and federal agency obligations	48,002	12,762
Non-U.S. government and agency obligations	37,059	20,500
Mortgage and other asset-backed loans and securities:		
Loans and securities backed by commercial real estate	6,582 [1]	1
Loans and securities backed by residential real estate	11,717 [2]	—
Bank loans and bridge loans	15,613	464 [4]
Corporate debt securities	21,603	5,800
State and municipal obligations	1,203	—
Other debt obligations	3,257 [3]	2
Equities and convertible debentures	96,442	28,314
Commodities	3,846	1,224
Subtotal	248,978	69,067
Derivatives	63,270	63,016
Total	**$312,248**	**$132,083**

Revenues by Segments



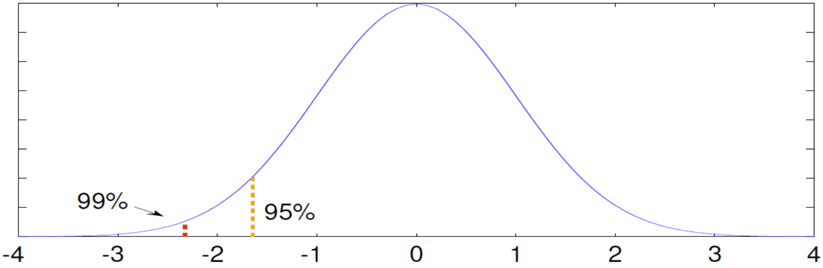
Key Risk Categories Faced by Financial Institutions:

- Market Risk (*from Goldman Sachs 2010 10-K form*):
  - Interest rate risk: changes in level, slope and curvature of yield curves, the volatilities of interest rates, mortgage prepayment speeds and credit spreads.
  - Equity price risk: changes in prices and volatilities of individual equities, baskets of equities and equity indices.
  - Currency rate risk: changes in spot prices, forward prices and volatilities of currency rates.
  - Commodity price risk: changes in spot prices, forward prices and volatilities of commodities, such as electricity, natural gas, crude oil, petroleum products, and precious and base metals.

Key Risk Categories Faced by Financial Institutions:

- Counterparty Credit Risk: failure of counterparties to fulfill their contractual duties (default losses); losses in the market value of a position due to counterparty downgrades.
- Liquidity Risk: the risk of increased costs, or inability to adjust financial positions (for example through widening of spreads), or of lost access to credit.
- Operational Risk: fraud, systems failures, trading errors (such as deal mis-pricing).
- Systemic Risk: breakdown in market-wide liquidity, chain-reaction default.

Value-at-Risk

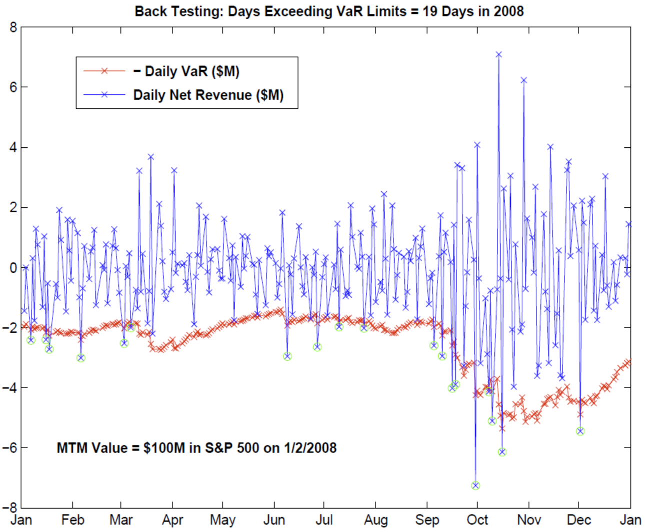


- Value-at-Risk for a \$100M portfolio with daily σ:

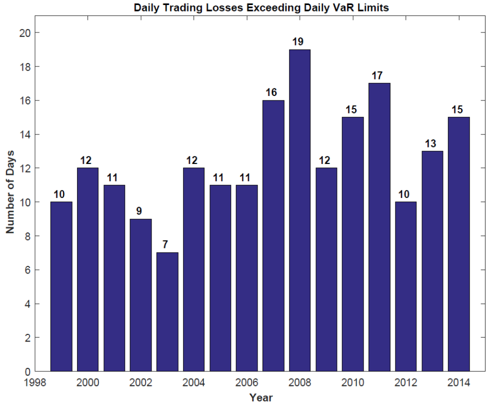
$$\$100\text{M} \times 1.645 \times \sigma$$

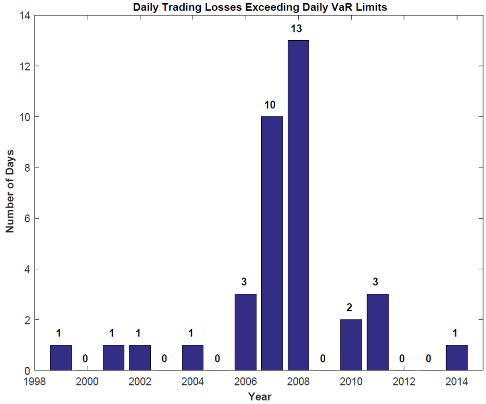
- The critical value for the 5% worst-case scenario: -1.645σ.

A Portfolio of $100M in S&P 500 on 1/2/2008



Daily Trading Losses Exceeding VaR: S&P 500 vs. Goldman Sachs





Risk-Based Capital Requirements

- Risk-based capital requirements:

$$\text{Capital Ratio} = \frac{\text{Capital Measure}}{\text{Risk Weighted Assets}}$$

- Value-at-Risk as a measure of market risk:
  - Internal monitoring of firm-wide risk positions.
  - Disclosed in banks' financial statements.
  - VaR-based capital requirements.

Capital Measures and Risk Weighted Assets

$ in millions	As of December 2014 Basel III Advanced	As of December 2014 Standardized
Credit RWAs		
Derivatives	$122,501	$180,771
Commitments, guarantees and loans	95,209	89,783
Securities financing transactions [1]	15,618	92,116
Equity investments	40,146	38,526
Other [2]	54,470	71,499
Total Credit RWAs	327,944	472,695
Market RWAs		
Regulatory VaR	10,238	10,238
Stressed VaR	29,625	29,625
Incremental risk	16,950	16,950
Comprehensive risk	8,150	9,855
Specific risk	79,918	79,853
Total Market RWAs	144,881	146,521
Total Operational RWAs	97,488	—
Total RWAs	$570,313	$619,216

1. Represents resale and repurchase agreements and securities borrowed and loaned transactions.

2. Includes receivables, other assets, and cash and cash equivalents.

$ in millions	As of December 2014
Common shareholders' equity	$ 73,597
Deductions for goodwill and identifiable intangible assets, net of deferred tax liabilities	(2,787)
Deductions for investments in nonconsolidated financial institutions	(953)
Other adjustments	(27)
Common Equity Tier 1	69,830
Perpetual non-cumulative preferred stock	9,200
Junior subordinated debt issued to trusts	660
Other adjustments	(1,257)
Tier 1 capital	78,433
Qualifying subordinated debt	11,894
Junior subordinated debt issued to trusts	660
Other adjustments	(9)
Tier 2 capital [1]	12,545
Total capital	$ 90,978

Basel III Supplementary Leverage Ratio (SLR)

$$\text{Leverage Ratio} = \frac{\text{Capital Measure}}{\text{Exposure Measure}}$$

- Capital Measure: Tier 1 Capital (common equity and preferred stock).
- Exposure Measure: sum of on-balance sheet exposures, derivatives exposures, securities finance transaction exposures and off-balance sheet items.
- Key departure from the risk-based capital ratios:
  - Intentionally does not distinguish between safer or riskier assets.
  - SLR: a bank must hold the same minimum amount of capital against low risk assets (e.g. US Treasuries) as higher risk assets (e.g. Equities).
- One-year SLR easing announced on April 1, 2020 by the Fed: Exclude Treasuries and cash held at the Fed from the SLR exposure measure.

Goldman Sachs 2019

	As of December	
	2019	2018
Risk-based capital requirements		
CET1 capital ratio	**9.5%**	8.3%
Tier 1 capital ratio	**11.0%**	9.8%
Total capital ratio	**13.0%**	11.8%
Leverage requirements		
Tier 1 leverage ratio	**4.0%**	4.0%
SLR	**5.0%**	5.0%

	For the Three Months Ended or as of December	
$ in millions	**2019**	2018
Tier 1 capital	**$ 85,440**	$ 83,702
Average total assets	**983,909**	945,961
Deductions from Tier 1 capital	**(5,275)**	(4,754)
Average adjusted total assets	**978,634**	941,207
Average off-balance-sheet exposures	**396,833**	401,699
Total leverage exposure	**$1,375,467**	$1,342,906
Tier 1 leverage ratio	**8.7%**	8.9%
SLR	**6.2%**	6.2%

$ in millions	Standardized	Advanced
As of December 2019		
CET1 capital	**$ 74,850**	**$ 74,850**
Tier 1 capital	**$ 85,440**	**$ 85,440**
Tier 2 capital	**$ 14,925**	**$ 13,473**
Total capital	**$100,365**	**$ 98,913**
RWAs	**$563,575**	**$544,653**
CET1 capital ratio	**13.3%**	**13.7%**
Tier 1 capital ratio	**15.2%**	**15.7%**
Total capital ratio	**17.8%**	**18.2%**

$ in millions	Standardized	Advanced
As of December 2019		
Credit RWAs		
Derivatives	**$120,906**	**$ 72,631**
Commitments, guarantees and loans	**179,740**	**134,456**
Securities financing transactions	**65,867**	**13,834**
Equity investments	**56,814**	**61,892**
Other	**75,660**	**78,266**
Total Credit RWAs	**498,987**	**361,079**
Market RWAs		
Regulatory VaR	**8,933**	**8,933**
Stressed VaR	**30,911**	**30,911**
Incremental risk	**4,308**	**4,308**
Comprehensive risk	**1,393**	**1,191**
Specific risk	**19,043**	**19,043**
Total Market RWAs	**64,588**	**64,386**
Total Operational RWAs	**–**	**119,188**
Total RWAs	**$563,575**	**$544,653**

Main Takeaways