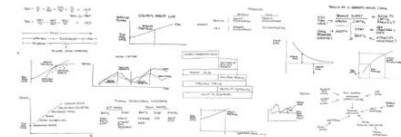


A BRIEF HISTORY OF RISK

2018

For more concepts click on:



Corporate Finance Concepts

Christian Schopper



www.christianschopper.com

CorpFinCE

Corporate Finance Central Europe

www.christianschopper.com

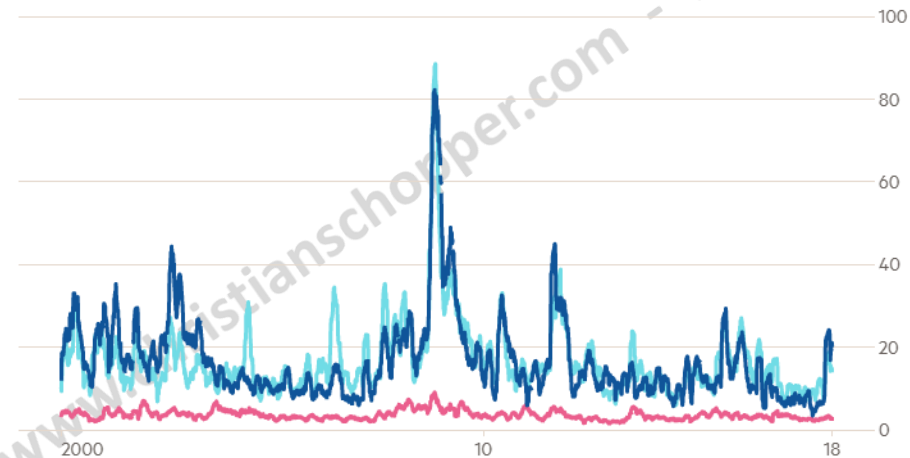
© Copyright – Christian Schopper

- Until about 1950, **fund managers had been judged largely by their performance**
 - It was intuitively understood that riskier investments should generate higher returns ...
 - ... but there was little rigour to it
- While waiting for his university supervisor, Markowitz struck up a conversation with a visiting stockbroker ...
- Published in the Journal of Finance in 1952, “**Portfolio Selection**” argued that **returns should be judged against**, and optimised for, the amount of **risk** taken
 - Since risk can be a vague concept, Markowitz used “variance”, or volatility, as a handy proxy
 - For example, stocks are more volatile than bonds, so investors should expect better returns to justify the increased risk
- See: https://www.math.ust.hk/~maykwok/courses/ma362/07F/markowitz_JF.pdf - 1952

Variable volatility

Thirty-day volatility of various financial markets

— US stock market — US bond market — Emerging market equities



Source: Bloomberg

© FT

- Sharpe dropped out of Berkeley ...
 - ... where he was planning to study medicine ...
- ... and pursued a degree in business administration at the University of California Los Angeles
 - Finding accounting a bore, he decided to major in economics, and was fascinated by Markowitz's work, eventually pursuing a doctorate in which the older economist served as an informal adviser
- The “Sharpe Ratio” is a simple mathematical measure, a “**reward to variability**”
 - It directly compares the returns of a fund manager to the volatility of his performance, and subtracting the returns of a risk-free asset such as cash
 - Back in the 1960s / 1970s, accurate financial data were hard to get, and computers were inadequate to the task of calculating the volatility of various markets or stocks, but all that began to change in the 1980s ...
- See: http://www.stat.ucla.edu/~nchristo/statistics_c183_c283/sharpe_mutual_fund_performance.pdf - 1966

- Guldemann dreamt of becoming a neurologist ...
 - ... but decided he wouldn't be very good at it
 - He switched to electrical engineering, but thought he wouldn't make a very good electrical engineer either ...
 - So he took an MBA at Harvard and started working at JPMorgan
 - (Today he runs vineyards in Saratoga, California)
- At JPM he constructed a **computer system to monitor major currency exchange rates** minute by minute - at the time a huge leap
 - “Risk management relied on limits. So you told traders how many pigs or horses they could buy [to control their risk] ...”
 - “But it was hard to gauge the overall exposure . . . because **we had to measure the relationship between pigs and horses**. If you had \$100 worth of horses on our books, and \$50 of pigs, then the overall exposure might not be \$150.”
- A bank had to know the “**correlation**” **between bonds and stocks**
 - ... or pigs and horses

- In the wake of the **1987 Black Monday crash**, JPM's then chairman Sir Dennis Weatherstone ordered staff to start a daily report that would show how much money the bank could lose on its trading positions on any given day
 - The **"value-at-risk" (or VaR) report** that landed on Sir Dennis's desk at 4.15pm every day
 - The report designed by Guldemann, who used the historical volatility of markets to calculate the maximum the bank could lose with a high degree of certainty
 - JPM's **RiskMetrics** spread across the industry in the early 1990s.
- The dominance of VaR and its dependence on volatility as a proxy for risk came **under fire in the wake of the financial crisis 2008**
 - Losses could be an order of magnitude larger than models might imply
 - VaR **assumes that market moves are normally distributed** ...
 - ... and VaR is always looking in the rear-view mirror

- Problem: **Volatility can nurture “pro-cyclical” behaviour**
 - When it is low, it encourages investors to buy more assets, pushing volatility even lower
 - When it rises, investors shed assets, in turn lifting volatility even more
- Despite its flaws, volatility-based risk management is what most of the modern investing industry is built on
- As volatility became the dominant way to measure and manage risk, a series of academics and investment bankers started **laying the groundwork for trading volatility itself**: In the process they changed what was once just an observable phenomenon into something that investors could themselves influence

Thales of Miletus – Option

- Following story is told by **Aristotle**:
 - One-year ahead, Thales forecast the next olive harvest would be an exceptionally good one
 - As a poor philosopher, he did not have many financial resources at hand ...
 - ... but he used what he had to place a deposit on the local **olive presses**
 - Thales secured the rights to the presses at a relatively low rate
 - As the harvest proved to be bountiful, and so demand for the presses was high, Thales charged a high price for their use and reaped a considerable profit
- The arrangement gave Thales the right but not the obligation to hire the presses

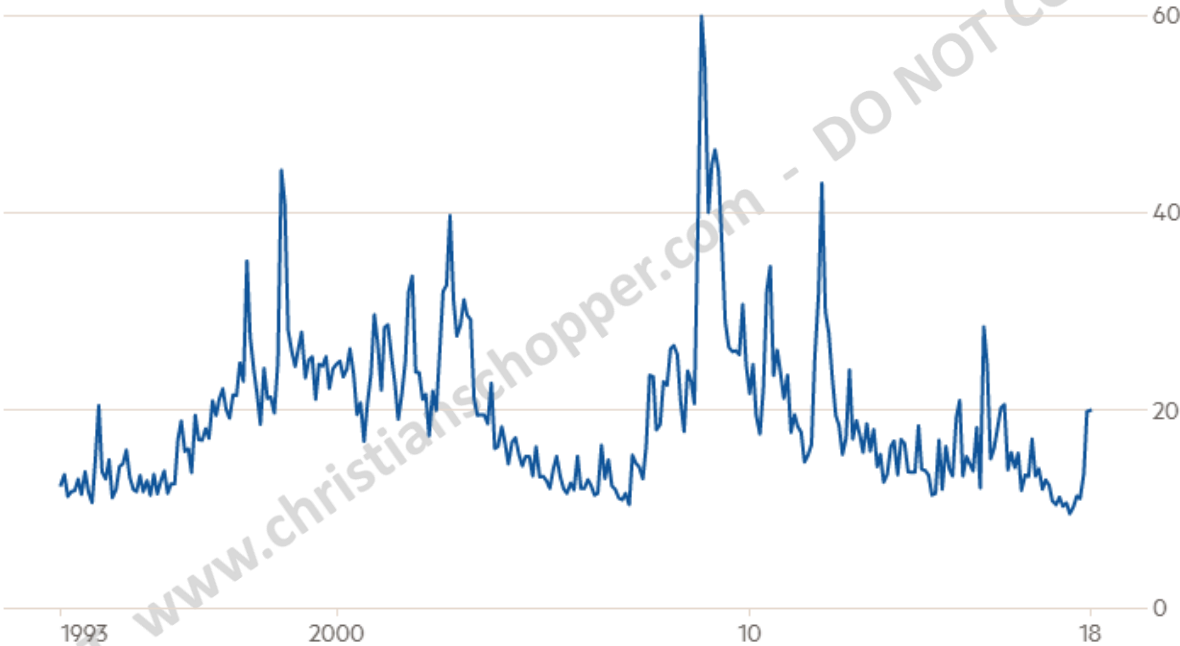
Fischer Black, Robert C. Merton and Myron Scholes – Black Scholes Model

- Options owe their popularity to Fischer Black, Robert C. Merton and Myron Scholes, who, in 1973, published a revolutionary model to **calculate** more efficiently the **value of options**
- The Black-Scholes model won Merton and Scholes the Nobel prize for economics in 1997
 - Black had passed away a few years before
- See: https://www.cs.princeton.edu/courses/archive/fall09/cos323/papers/black_scholes73.pdf - 1973

- Already in the 1980s, Menachem Brenner and Dan Galai published a series of papers that created an actual index of stock-market volatility based on options, which they called “**Sigma**”
 - They pitched the idea to various exchanges but at the time no one wanted to turn it into a live volatility benchmark
- In 1992, the Chicago Board Options Exchange (Cboe) hired Robert Whaley
 - ... a Bob Dylan-loving financial academic with an Irish pub in his basement
 - His task was to **turn the idea of an options-based volatility index into reality**
- By 1993, the **Cboe Volatility Index** was born
 - The originally contemplated stock ticker REW was already taken, so Cboe faxed a list of alternatives to Whaley: “On the list was ‘VIX’. I circled it and faxed it back”

The Fear Index

Cboe Volatility Index (VIX)



Source: Bloomberg

© FT

- Vix aims to measure the **expected volatility of the US stock market over the next 30 days, as implied by option prices**
 - ... in theory measuring the level of investor anxiety
- The Vix tracks how much investors pay for options they often use as insurance against future stock-market declines
 - It typically rises as stocks fall or vice versa, reflecting shifting demand for options used to hedge investments
- But **investors couldn't buy or sell the Vix** itself ...
 - It is only a number based on complicated calculations from thousands of underlying derivatives

- ... yet there were fees to be made, and investment banks always find a way
 - The first “pure” volatility derivative appears to have been a deal structured by a UBS banker called Michael Weber in 1993
 - Weber built something that became known as a “**variance swap**”, based on the UK stock market’s volatility, to protect the Swiss bank’s trading book from losses
 - Variance swaps quickly started to **gain ground** on Wall Street, especially in the late 1990s, when markets were roiled by the **Asian financial crisis** and the collapse of hedge fund **LTCM**
 - This stirred interest in the idea of trading volatility itself, but variance swaps remained too arcane for wide usage

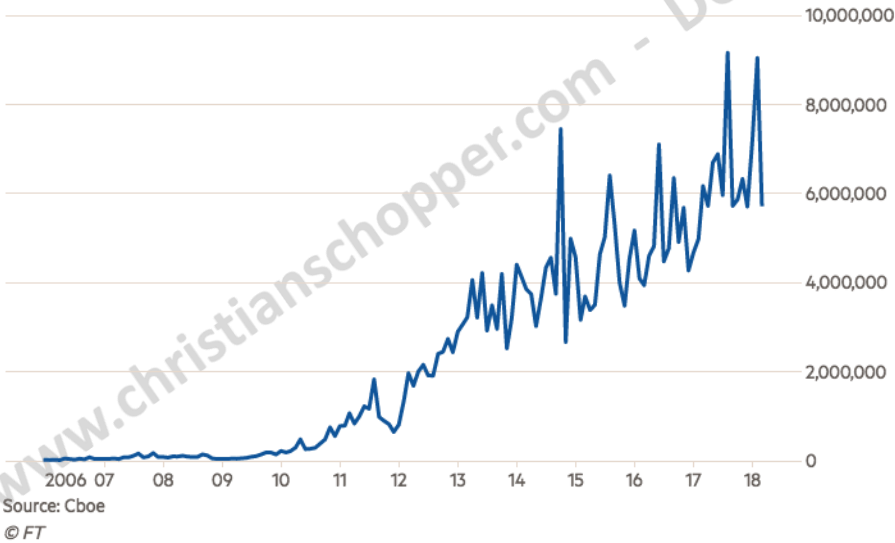
Volatility or Variance Swap



- In the summer of 2002, Mark Cuban wanted to **buy some protection**
 - A few years earlier, he had sold Broadcast.com, an internet radio company, to Yahoo for US\$5.7bn, netting \$1.4bn worth of the portal's stock at the time
 - But then the dotcom bubble unravelled
 - The first conversations with Goldman Sachs proved frustrating
 - Devesh Shah, the banker who fielded the call, tried to sell Cuban a variance swap, but Cuban wanted to the "fear index" somehow used ...
 - Shah mentioned the story to a colleague, Sandy Rattray, who thought the challenge "would be fun"
- Subsequently, Cboe hired Goldman to make tradable futures contracts based on the Vix
 - In 2004, Cboe was ready to launch the first **Vix futures**
 - In 2006, the number of Vix futures contracts being traded averaged about 1,730 a day
 - By 2008 more than 4,300 volatility futures were traded each day ...

The relentless rise of volatility trading

Volume of Vix futures contracts traded per month



- Financial engineers started constructing **exchange-traded products** based on the index
 - In 2009, Barclays built the first volatility-linked ETP using Vix futures
 - By 2017 there were more than 40 Vix-linked ETPs available for ordinary retail investors to trade

Vix futures grow as ETPs* become more popular

Total net vega** short-term

Vix ETPs

Vix Futures Open Interest

('000)



* Exchange-traded products

** Measurement of an option's sensitivity to changes in the volatility of the underlying asset

Sources: Goldman Sachs; Bloomberg

© FT

- In 2017, Christopher Cole, money manager at Artemos Capital, highlighted how **volatility had transformed from a proxy of risk into an input for risk**
 - Just \$3bn of Vix-linked ETNs could already cause a major market mayhem
 - He believes that there is now a “dangerous” **feedback loop linking volatility, low interest rates and financial engineering ...**
 - ... and he estimates that there is more than \$2tn in strategies that both exert influence over, and are influenced by, stock market volatility
- **Has volatility become the only asset class that really matters?**
 - Volatility is now embedded in risk-management models
 - Trading strategies have been built on volatility targets, Vix futures developed and complex financial instruments created that can fuel the very thing they attempt to harness
- Physicists have long noted that observing some phenomena actually changes their nature: In finance, the equivalent is known as **Goodhart's law**
 - British economist Charles Goodhart argued in 1975 that **once a measure becomes a target, it loses the very properties that made it a good gauge to begin with ...**

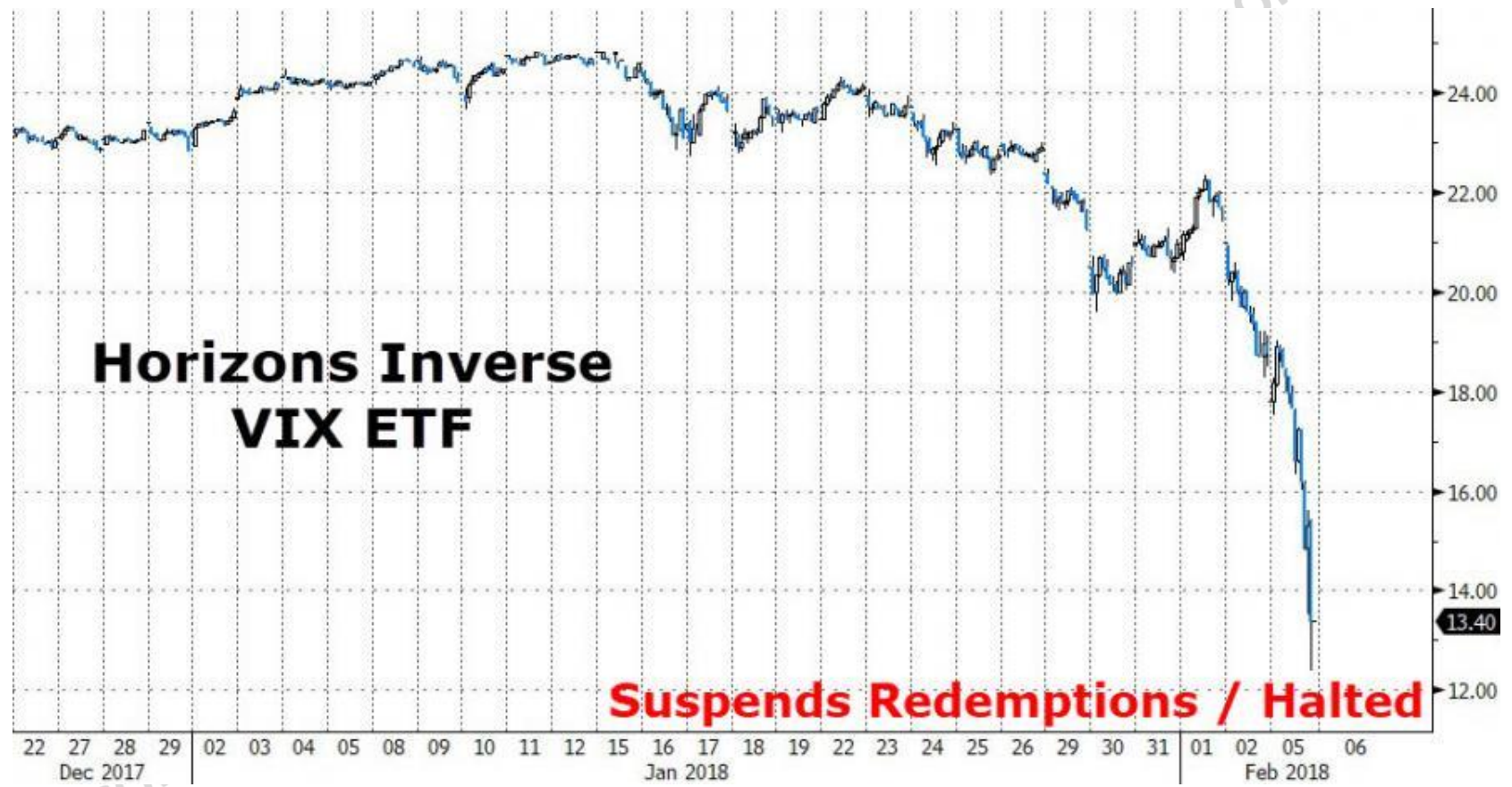
Bet on markets remaining calm turns sour

VelocityShares daily inverse Vix short-term ETN* net asset value (\$ per share)



* Exchange-traded note
Source: Bloomberg
© FT

Bets on Markets Remaining Calm Turns Sour (cont'd)



- 18 April 2018 - **Vix index surge revives manipulation concerns**
- The Vix index surged more than 10 per cent **in** the space of **a few minutes** on Wednesday morning, around the time of a monthly auction that sets the price of derivatives tied to the index
- The highly **unusual move** happened **despite** there being **no significant increase in volatility in the S&P 500 equity market benchmark**, which the Vix is supposed to reflect
- **Instead**, the surge was the result of apparently outlandish **bets placed** in the options market in the moments **before the settlement auction closed** at 8.30 am in Chicago
- A trader or traders paid \$2.1m for options on the S&P 500 falling 50 per cent in the next month, according to data from Macro Risk Advisors (MRA)
- The Financial Industry Regulatory Authority, the US finance industry's self-regulatory authority, is looking into whether the index has been the victim of manipulation

Vix index

Apr 18, Central Daylight Time



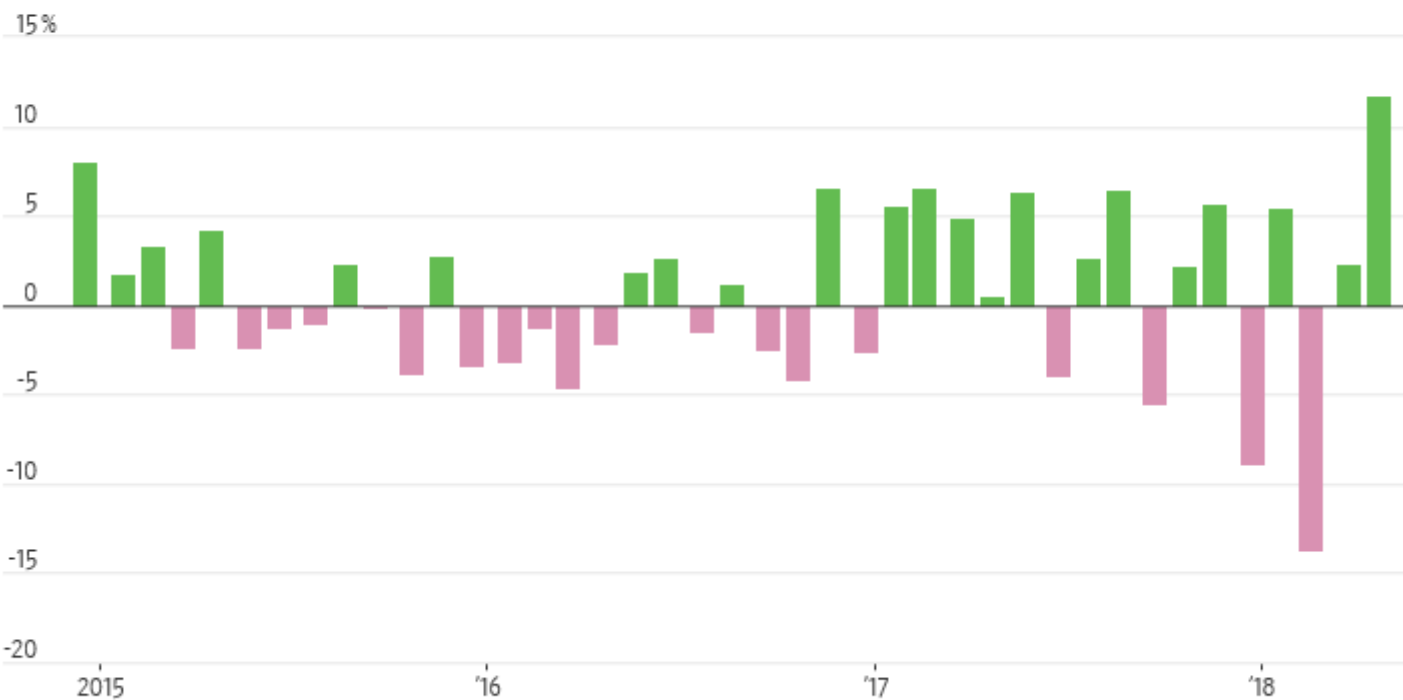
Source: Bloomberg

© FT

Deviating Prices

There have been large differences between VIX futures prices at 9 a.m. and the final price at 9:30—after a monthly auction.

Difference between futures prices at 9 a.m. and 9:30



Source: Macro Risk Advisors

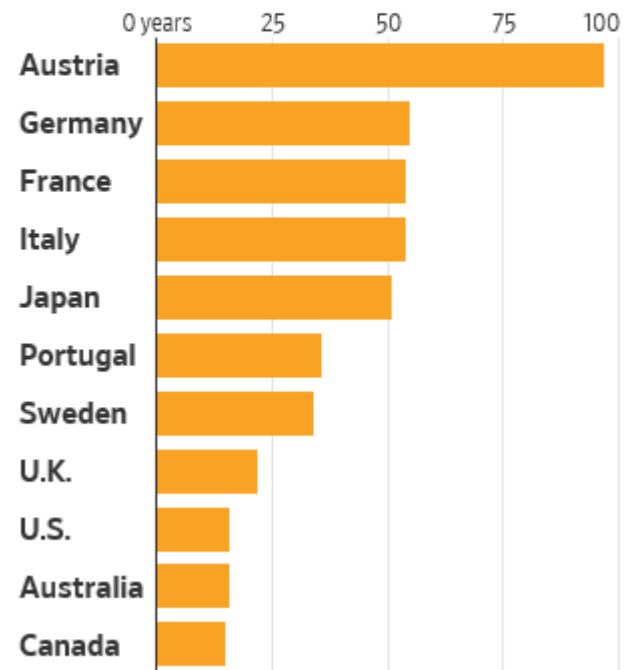
What has been the Biggest Risk in the 20th Century?

- In the 20th century the biggest risk to investors was geopolitics, in the form of Communist revolutions and the first and second world wars
 - Investors who owned Russian stocks in 1917 or Chinese stocks in 1949 lost everything
 - Shares in Austria—which lost two wars and an empire — lost money after inflation over 97 years, even when counting dividends
 - Shareholders in Belgium, Germany, Italy, France and Japan were down in real terms for more than half a century, as were Spanish investors, who endured a destructive civil war and dictatorship

War, Huh

The biggest losses for equities were in countries that lost wars or had revolutions.

Longest period of after-inflation losses, selected countries



Sources: Credit Suisse; Dimson, Marsh & Staunton

The Self-Fulfillment of the Risk Volatility Equivalent

- Bank regulations have long had volatility embedded in them via measures of value at risk in their trading books
 - When volatility rises, the value at risk rises, and banks typically respond by selling stocks — helping to push down stock prices ...
- But this does not only apply to banks
 - Insurance companies and pension funds, typically use volatility as part of the assessment of their portfolios
- Combined with mark-to-market valuations and Europe's Solvency II directive financial institutions and investors might well be forced into selling stocks in the next bear market
 - ... rather than acting as a stabilizing influence by buying on the cheap
- When the word “risk” is used investors should question what it means, because one person's risk is another's opportunity ...

Contact

Christian Schopper

Private: christian.schopper@aon.at
Business: christian.schopper@corpfince.com

For more concepts click on:

