

# Why Banks Fail and What to Do About It

**Dan diBartolomeo**  
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# Motivation

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Since the collapse of the crypto exchange FTX last November, the banking sector both in the US and Europe have come under increased stress.

- While the reasons vary as to why particular banks have come under fire, the predominant risk to the banking system in general, depositors, and the shareholders of banks is the potential for “bank runs,” where uninsured depositors all want concurrent withdrawals beyond the available liquidity of a specific bank.

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We assert that the recent set of bank failures as well those experienced in the Global Financial Crisis of 2008-2009 share a simple common root. Banks managements see risk management as a binding constraint *which is always costly*. They therefore prefer to ignore any risk which they are not required by regulators to address.

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What we need is a way to align the interest of bank managements, shareholders and regulators to reduce the chance of similar events in the future. *Healthy banks that are profitable for shareholders don't need rescues from regulators.*

# Introduction

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The entire financial system has recently been shaken by the failure of several major banks (SVB, Credit Suisse, Signature, First Republic).

- While the reasons vary as to why particular banks have come under fire, the predominant risk to the banking system, depositors, and the shareholders of banks is the potential for “bank runs,” where uninsured depositors all want concurrent withdrawals beyond the available liquidity of a specific bank.

*We propose a dynamic risk management policy that contributes positively to the success of banks*

- Our framework aligns the interests of banks shareholders and bank regulators in a new way and is demonstrably optimal for the long-term profitability of commercial banks.
- The proposed process relies on sound economic theory from Litzenberger and Rubinstein (*Journal of Finance*, 1976), Wilcox (*Journal of Portfolio Management*, 2000), Acerbi and Scandolo (*Quantitative Finance*, 2007) and diBartolomeo (*Journal of Performance Measurement*, 2021).

# A Succinct Summary of Recent Events

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About a month ago, I had an unrelated phone conversation with a friend who is one of the most famous equity portfolio managers in history.



His comment on the collapse of Silicon Valley Bank was brief:

**“Greed and stupidity”**

*Disclaimer: Almost every financial institution mentioned in this presentation currently does business with Northfield.*

# How Fragile is (or isn't) the US Banking System?

Just a few days after the collapse of SVB a working paper by Jiang, Matvos, Piskorski, and Seru (SSRN, 2023) was posted online.

- The relevant comes from FDIC “call reports” which are posted online quarterly.

The study considers two key aspects of the current situation to describe the fragility of a particular bank.

- Uninsured deposits as a fraction of total assets of a bank
- The estimated **unreported** decline in capital reserves arising from the loss of market value of bank assets as a result of recent increases in interest rates.

SVB was in the 99<sup>th</sup> percentile (highest ratio) of insured deposits and in the 90<sup>th</sup> percentile in terms of capital status (i.e. 10% of banks are worse off).

- In Northfield models SVB equity risk was in the 96<sup>th</sup> percentile of major banks

*Up to 190 banks with \$600 Billion in uninsured deposits could be at risk*

# Going “Green” with Recycled Deposits

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The \$600 Billion of uninsured deposits estimated in the study would represent *about \$360 Billion adjusted for inflation in 2008 dollars.*

- That figure compares to \$750 Billion for the US allocated for “bailouts” in the GFC period
- \$182 Billion of the \$750 Billion was allocated to AIG, which not only repaid the Treasury in full, but the US Government had \$26 Billion profits on the deal

While \$360 Billion is almost half of the \$750 Billion allocated in 2008, there is a fundamental difference.

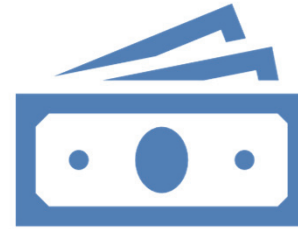
- *A bank run is a liquidity event not a solvency event. The withdrawn cash isn't gone from the system, it just moves to other banks or money market funds.*
- *Any loss of solvency arises from the impacted bank doing “fire sales” (high transaction costs) of assets to raise cash to meet withdrawals.*
- This effect was illustrated by the deposit of \$30 Billion into First Republic Bank by a consortium of larger banks led by JPMorgan.
- Japan has a long tradition of “convoy” rescues within banking

# The Anatomy of Unreported Losses

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US banks with less than \$250 Billion in assets can choose not to “mark to market” certain assets in financial statements as most bank assets are loans with no secondary market.



Among the asset types often treated under “statutory accounting” treatment are high quality bonds that a *bank intends to hold to maturity*.

Since the value of a bond is fixed at maturity the market value fluctuations through time become irrelevant an investor who is almost certain to hold the bond to maturity (e.g. a life insurance company)

Statutory accounting allows financial institutions to report much steadier earnings because the “income” of fixed income securities is always positive. If you can ignore price fluctuations total returns are always positive.

*With rising interest rates, the market value of fixed income assets (bonds, MBS, loans) declines so unreported losses arise and become relevant **if and only if** a current sale of these assets is required to meet withdrawals.*

# Regulate Away Statutory Accounting?



The US requires market to market accounting for many financial entities.

Large banks with over \$250 Billion in assets  
Investment banks, brokers, exchanges, futures brokers



Some countries (e.g. Canada) require mark to market even for financial entities with predominantly long-term liabilities (e.g. life insurance companies).



Statutory accounting can be abused

First Executive Life 1991, MBTARS 2015



But requiring mark to market for all financial assets would add operating costs and make earnings much more volatile for small institutions.

Marking illiquid assets under FASB 157 is vague and often manipulated.



# “Bank Runs” and Risk in Endogenous Time



Since 2017, Northfield has adjusted our risk models daily in response to financial news coverage on companies, industries and countries.

The methodology is called *Risk Systems That Read*<sup>®</sup> and was first proposed in diBartolomeo, Mitra, and Mitra (Quantitative Finance, 2009)

Discussion at <https://www.northinfo.com/Documents/795.pdf>



The RSTR process redefines the passage of time based on flows of information rather than traditional clock and calendar time.

When information flow is high, time is passing quickly for investors. Time moves slowly when no new information is being revealed.

See [Return and Risk in Endogenous Time \(northinfo.com\)](https://www.northinfo.com/Documents/795.pdf).



A bank run is a special case of this problem, as *uninsured depositors can only lose in response to financial news coverage*. No news is good news.

Online banking has made uninsured depositor response almost instantaneous

## Playing Connect the Dots in the Timeline



The voluntary bankruptcy of Silvergate bank and the collapse of Signature Bank were closely tied to turmoil in digital assets after the failure of FTX.

- Both concentrated in transaction processing for crypto related client
- Crypto related investments were somewhere 1 and 4% of all global venture capital deals in recent years.
- *While not a huge percentage, it was still tens of billions of dollars and sufficient to focus the attention of VCs on financial stability*

Silicon Valley Bank was concentrated in activities related to venture capital and was among the top of the nation in uninsured deposits.

The SVB failure prompted investors to look generally at the issue of banks with high degrees of vulnerability to a bank run.

- Several west coast regional banks seemed vulnerable along with CS and FRC
  - *There were personal connections between FRC and SVB senior managements*
- CS was considered of global systemic importance

## Let's Look at Northfield Risk Model Data

Our "near horizon" and "short term" models adjust risk estimates daily.

Closing data on 229 major banks traded in the US (including global banks as ADRs). Table reflects idiosyncratic risk only

*SVB and CS are at near the top as most risky of March 1<sup>st</sup>, 2023*

*SVB idiosyncratic more than doubles on March 9th, the day **before** the closure*

	3/1/2023	3/1/2023	3/1/2023	3/1/2023	3/9/2023	3/23/2023
	Mo Vol	Annual Vol	Z	%	Mo Vol	Mo Vol
UBS	4.71	16.32	-0.12	45	5.11	6.43
SVB	11.95	41.40	1.74	96	27.46	27.41
CS	12.42	43.02	1.86	97	14.11	28.42
FRC	6.08	21.06	0.23	59	7.59	12.53

## Sustainability Scores

Closely related to our internal credit ratings are “sustainability horizons” that represent the median of the number of years that equity investors believe a given company is expected to survive.

See diBartolomeo (Journal of Investing, 2010) for data from 1992 forward

The seemingly high values for SVB and FRC in 2021 relate to near-zero interest rates (i.e. even with high leverage it’s hard to go broke if your cost of funds is negative)

The 10 Year horizon for CS and UBS equates to a 6.7% annual default probability

	Expected Life in Years			
	12/31/2021		2/28/2023	% Change
UBS	15		10	-33.33
CS	8		10	25.00
SVB	46		23	-50.00
FRC	42		24	-42.86

# SVB was a Trifecta

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SVB had three related attributes that made it inherently unstable.

- It was in the 99<sup>th</sup> percentile for the highest ratio of uninsured deposits making it most vulnerable to a bank run.
- It was in the 90<sup>th</sup> worst percentile for capital reserves after adjustment for unrealized losses.
- A few months earlier SVB borrowed \$20 Billion from the Federal Home Loan Bank, indicative of internal knowledge of concerns about liquidity.

According to our models (as of 3/1/2023) SVB was in the 96<sup>th</sup> percentile for monthly idiosyncratic risk at 11.65% at two-week horizon and 10.85% at the one-year horizon.

- *Even if uninsured depositors were unaware of SVB's problems, investors were quite aware.*
- *This risk level contributed to the difficulty SVB encountered when trying to hastily arrange an equity share sale on March 9.*

# The Magic Disappearance of \$17 Billion in Hybrids

In the takeover of CS by UBS, approximately \$17 Billion of “Additional Tier 1 capital” bonds were declared worthless.

- This kind of “hybrid” bond is structurally similar to preferred equity shares.
- Calling it a bond makes it easier to sell to investors and the “interest” is a tax-deductible expense to the issuing bank.
- Most AT1 bonds are structured like a convertible bond in reverse, where the issuer decides when the bond should be converted to equity.

The CS AT1 bonds were different

- They were perpetual with no maturity date like preferred equity.
- The legal covenants were more like “catastrophe bonds” issued by insurance companies where predetermined conditions trigger a “wipe out” of the bondholders.
- *As of late February, the 5.5% CS AT1 bonds were yielding 9.75%, as compared to about 1.4% for long term Swiss government bonds, so the market clearly recognized the high likelihood of default.*

# Implications for Sovereign Debt

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The creditworthiness of the sovereign debt of a given country and the soundness of their banking system are highly interdependent.

- Banks are strongly encouraged by regulation with minimal requirements for capital reserves to hold government debt as their major reserve asset.
- The government needs banks to function smoothly to keep their national economy out of chaos, so acts as a de facto guarantor.
- *The new combination of UBS/CS will have assets twice the annual GDP of Switzerland. Combined Swiss banks assets are around five times GDP.*
- *All US bank assets combined are about one times annual GDP.*

Mervyn King, former Governor of the Bank of England has argued that central banks should act more like pawn shops, lending against collateral other than sovereign debt.

- This might encourage some banks like SVB to diversify into credit risky securities rather than longer maturities to obtain attractive yields.
- Credit risk is much more carefully regulated than interest rate risk

# Recipe for Keeping Banks Prosperous and Out of Trouble

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We will first consider a bank simply as a pool of assets to be managed to maximize risk-adjusted return for the investors.

We will next consider how having highly leveraged balance sheets impacts an investment entity.

- Ignoring liquidity concerns, a bank would look very much like a highly levered fixed income hedge fund.

We will derive an intuitive dynamic risk management policy that is mathematically optimal to ensure that banks stay solvent and yet maximize long term returns to shareholders.

We will illustrate risk calculations that allow both bank management and regulators to observe whether optimal risk policies are being followed.



# Starting at the Beginning

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- If an investment entity has no liabilities and an infinite time horizon, their objective is “growth optimal.” If returns are measured in percentages (i.e. not decimals)
  - See Markowitz and Levy (1979)

$$U = R - (\sigma^2/T), T = 200 \text{ if growth optimal}$$

R = bank net return on assets (net of operating expenses and cost of funds)

$\sigma$  = “volatility equivalent” of the bank’s assets (i.e. inclusive of illiquidity, skew, and kurtosis)

- If the investor has liabilities or cares about maintaining solvency (i.e. a bank) during the path to the long-term horizon, T will be smaller making the penalty for taking risk larger.

## Dynamic Optimal Risk Tolerance



For a bank, the optimal level of risk tolerance  $T$  is just  $200 * \text{the bank's percentage of capital on its balance sheet}$  if the bank wants to be 100% remaining solvent.

- If a bank has 6% capital ratio at a moment in time, the optimal value of  $T$  is

$$(1-.06) * 0 + (.06 * 200) = 12$$

- This relation can be derived from the GLUM model (Litzenberger and Rubinstein, 1976) as extended in Wilcox (2000, 2003).

The intuition is that a bank should take zero risk in terms of fulfilling liabilities but invest the available surplus to maximize long term growth to benefit shareholders.

- This does not imply holding two portfolios but rather maintain the *optimal level of  $T$  to maximize  $U$*
- If a bank is willing to have some non-zero likelihood of not meeting liabilities (i.e. 98%) they can adjust the formulation and raise a  $T$  a little  $(1-.06) * 0 + (.06 * 200)/.98 = 12.25$

# Changing T through Time to Maximize U

Banks have a lot of multiple ways to maintain optimal risk tolerance levels.

- Increase or decrease capital (sell or buyback equity shares)
- Increase or decrease additional Tier 1 capital (sell or call AT1 bonds)
- Increase or decrease  $s$  (annual volatility equivalent) through derivatives (CDS, interest rate swaps)

To know how to change T, the bank needs to know what T is implied by the current operations.

- Banks routinely report a short term “Dollar Value at Risk” metric to regulators.
- A typical report would be “10 trading day, 95%, confidence interval)

$$\sigma_{\text{current}} = \text{VaR (10 day, 95\%)} / [\text{Total Assets} * 1.645 * (10/252)^{.5}]$$

$$T_{\text{current}} = (6 * \sigma_{\text{current}}) / (\text{bank decimal capital ratio})$$

- See *diBartolomeo (2021)* for derivation of the 6 value

# Adjusting VaR for Realism

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The previous slide assumes banks are calculating their “Value at Risk” in a realistic manner.

- Earlier today we addressed asset illiquidity and higher moments of returns.

Northfield has long advocated all financial entities have a transparently documented “liquidity policy” as proposed in Acerbi and Scandolo (2008)

- Builds the transaction costs of liquidating a chosen percentages of assets P (e.g. 25%) in N trading days (e.g. 5) into *liquidity adjusted VaR values*.
- **For banks, the percentage of assets covered can be tied to uninsured deposits**

Since VaR represents potential dollar losses on a portfolio of financial assets, we should add in unrealized losses as these losses will be realized if immediate liquidity is required to meet withdrawals.

- Increased VaR values will require banks to add to liquidity and capital
- *The probabilistic nature of the unrealized losses being realized in the future belongs in the realm of risk management, not financial accounting.*

# Conclusions

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We assert that most bank failures are the result of management decisions wherein risk management practices required by regulators *are always seen as a cost to shareholders*.

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By framing the policy decisions of a bank in a fashion similar to a hedge fund, we can take advantage of a great deal of economic theory that would guide bank managements to optimal behavior, aligning the interests of shareholders and regulators to greatly minimize the likelihood of bank failures.

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The general principle is that bank risk management policy should be dynamic through time and reset frequently to the level which is optimal given market conditions and the degree of leverage on the bank's balance sheet.

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Implementation of such a process is dependent on accurate estimation of Value at Risk, inclusive of the effects of serial correlation, higher moments in asset returns, unrealized losses (not recognized), and potential transaction costs of greatly accelerated asset sales during a “run on the bank”.