Stock Fluctuations in the Short Run

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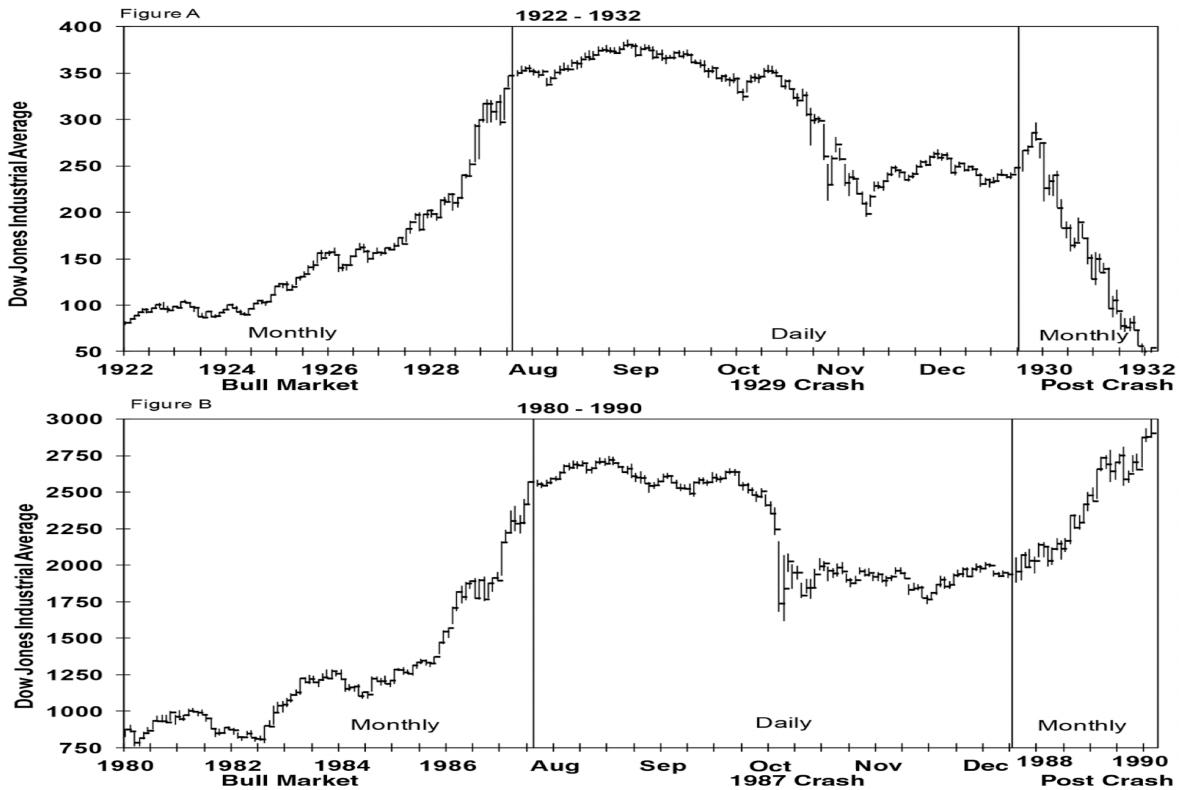
Market Crises and Stock Volatility

Market Volatility

★ Market Volatility

Does the past portend the future?

Fig 1 1929 and 1987 stock market crashes



There is an uncanny similarity between these two bull markets.

Market Volatility

The similarity between the 1929 and the 1987 episodes stopped at year's end.

1929 Two years after the crash, stocks were in the throes of the greatest bear market in the US history. The Dow had lost more than two-thirds of its value and was about to lose two-thirds more.

1987 The stock market recovered from its October 1987 crash, and by August 1989, stocks hit new high ground.

Market Volatility

★ The Stock Market Crash of October 1987

The Dow Jones Industrials was declined from 2,247 to 1,739 (22.6%)–by far the largest point drop up to that time and the largest one-day percentage drop in history.

The crash on Wall Street reverberated around the world.

- Tokyo: two years later it experienced a record one-day drop of 15.6%.
- New Zealand: fell nearly 40%.
- Hong Kong: market closed because collapsing prices brought massive defaults in the stock index futures market.

In the US alone, stock values on that day dropped about $500 billion, and the total worldwide decline in stock values exceeded $1 trillion.

Market Volatility

★ The Causes of the October 1987 Crash

There was no single precipitating event–such as a declaration of war, a terrorist act, an assassination, or a bankruptcy–that caused Black Monday. However, worrying trends had threatened the rising stock market for some time:

- sharply higher long-term rates caused by a falling dollar.
- the rapid development of a new strategy (portfolio insurance) that was designed to insulate portfolios from a decline in the overall market.

The portfolio insurance was born from the explosive growth of stock index futures markets, which did not even exist six years earlier.

Market Volatility

- Exchange Rate Policies

The roots of the surge in interest rates that preceded the October 1987 stock market crash are found in the futile attempts by the US and other G7 countries to prevent the dollar from falling in the international exchange markets.

- The dollar had bounded to unprecedented levels in the middle of the 1980s on the heels of huge Japanese and European purchases of dollar securities and a strong US economy.
- Foreign investors were attracted to high dollar interest rates.
- By February 1985, the dollar became massively overvalued, and US exports became very uncompetitive, severely worsening the US trade deficit. The dollar then reversed course and began a steep decline.
- The trade deficit did not improve; in fact, it worsened after the initiation of the exchange stabilization policies.
- The stock market initially ignored rising interest rates.
- Rising bond rates, coupled with higher stock prices, spelled trouble for the equity markets.

Market Volatility

- The Futures Market

Since the introduction of the stock index futures market, a new trading technique, called portfolio insurance, had been introduced into portfolio management.

  - Portfolio insurance (stop-loss order): If an investor buys a stock and wants to protect herself from a loss, it is possible to place a sell order below the current price that will be triggered when and if the price falls to or below this specified level.

If the stock falls below your specified price, your stop-loss order becomes a market order to be executed at the next best price. If the stock gaps, or declines dramatically, your order could be executed far below your hoped-for price. This means a panic might develop if many inves tors place stop-loss orders around the same price. A price decline could trigger a flood of sell orders, overwhelming the market.

Market Volatility

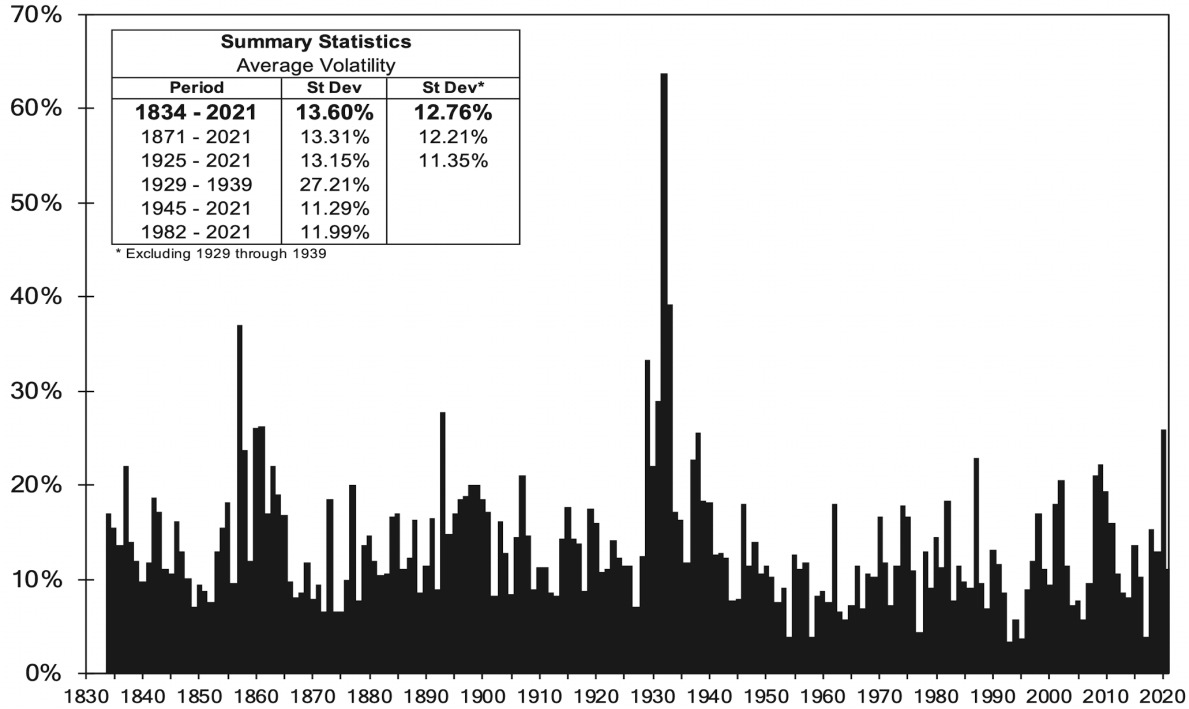
- During the week of October 12, the market declined by 10%, and a large number of sell orders flooded the markets.
- So many traders and money managers using portfolio insurance strategies tried to sell index futures to protect their clients' profits that the futures market collapsed.
- There were absolutely no buyers, and liquidity vanished.
- Certainly, there were factors other than portfolio insurance contributing to Black Monday.
- But portfolio insurance and its ancestor, the stop-loss order, abetted the fall. All these schemes are rooted in the basic trading philosophy of letting profits ride and cutting losses short.

As a result of the crash, the Chicago Mercantile Exchange and the NYSE implemented rules (circuit breakers) that restricted or halted trading when certain price limits were triggered.

Market Volatility

★ Historical Trends of Stock Volatility

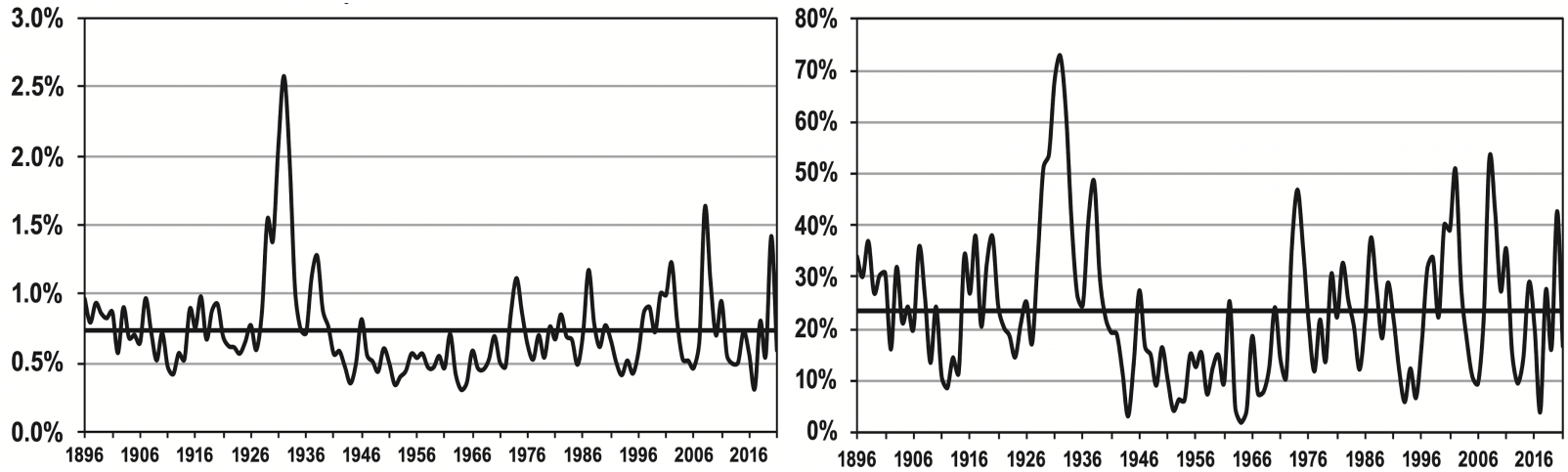
Fig 2 Annual volatility of stock returns: annualized standard deviation of monthly nominal returns, 1834-2021



- The period of greatest volatility was during the Great Depression, and the year of highest volatility was 1932.
- The volatility of 2020 during the Covid-19 pandemic was the highest since the Great Depression, edging out 2008, the year of the financial crisis and 1987, the year of the October crash.

Market Volatility

Fig 3 (A) Average Daily % Change in Dow Industrials (B) % of Daily Changes Larger than 1%



- Except for the 1930s, there was a downtrend in volatility from 1896 to 1960 and a subsequent uptrend. Some of the uptrend is due to the faster response of markets to economic developments.
- Some of the downward trend in the Dow volatility in the early 20th century is due to the increase in the number of stocks in the Dow Industrials.
- The daily volatility during the financial crisis in 2008, at 1.63 percent, was the highest since the Great Depression and edged out the daily volatility in the 2020 pandemic.

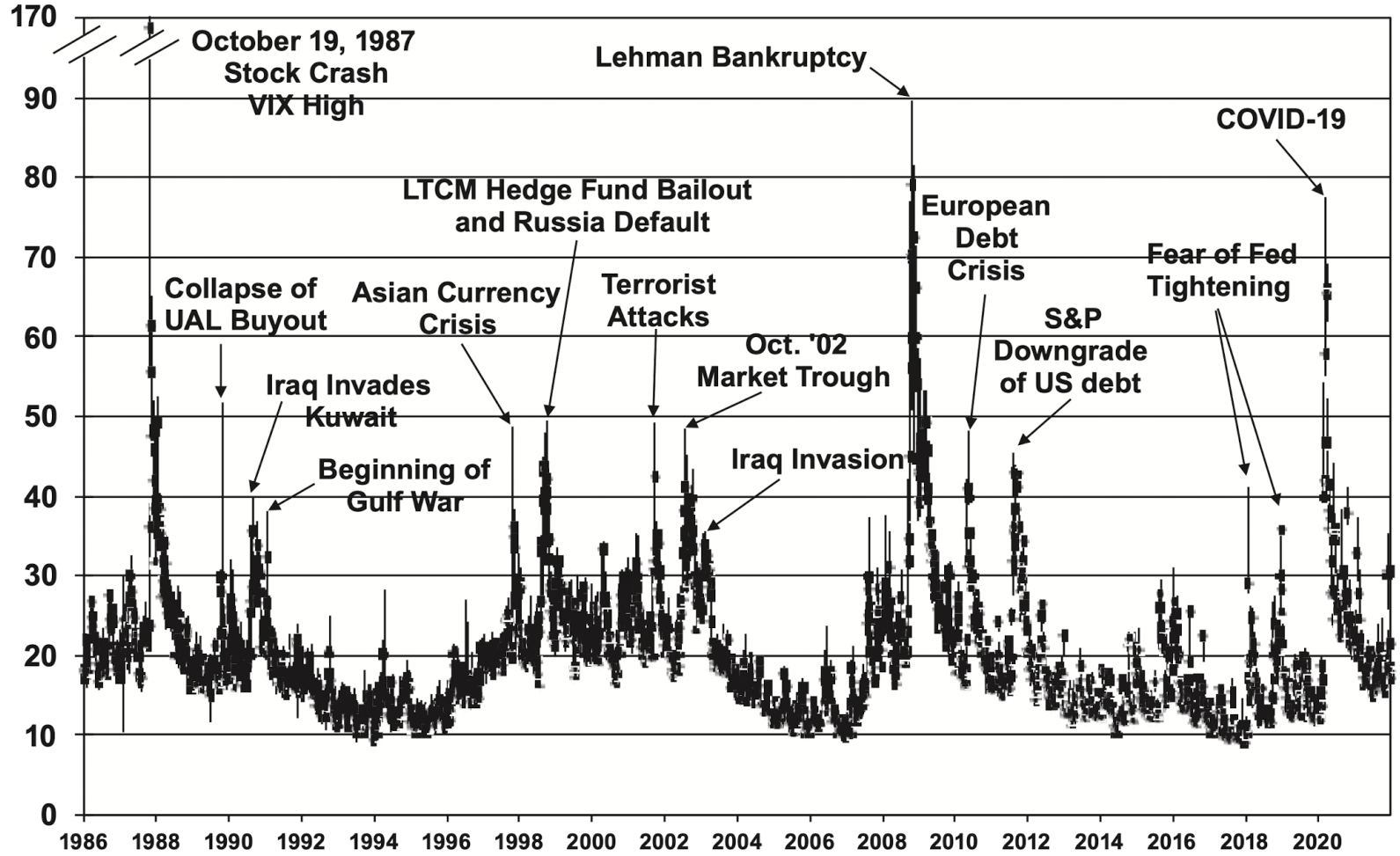
Market Volatility

★ The Volatility Index

- Measuring historical volatility is a simple matter, but it is far more important to measure the volatility that investors expect in the market.
- By examining the prices of put and call options on the major stock market indexes, one can determine the volatility that is built into the market, which is called the implied volatility.
- In 1993, the Chicago Board Options Exchange introduced the CBOE Volatility Index, also called the VIX Index (VIX), based on actual index options prices on the S&P 500 Index,

Market Volatility

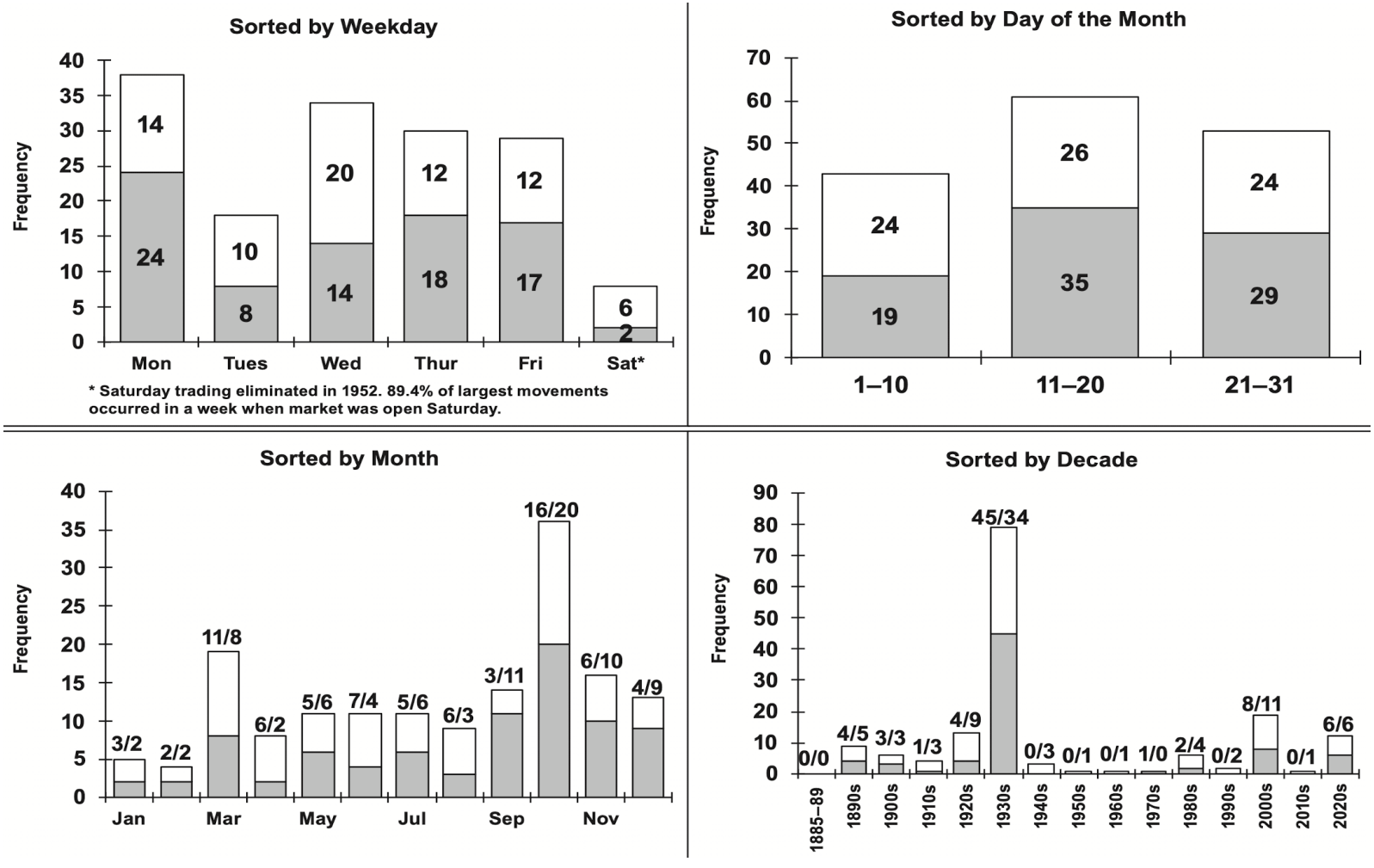
Fig 4 The VIX Index 1986-2021



Market Volatility

★ The Distribution of Large Daily Changes

Fig 5 Distribution of Dow Industrial changes over 5%, 1885-2021 (white rises, gray declines)



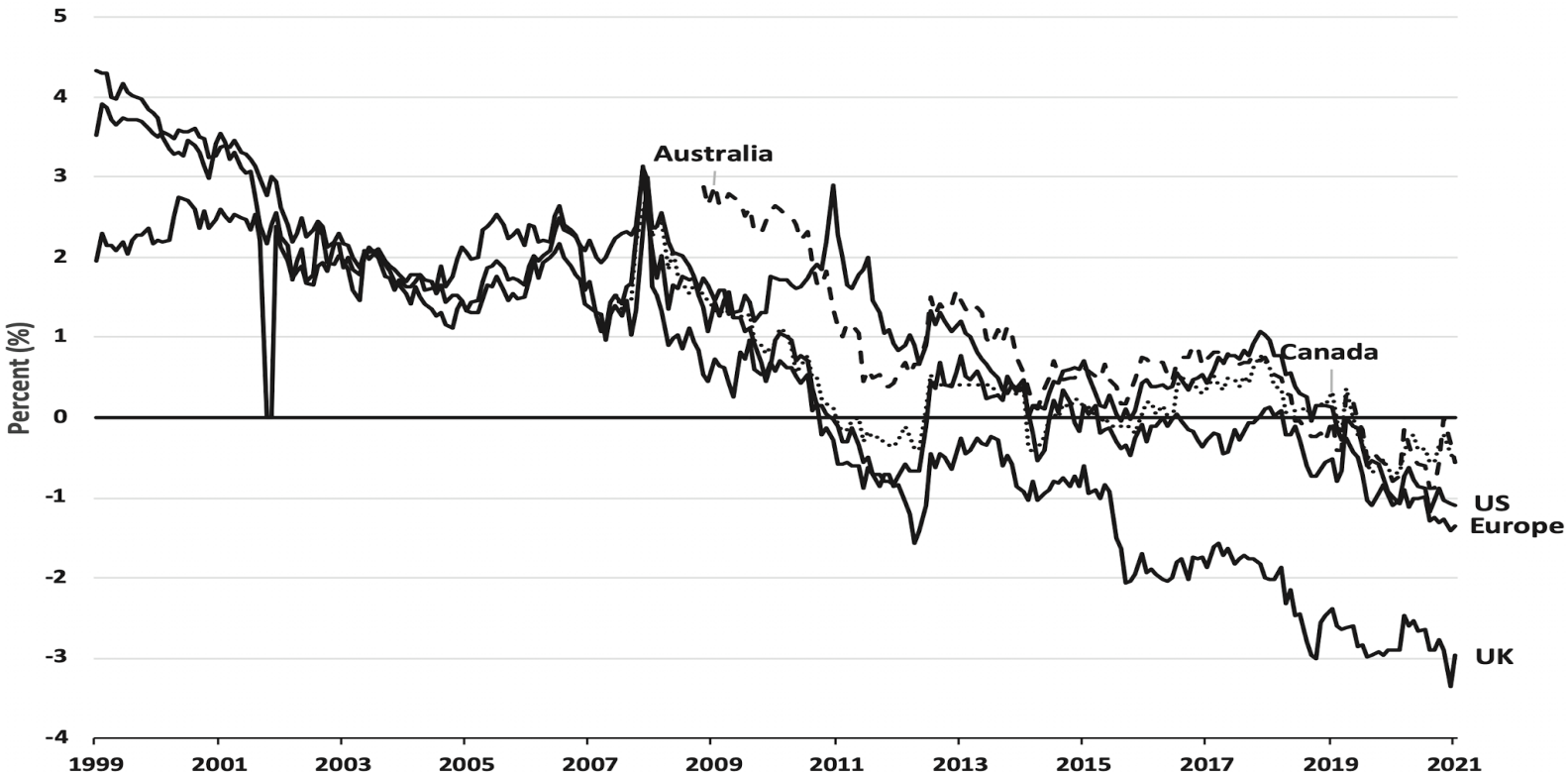
Interest Rates and Stock Prices

Interest Rates and Stock Prices

★ Interest Rates and Stock Prices

One of the most surprising developments over the last several decades has been the persistent and steep decline in real interest rates. Certainly nominal, or market, interest rates, which include a premium for expected inflation, have declined because inflation (until the Covid-19 pandemic) fell over this period. But real, after-inlation interest rates have also fallen dramatically.

Fig 6 Real yields on 10-year government bonds



Interest Rates and Stock Prices

★ Determinants of Real Interest Rates

A popular explanation for the persistent decline in real interest rates is the “easy money” policy of the central banks, but that explanation is largely mistaken. Real interest rates were primarily impacted by

1. Economic Growth
2. Time Preference
3. Risk

Interest Rates and Stock Prices

★ Economic Growth

Economic growth consists of three components:

1. Population growth
2. The share of the population in the labor force
3. Productivity

All three of these measures have been trending downward in recent years.

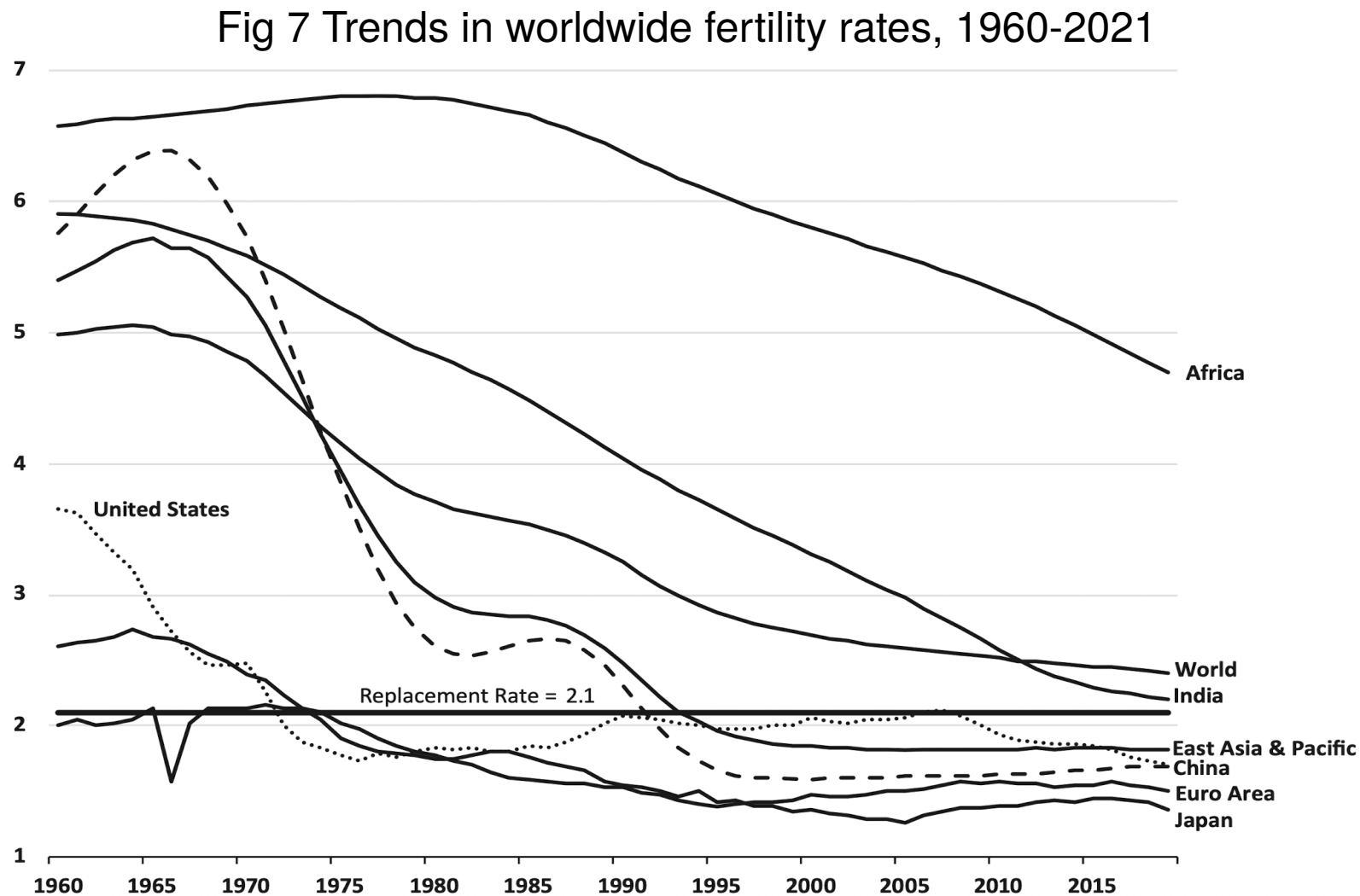
- A reduction in the growth of the workforce or productivity reduces the demand for capital by firms and the incentive to borrow against future income by individuals.

The impact of economic growth on interest rates is confirmed by the reactions of financial markets:

- When stronger-than-expected data on the economy are released, bond prices fall and interest rates rise.
- When weaker-than-expected data on the economy are released, bond prices rise and interest rates fall.

Interest Rates and Stock Prices

- Population Growth



Interest Rates and Stock Prices

- Aging of Population

The aging of the world's population arises from two factors: 1) the increase in life expectancy and 2) the drop in the birth rate. The degree of aging is frequently measured by computing the old-age dependency ratio, defined as those aged 65 years as a percentage of the total population.

Table 1 The old age dependency ratio

Country	1950	2020	2050
United States	8%	15%	22%
Germany	10%	22%	30%
Italy	8%	22%	37%
Japan	5%	29%	37%
China	4%	10%	26%
South Korea	3%	15%	38%

Source: UN World Population Prospects

Interest Rates and Stock Prices

- Productivity

One factor that can offset the fall in population growth and increase in the dependency ratio is a rise in productivity.

Table 2 Productivity growth

Geographic Area	2000–2010	2010–2020
United States	2.2%	0.9%
Japan	1.1%	1.0%
G7 Countries	1.5%	1.0%
Eurozone	1.2%	1.0%
OECD	1.3%	1.2%

Source: OECD

In the last decade, productivity growth has fallen in all major developed countries in the world, particularly in the United States. Despite the tremendous gains in technology developed over this period, growth in output per hour worked has not accelerated.

Interest Rates and Stock Prices

- Decline in Growth of Per Capita GDP

The decrease in the working-age population, combined with the stagnation of productivity growth, has contributed to a slowdown in the growth rate of per capita GDP.

Table 3 Per capita gdp growth

Region/Country	1970–2000	2000–2020	2000–2010	2010–2020
World	1.59%	1.47%	1.74%	1.21%
United States	2.21%	0.92%	0.81%	1.04%
Eurozone	2.32%	0.53%	0.73%	0.33%
Japan	2.70%	0.45%	0.47%	0.42%
China	7.06%	8.11%	9.92%	6.33%
India	2.48%	4.41%	5.09%	3.75%

Source: OECD

The slowdown in per capita GDP has been especially sharp in Europe, Japan, and the United States in the last 20 years.

Interest Rates and Stock Prices

- Other Impacts of Slower Economic Growth

Slower economic growth, in addition to lowering the real rate of interest, does have benefits.

1. It reduces the pressure on the world's natural resources.
2. An increase in the retirement period and a reduction in the hours worked do increase leisure time. Leisure is not directly valued in GDP, so economic welfare may be increasing at a faster rate although GDP growth may be slowing.

Nevertheless, slower economic growth reduces the demand for capital, and slower productivity growth reduces the demand for borrowing against the future, both of which lower the real rate of interest.

Interest Rates and Stock Prices

- Time Preference

Time preference is another factor influencing real interest rates.

- Time preference: the psychological trait that given a choice, most individuals prefer a unit of consumption today to an identical unit of consumption in the future.

That means that to persuade someone to defer consumption today, one has to offer a greater quantity of consumption tomorrow.

The higher the time preference for today's consumption, the higher the interest rate required to entice consumers to invest, or defer today's consumption for the promise of more in the future. This variable is difficult to measure, and there is no evidence of a trend in one direction or another.

Interest Rates and Stock Prices

- Risk Aversion

Slower growth has a negative effect on real interest rates and also influences interest rates

1. The changing risk behavior of investors
2. The shifting risk characteristics of bonds

These two factors are caused by the aging of the population and the increasing ability of bonds to hedge short-term risks in the equity market.
As individuals age, their portfolios become more conservative and the proportion of their assets in bonds rise.

- This occurs because mean reversion of equity returns means that the riskiness of stocks compared to bonds rises as the time horizon gets shorter.
- Older investors have a lower opportunity to offset losses in one's portfolio by increasing labor income, increasing their conservatism.

This incentivizes older individuals to hold more bonds in their portfolio relative to stocks, a factor that lowers real rates of interest.