



Correlation Regimes

A single factor approach to
evaluating financial assets



Summary

“Regime Change” is a large, abrupt, persistent changes in the structure and function of a system. This change can lead to unexpected outcomes when expectations are based on observations of the recent past.

The financial system appears to have experienced six “Correlation Regimes” since 1871. Correlation Regimes are characterized by higher or lower correlation between risky assets and sovereign bonds. Periods of high correlation seem to be largely driven by inflation which forces sovereign bond prices to fall. Risky asset prices fall as well because of sovereign debt determines the discount rate, borrowing costs constrain credit, and inflation destroys wealth leading to a reduction in the supply of available capital.

Today’s Correlation Regime began around the year 2000. That was the period when the correlation between Stocks and Treasury Bonds switched from around positive 40% to negative 40%. Since then investors and regulators have come to expect risky and non-risky assets to have a negative correlation...an assumption that could lead to unexpectedly large downside risks.



Outline

1. Correlation Regimes
2. Inflation Drivers
3. Evidence of a Bond Bubble
4. Strategy Considerations



1. Correlation Regimes

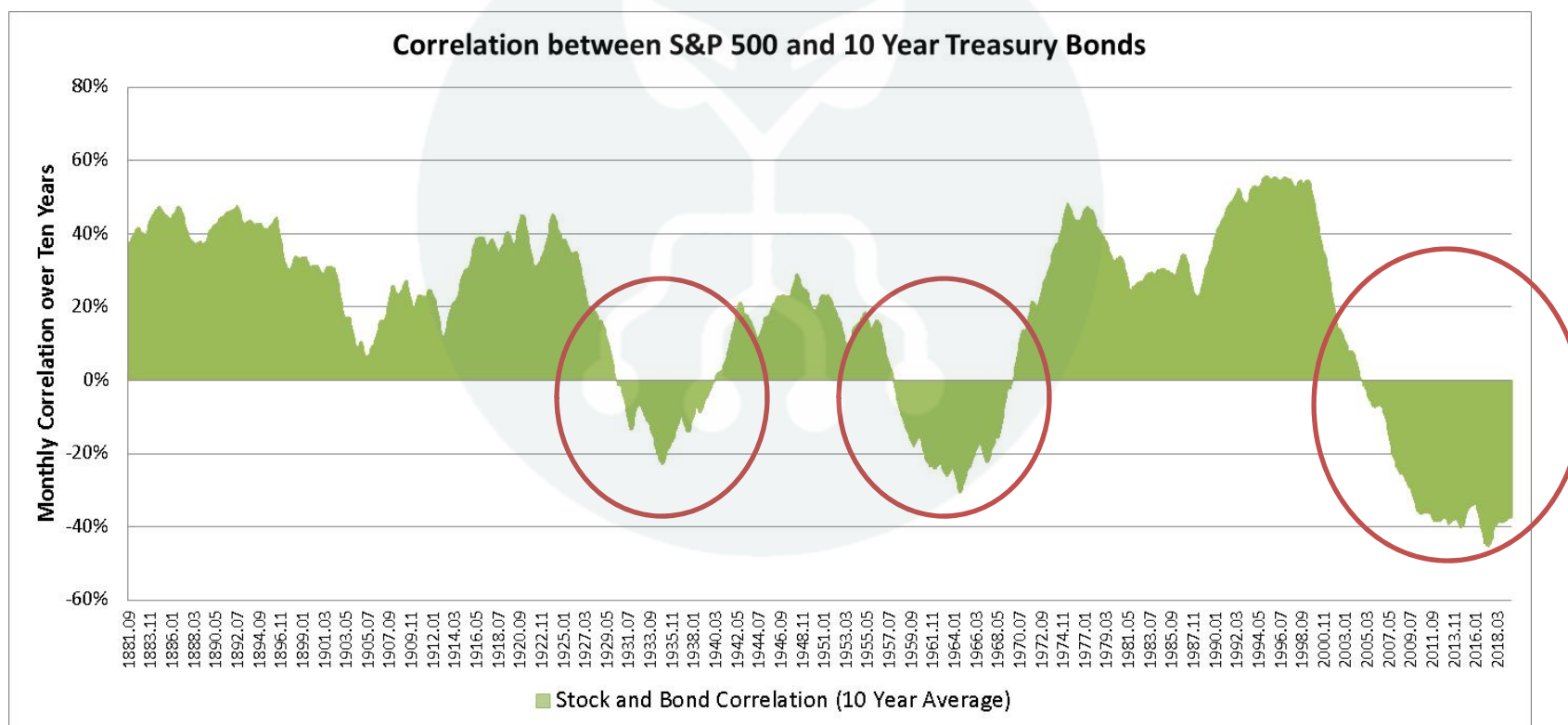
Empirical Approach

- Calculate historical correlations of stocks and treasury bonds over the past 150 years.
- Smooth cyclical volatility using 10 year averages.
- Extrapolate findings to corporate bonds by evaluating recent data.
- Identify and explore causes of correlation regimes.



1. Correlation Regimes

Over the past 150 years the correlation between stocks and bonds has typically been positive. Three notable exceptions include the 1930s, 1960s, and 2000s.

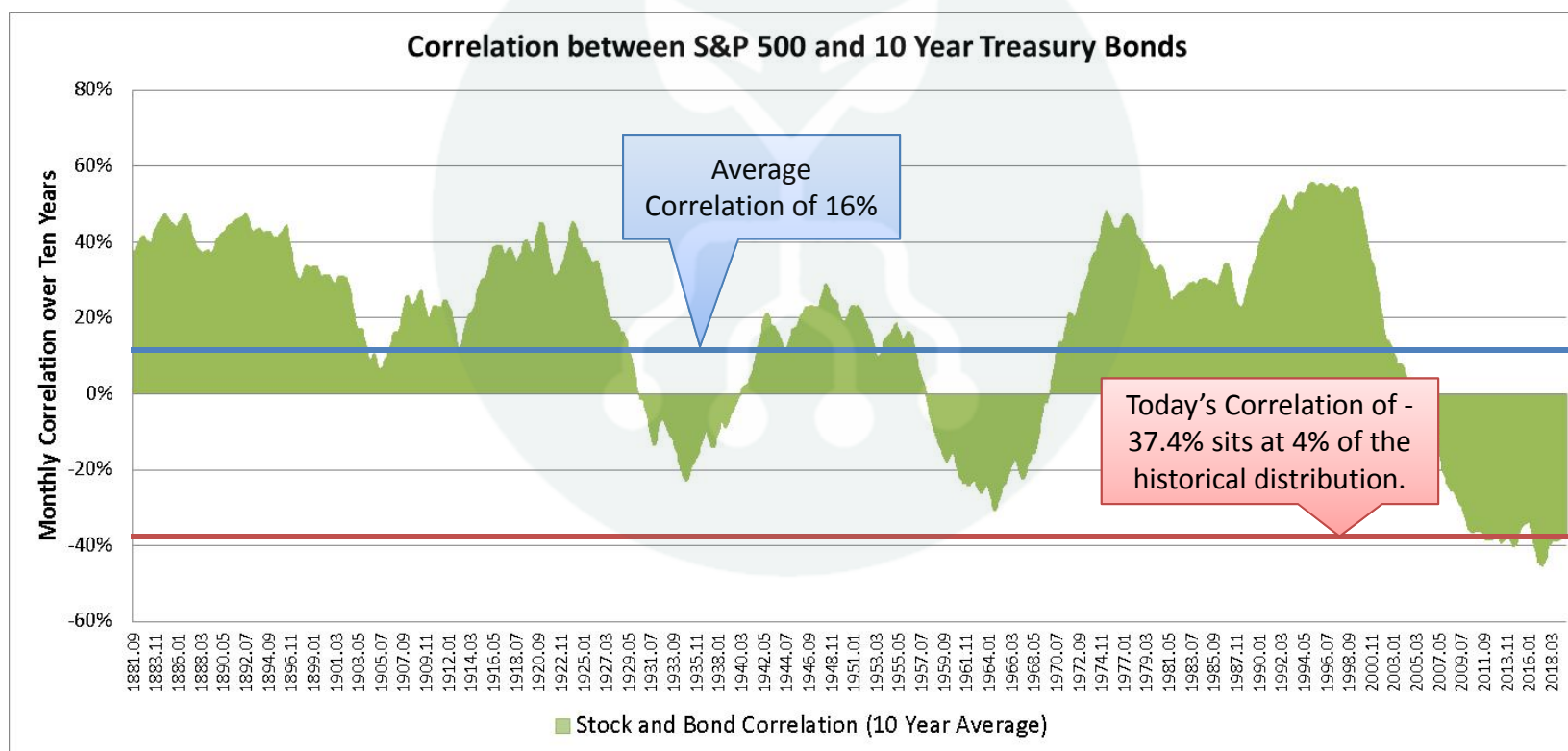


Note: Correlations are based on monthly returns. Treasury bond returns are calculated based on historical YtM of 10 year Treasury Bond data from [Robert Shiller](#). Correlations are backward looking. For example, the most recent year (2019) negative correlation of -39% is based on years 2009 – 2019.



1. Correlation Regimes

Today's correlation of negative 37.4% has been steady since the Global Financial Crisis, an unprecedentedly low level going back to 1881.

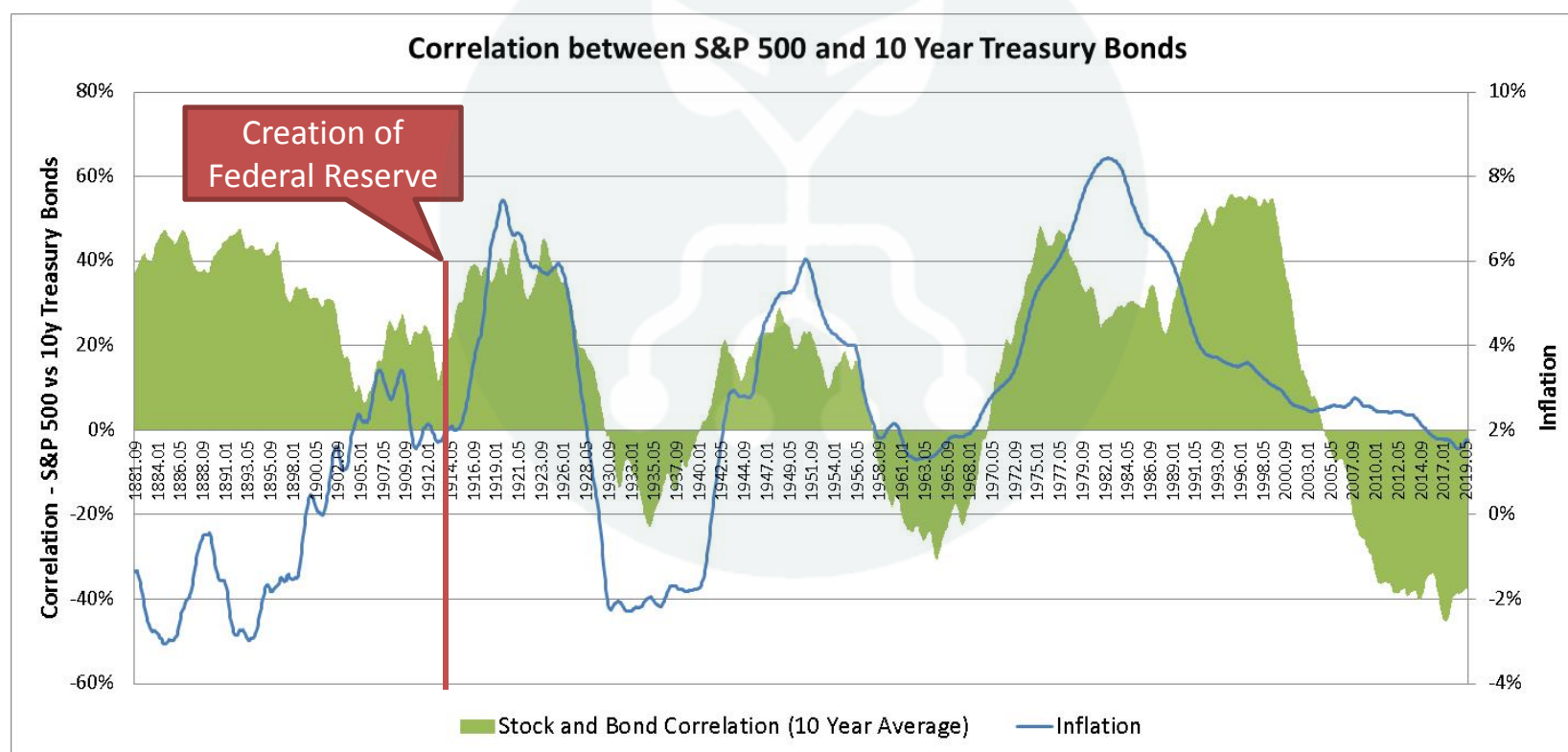


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1. Correlation Regimes

Periods of negative stock and bond correlation overlap with periods of low and predictable inflation.

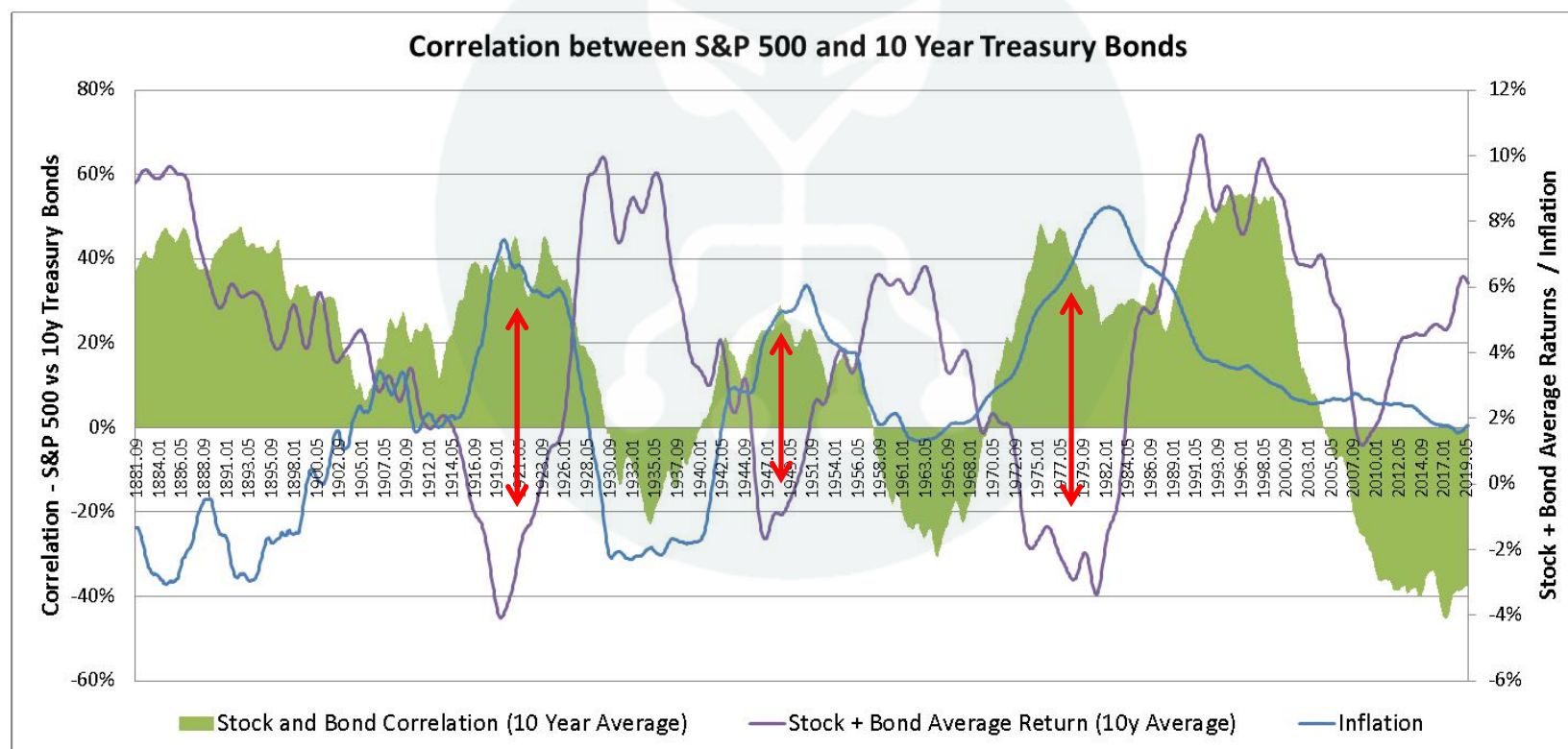


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1. Correlations Regimes

Negative correlation regimes are characterized by high returns on a 50/50 stock bond portfolio. This is consistent with the wealth destroying effects of inflation.

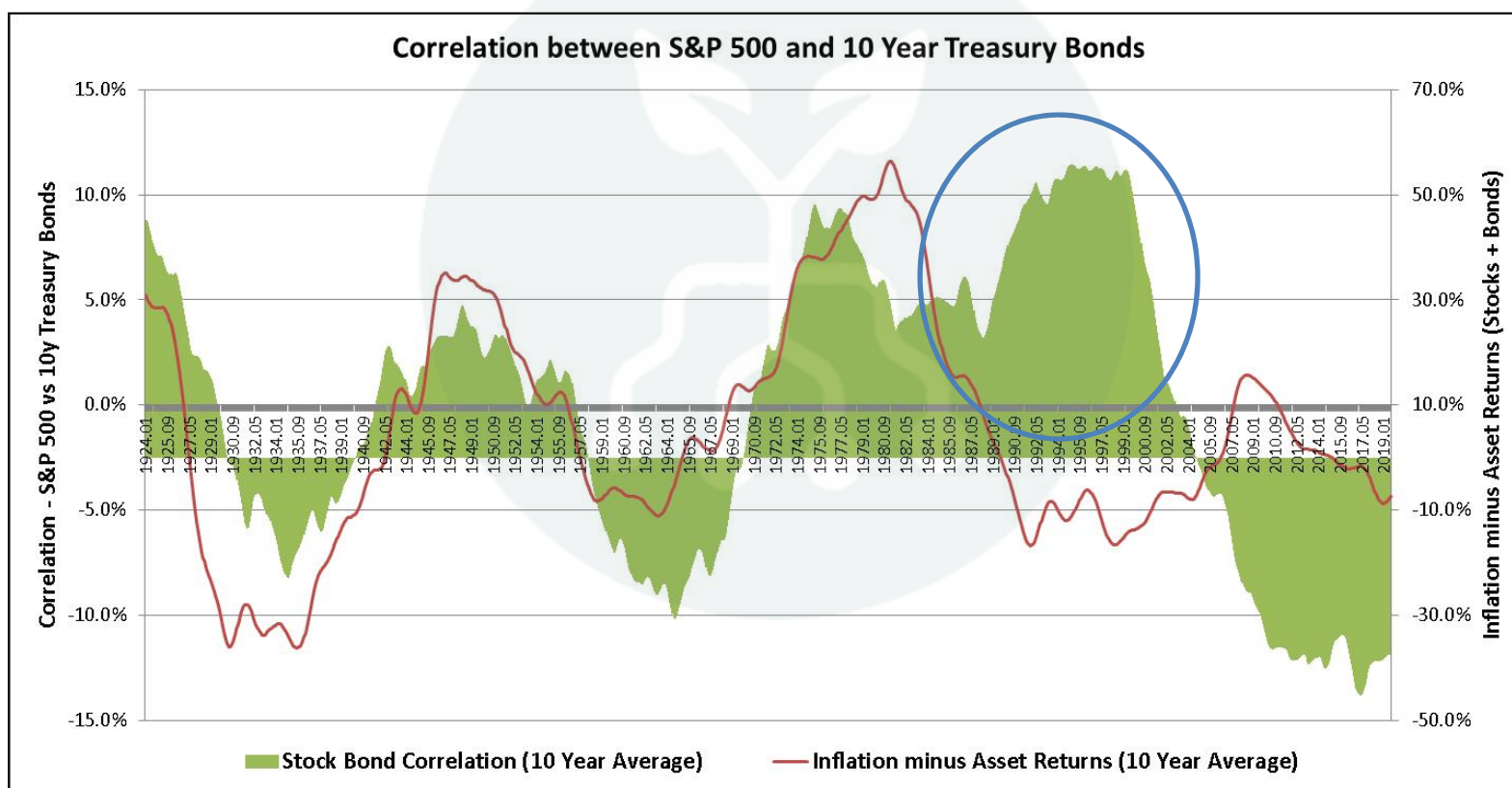


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1. Correlation Regimes

The one exception to this was the 1980s...during which rapidly falling inflation also led to a high correlation between stocks and bonds.

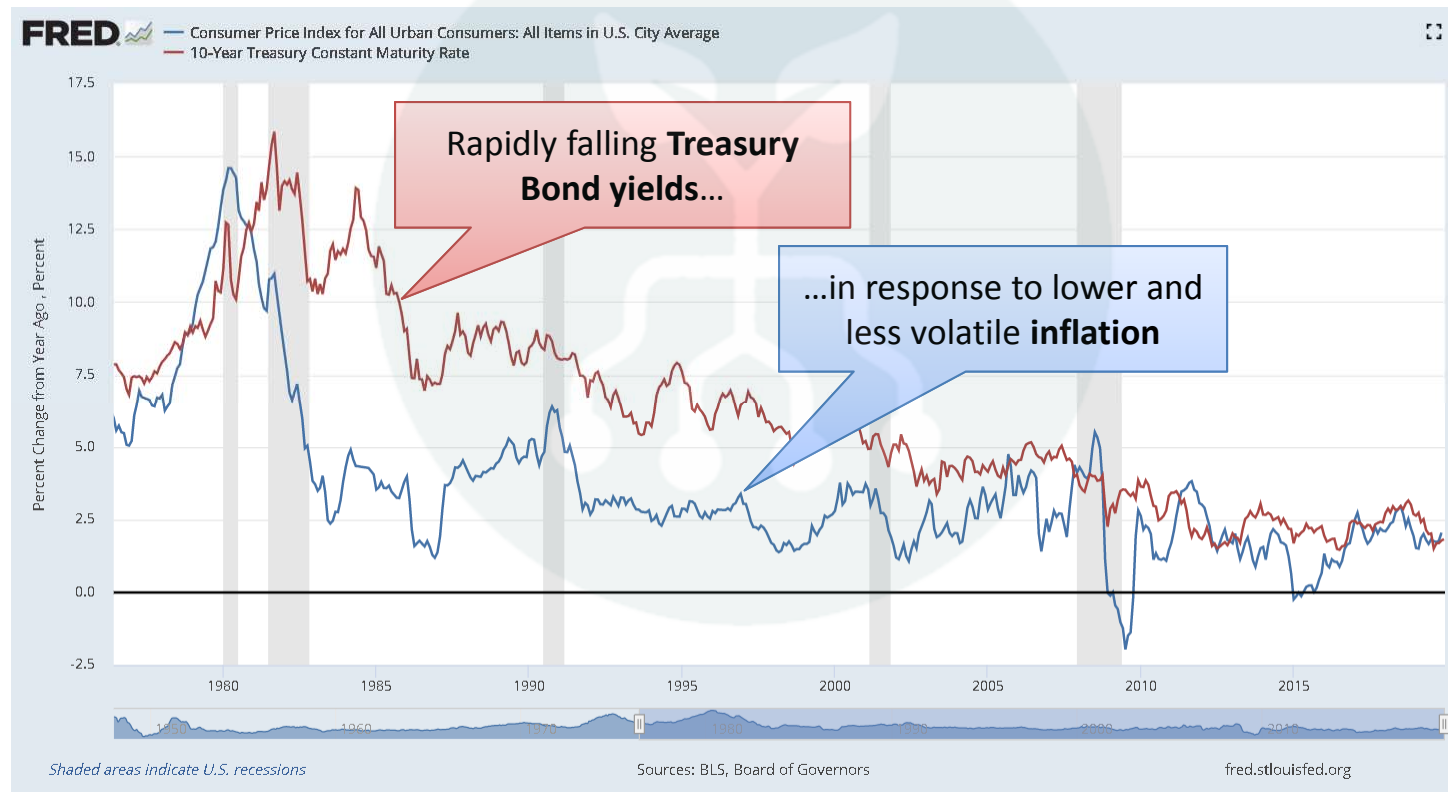


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1. Correlation Regimes

But the high correlation between stock and bond returns during the 1980s and 1990s also appears to have been driven by inflation...just in reverse.

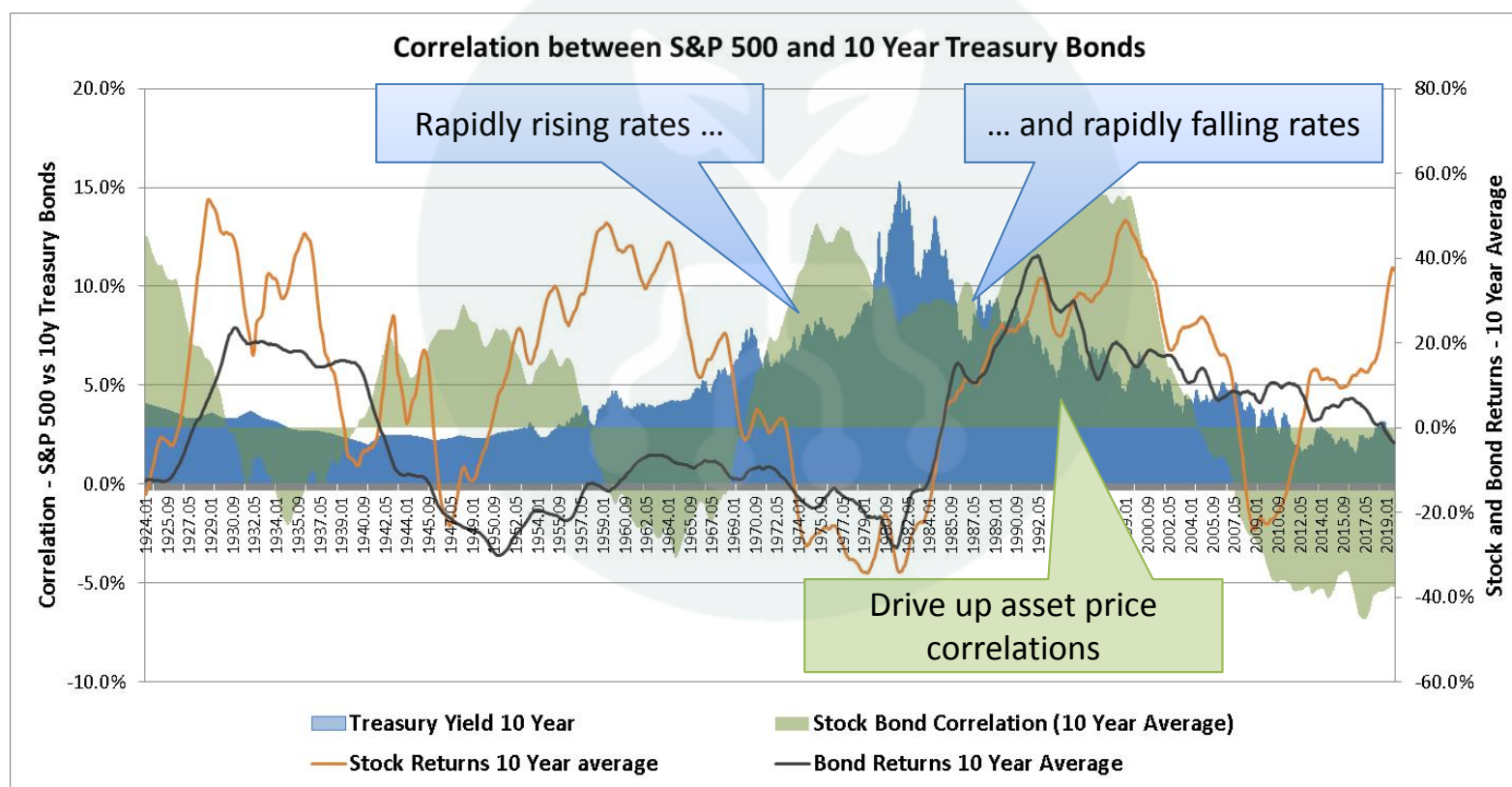


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1. Correlation Regimes

Synchronous rise in stock and bond prices shown again here ... breaking out stock and bond returns over previous ten years.

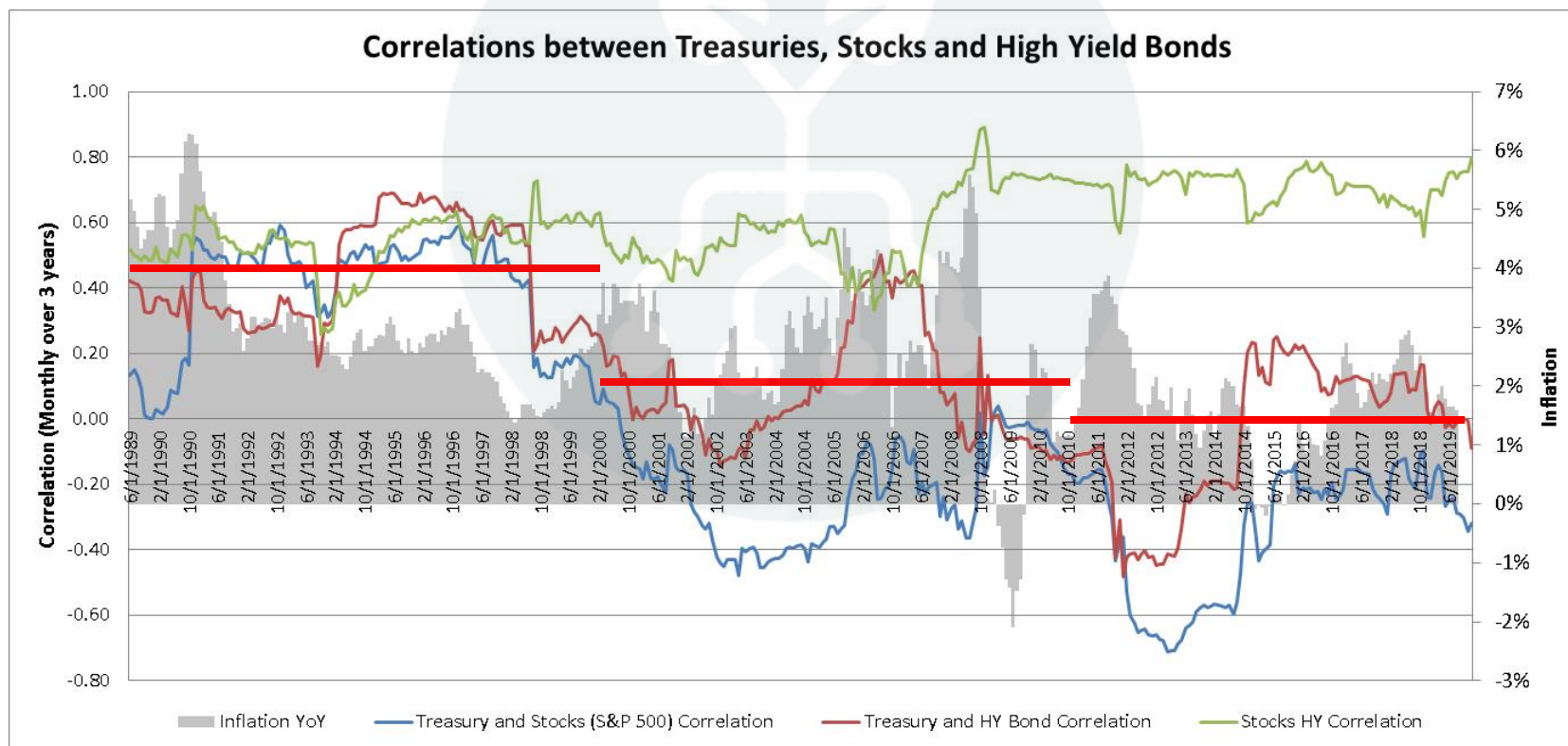


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1. Correlation Regimes

Correlation between Treasury and High Yield bonds fell as well since 1986...the earliest year for which I could locate monthly total returns from high yield bonds. The correlation between inflation and these correlations is



Note: Correlations were calculated using monthly returns calculated from Yahoo Finance adjusted close figures for VUSTX (Vanguard Long Term Treasury Bonds), VFINX (Vanguard S&P 500), and VWEHX (Vanguard High Yield Corporate Bonds).



1. Correlation Regimes

Key conclusions from examining correlation regimes:

1. The past 20 years have been characterized by exceedingly low correlations between Treasury Bonds and Stocks. The same is true for Treasury and High Yield bonds suggesting that this phenomenon may apply to Treasury Bonds and risk assets more generally.
2. Correlation regimes tend to persist over long periods. Two other notable low correlation regimes include the 1930s and 1960s. Both were followed a high correlation regimes that lasted longer than a decade.
3. Low correlation regimes are characterized by low and falling inflation as well as high and rising returns from Treasury Bonds and Stocks.
4. This low correlation regime has been much longer than in the past. There is growing evidence of complacency.



2. Inflation Drivers

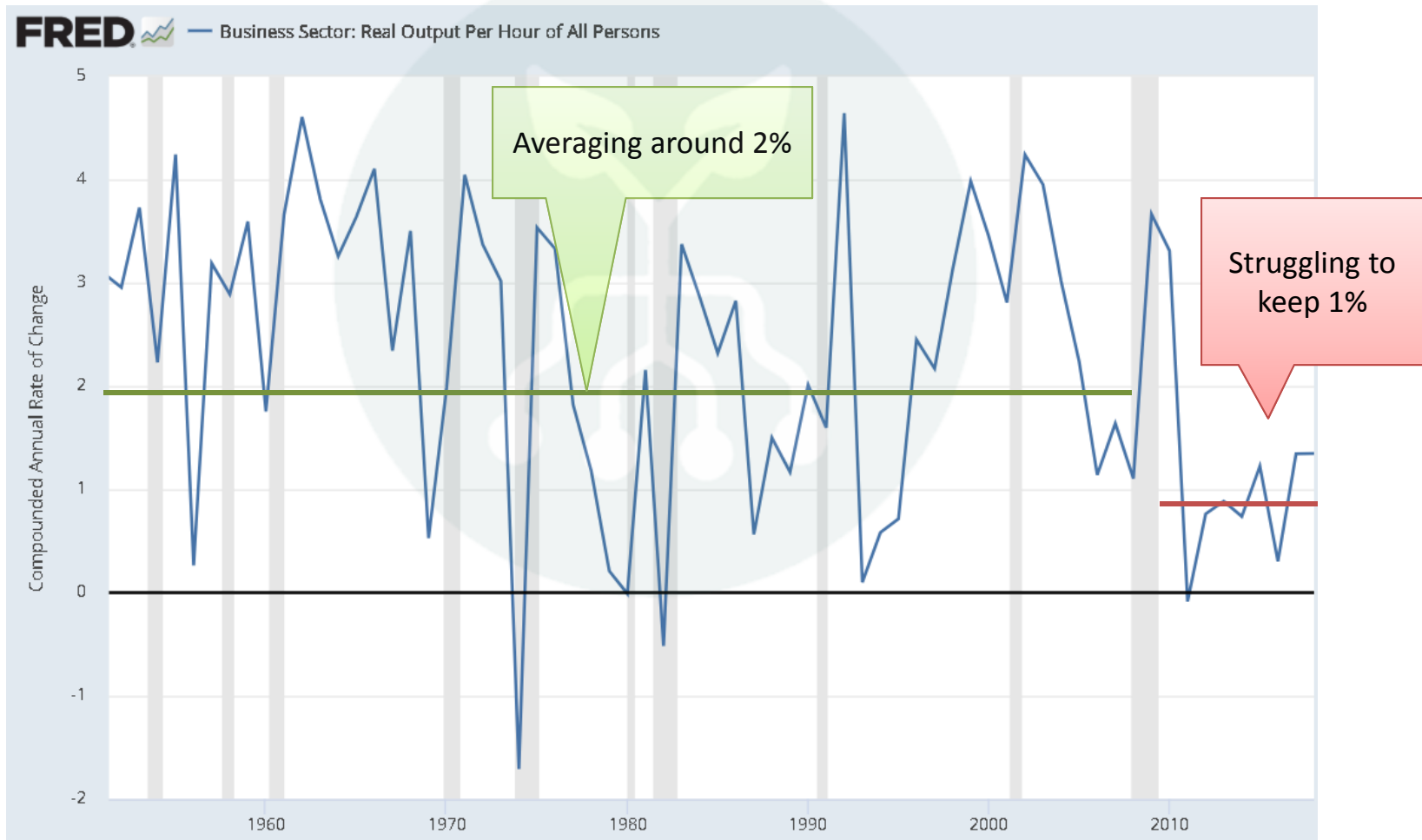
Economists have identified many inflation drivers:

Driver	Mechanism	Direction
1. Productivity	Reduces cost of producing goods and services via improvements in technology, education, and capital accumulation.	Down
2. Independent Central Bank	Prevents excessive easing of monetary policy during periods of economic overheating.	Down
3. Peace / Stability	Reduces government spending leaving more capital for private investment. Keeps cost of raw materials lower.	Down
4. Wealth Inequality / High Savings	Increases savings rates which reduces consumption.	Down
5. Low Govt Expenditures to GDP	Reduces government spending leaving more capital for private investment. Also improves confidence in currency as a store of value.	Down
6. International trade	Reduces costs of imports. Downward pressure on wage growth when foreign wages are lower than local wages.	Down
7. Absence of supply shocks	Supply shocks to critical inputs such as crude oil can increase near term inflation as increase inflation expectations.	Down
8. High corporate profit margins	When corporate profit margins are high then corporates are not pressured to raise prices.	Down



2. Inflation Drivers

1. Productivity since the Financial Crisis has averaged about half prior cycles since WWII





2. Inflation Drivers

2. Independent Central Bank is no longer a given going forward (see quote). However, Central bankers have learned a lot about how inflation works and have been largely independent of political influence since 1980.

“When I was writing my book, I observed that President Donald Trump had not attacked the independent US Federal Reserve, for which I was grateful. To say that is no longer true would be an understatement.

Not since just after the second world war have we seen a president so openly seek to dictate policy to the Fed. That is a matter of great concern, given that the central bank is one of our key governmental institutions, carefully designed to be free of purely partisan attacks.”

The Late Paul Volcker – Final Essay, Sept 2019

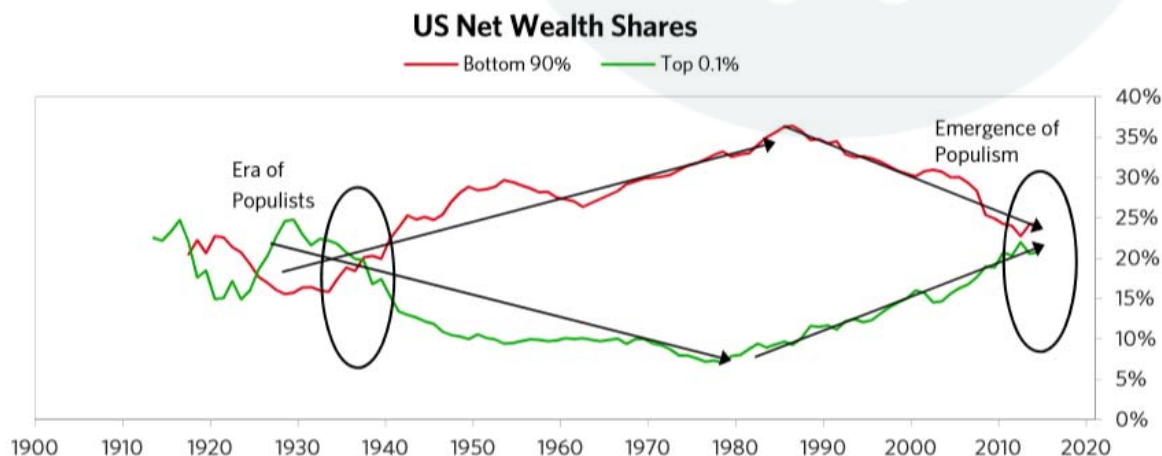
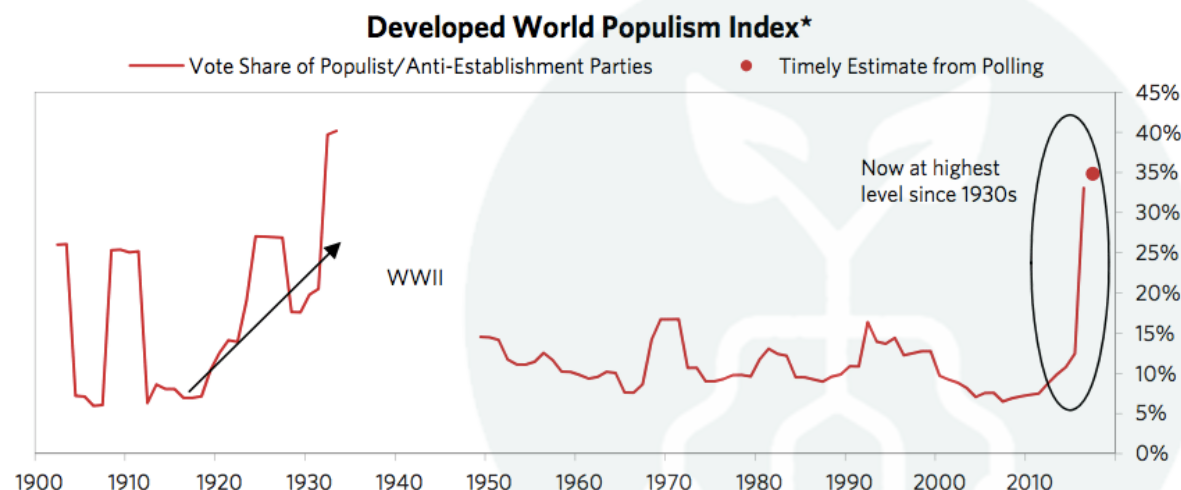
Source: <https://www.ft.com/content/2389d7ec-1b3c-11ea-97df-cc63de1d73f4>



2. Inflation Drivers

3. Peace and Stability is no longer a given going forward...

Why?

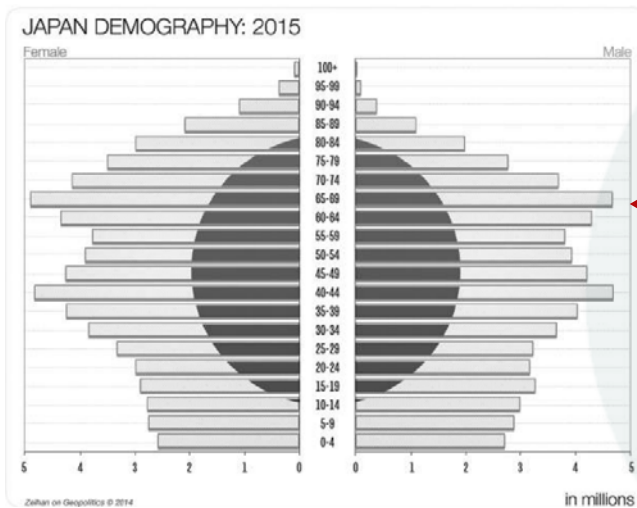


- Growing populism which tends to occur during periods of higher wealth inequality
- USA is no longer willing or able to independently secure international supply chains...partly owing to shale boom and partly owing to the rise of China.
- China's large population ensures that its rise will not go the way of Japan in the 1980s. Global power rebalancing takes time and adds risks to stability.

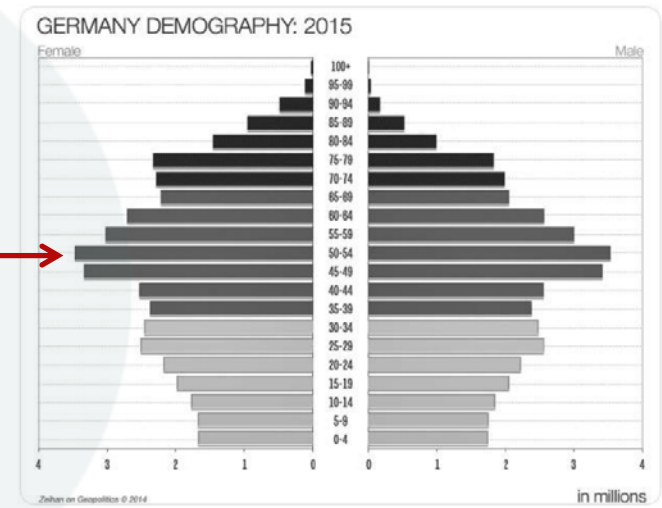


2. Inflation Drivers

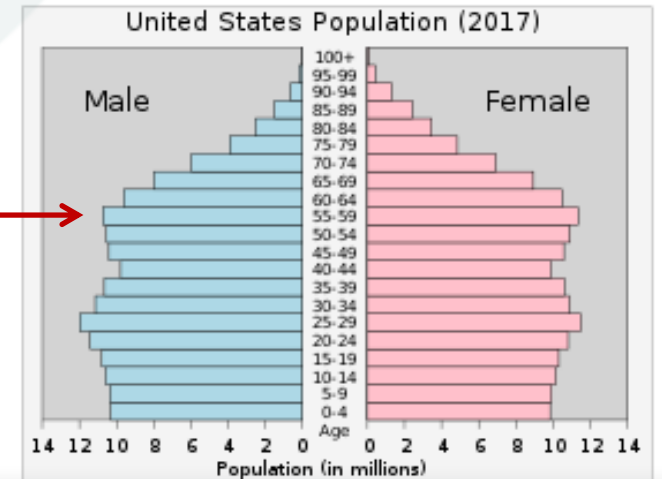
4. Wealth Inequality is has reached a point of populist backlash (previous slide) and **high savings** from boomers is starting to transition into spending.



Benchmark interest rates are lowest in the developed countries that have the biggest demographic imbalances, namely Japan and Europe.



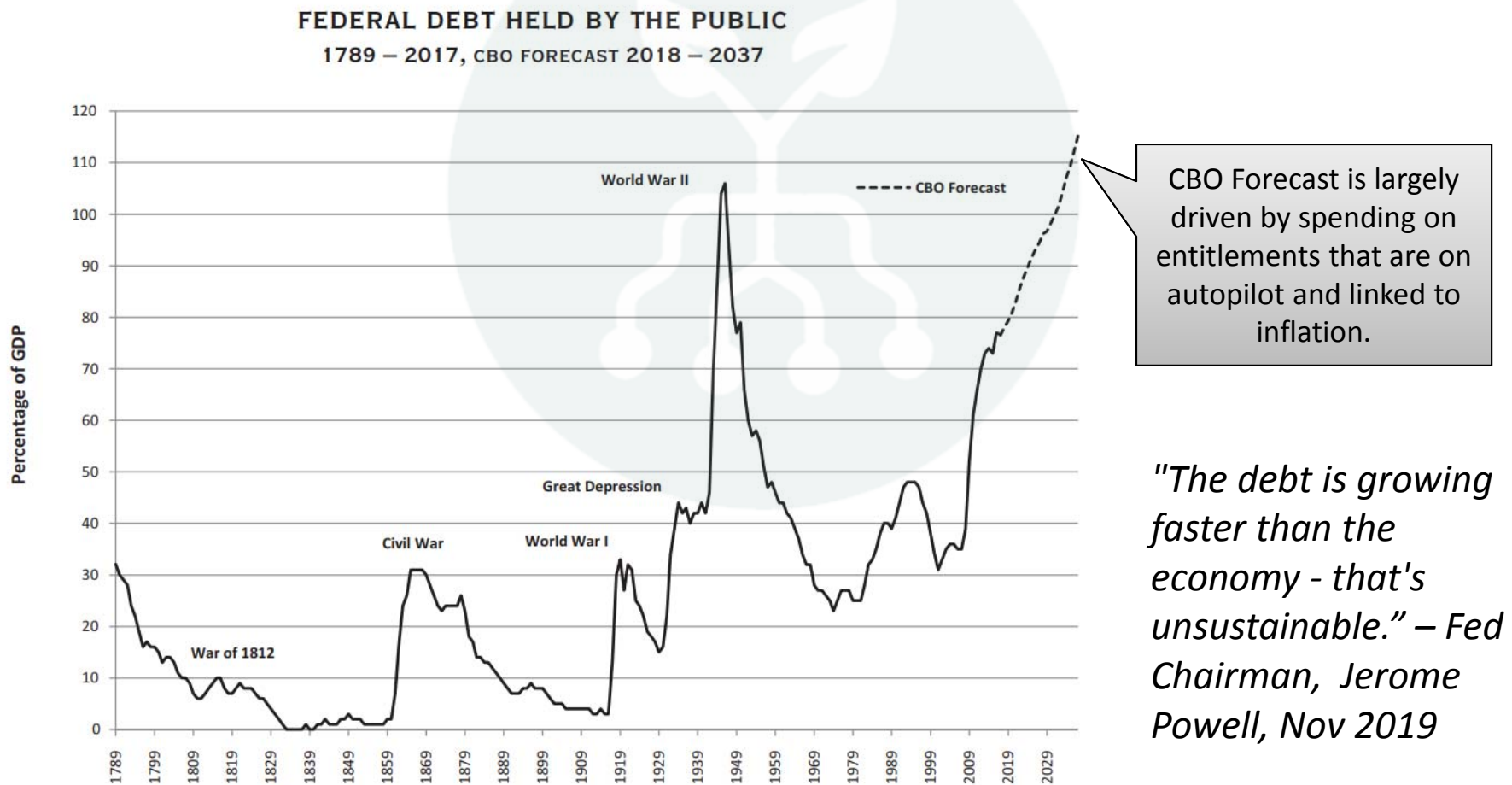
US demographics are not as imbalanced, but global financial markets have caused inflation and interest rates to move together.





2. Inflation Drivers

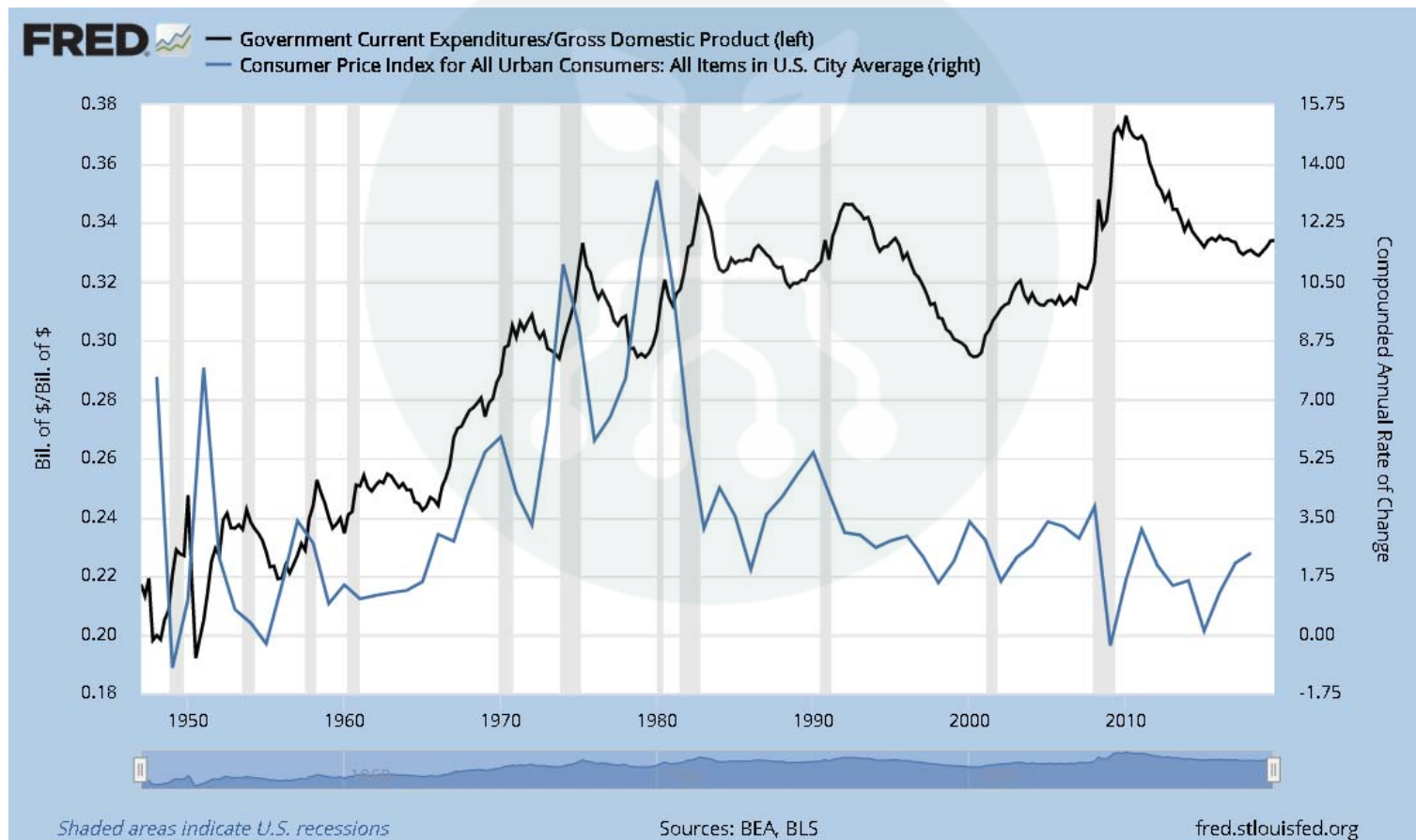
5. Low Government Expenditures as a percent of GDP are a certainly unless congress learns to compromise and balance the budget.





2. Inflation Drivers

5. Government current expenditures as a percent of GDP have started moving up during this cycle relative to 1980-2010.

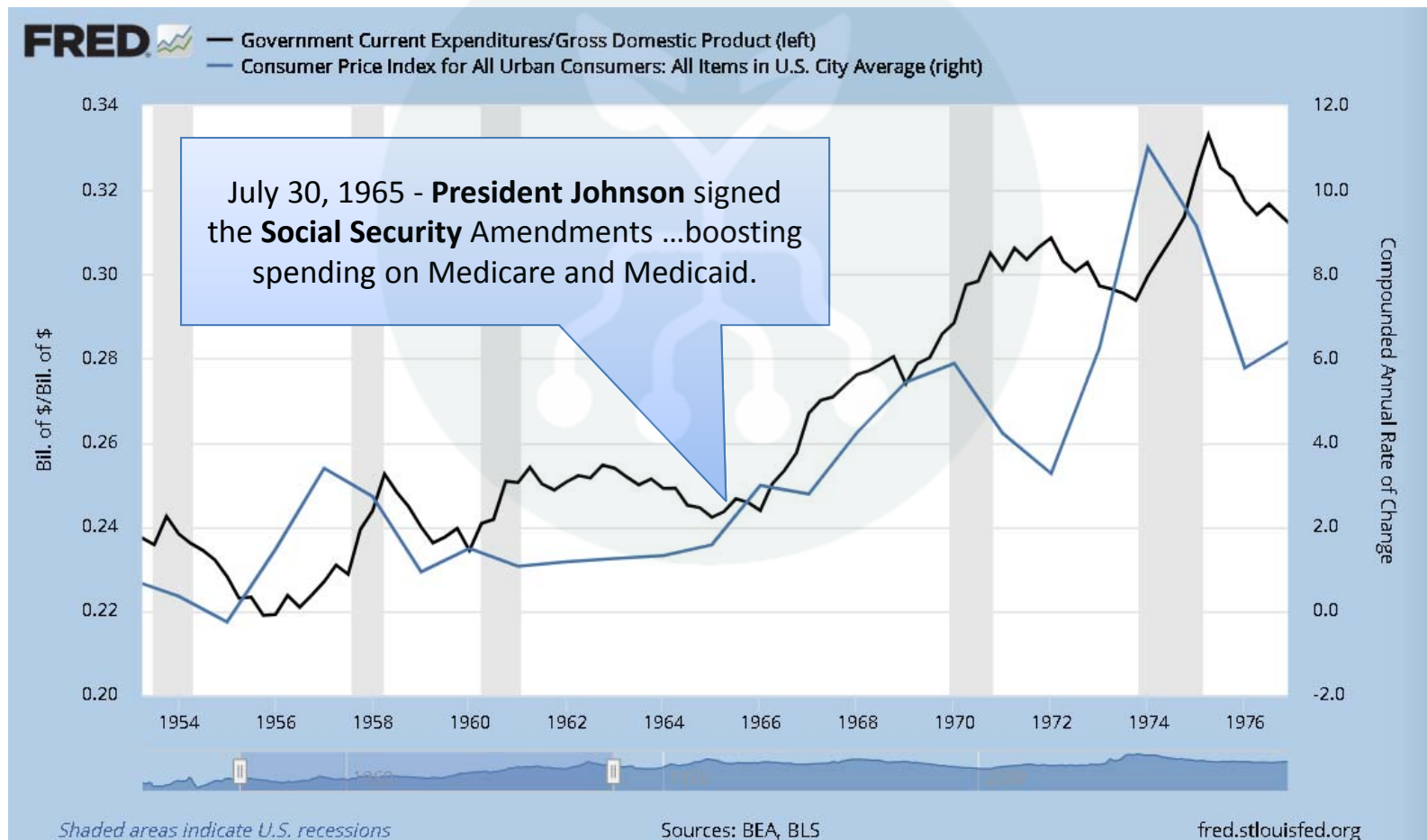


Source: <https://fred.stlouisfed.org/graph/?g=pJlP>



2. Inflation Drivers

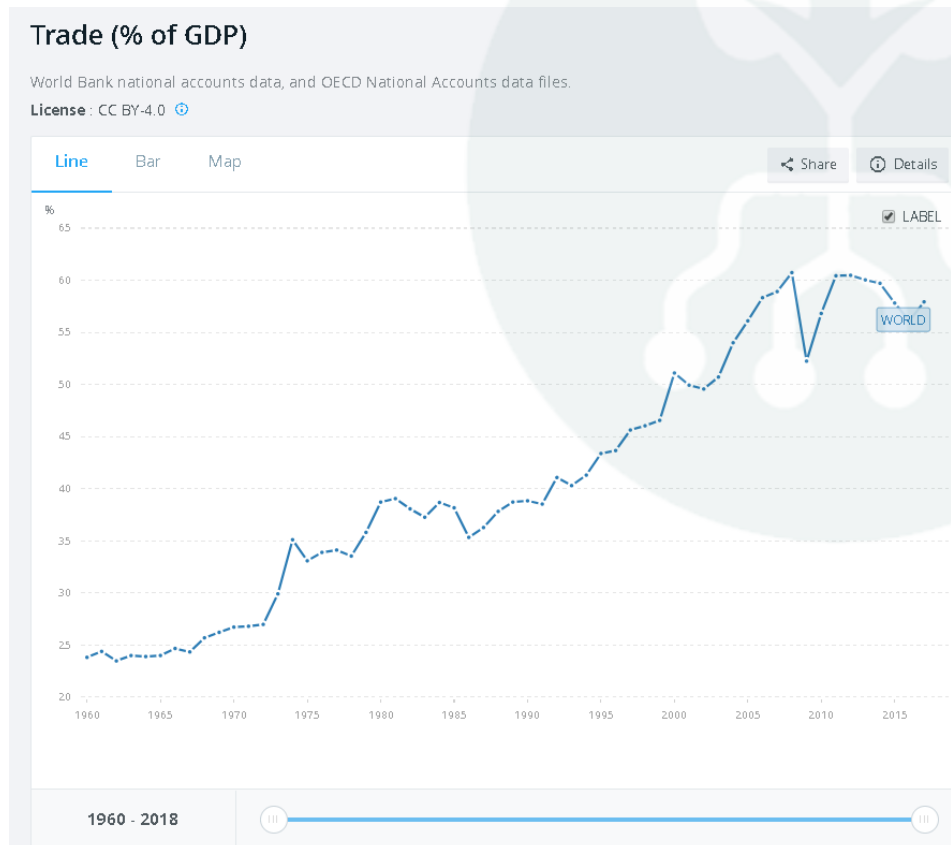
The last time that happened was in the 1960s. Inflation rose from a stead 2% from 1960-1965 to 5% by 1969.





2. Inflation Drivers

6. International trade has boomed since the end of the Cold War and creation of the WTO + NAFTA connecting about half the worlds population to global markets. This has weighed down wages in the developed world and lowered costs of physical goods.



International trade was driven partly by cheap labor in emerging markets. However, trade started slowing in part because wages have grown faster in emerging markets, especially China, than developed markets reducing some of these benefits. We have yet to see how much the trade war has hastened this new trend.

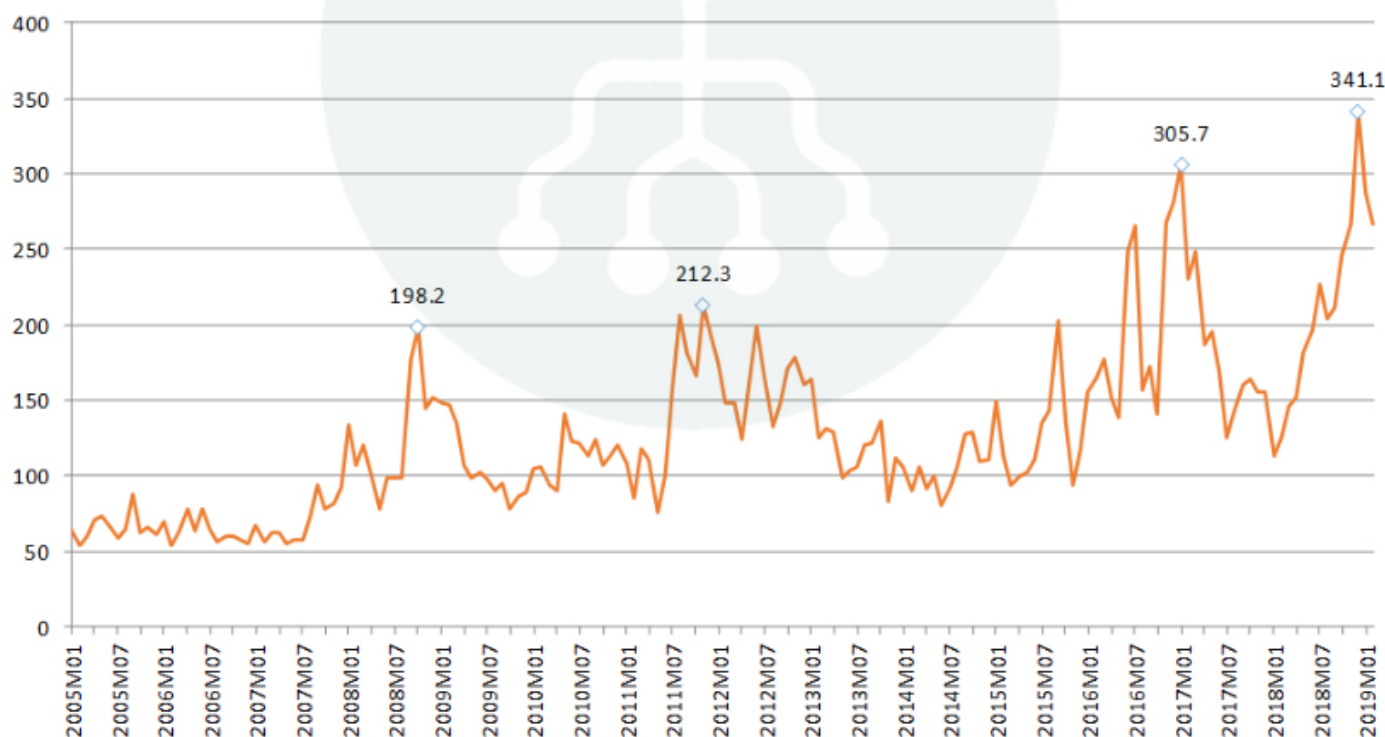


2. Inflation Drivers

International trade policy uncertainty is partially driven by the rise in populism and nationalism. Historically, populist and nationalistic regimes have been more willing to impose tariffs.

Chart 8: Global economic policy uncertainty, Jan. 2005 – Feb. 2019

(index, average 1997-2015=100)



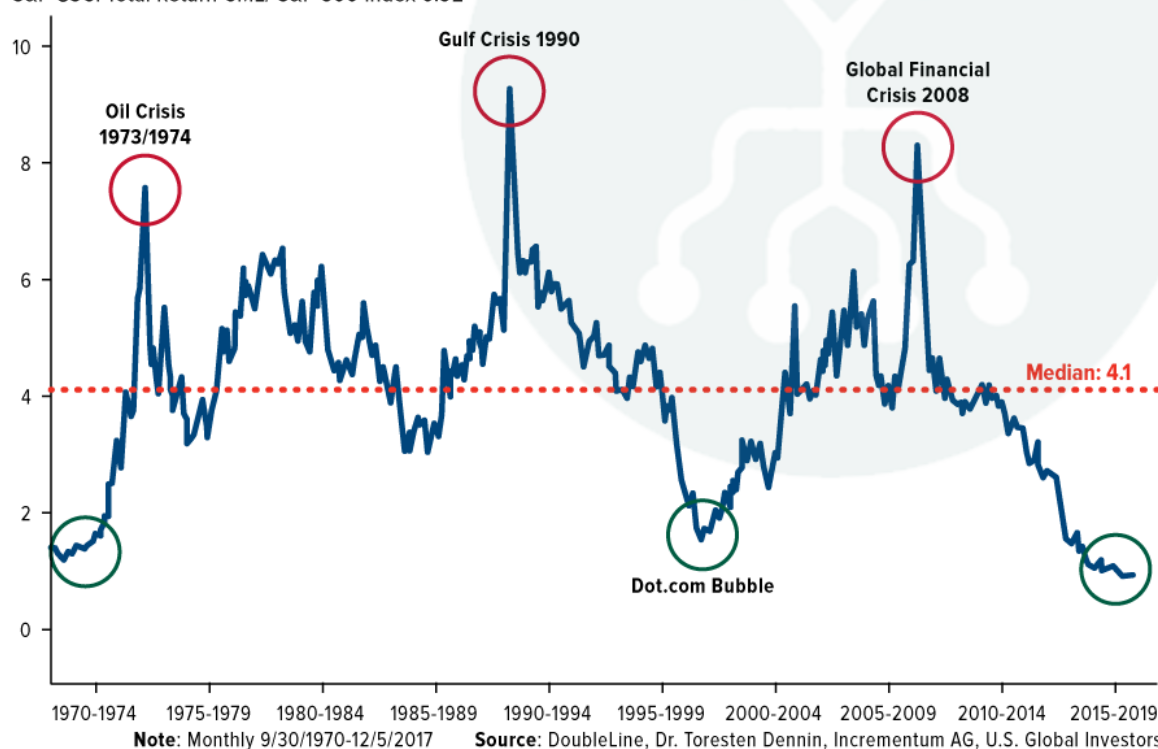


2. Inflation Drivers

7. Absence of supply shocks has helped keep inflation low since the financial crisis. Commodities have been cheap, but commodity prices tend to move in due to the “Capital Cycle”.

Equities vs. Commodities

S&P GSCI Total Return CME/ S&P 500 Index 0.92



The transition to renewable energy also makes the USA partially dependent on metal prices, most of which are produced in emerging markets outside the USA.

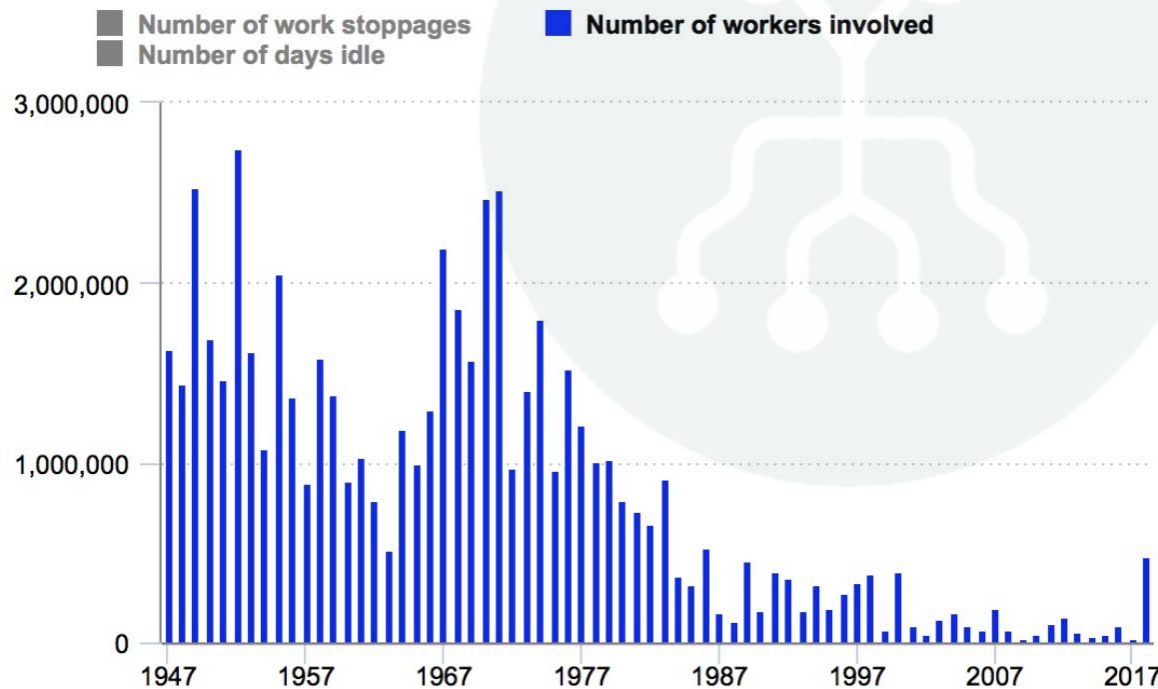
One example of a shock is the Vale mining dam collapse in Brazil which sent iron prices up 35%.



2. Inflation Drivers

Supply shocks can also come from strikes...which have been absent from the USA during the current correlation regime...until last year.

Annual work stoppages involving 1,000 or more workers, 1947–2018



Click legend items to change data display. Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

Strikes are another reason why high wealth inequality tends to proceed periods of rising inflation. Strikes reduce productive capacity (reducing goods and services) while increase wages (leading to more spending).

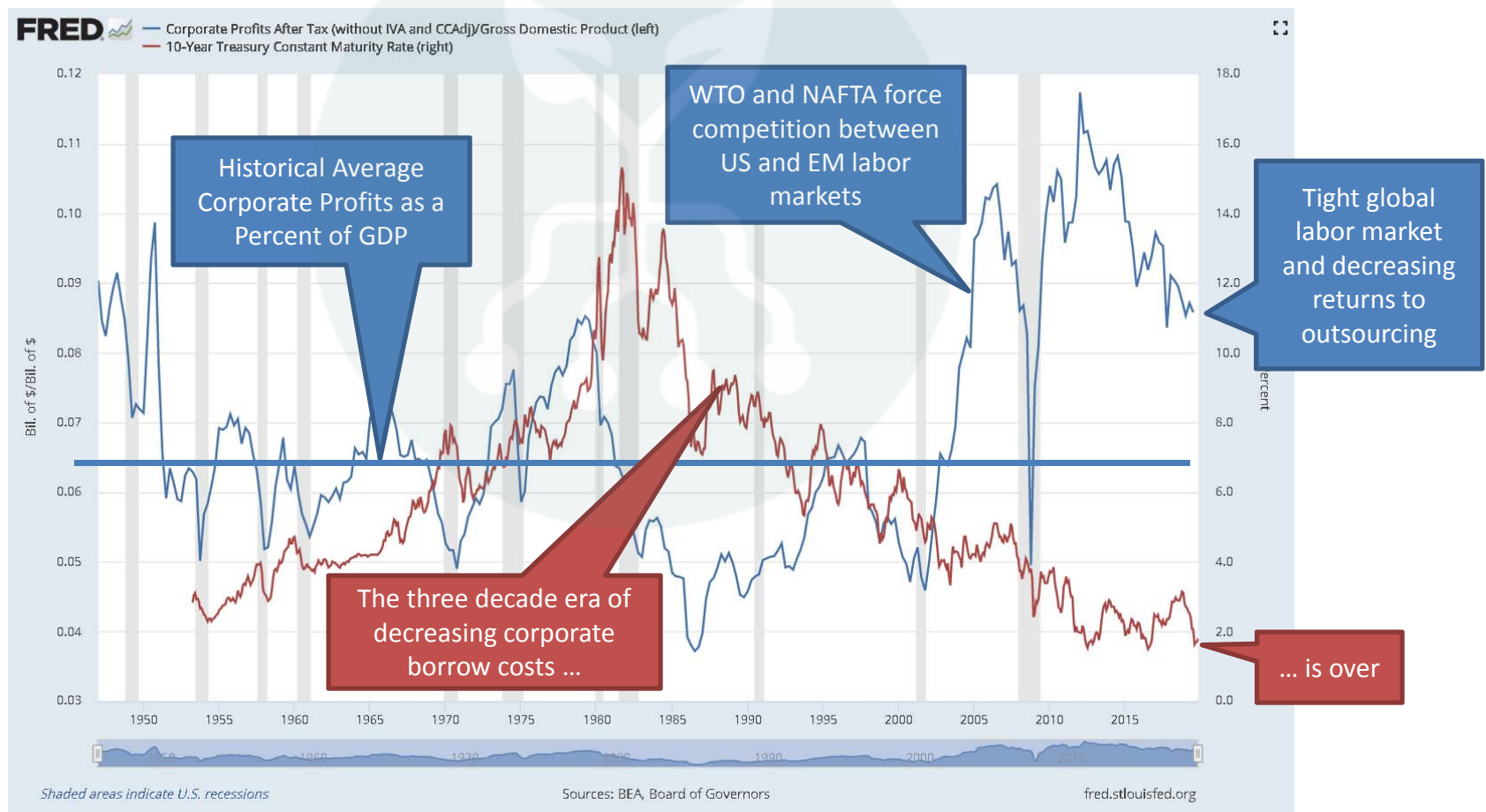
...inflation is caused by too much spending chasing too few goods and services.





2. Inflation Drivers

8. High corporate profit margins have persisted over the current regime. That's unlikely to continue.





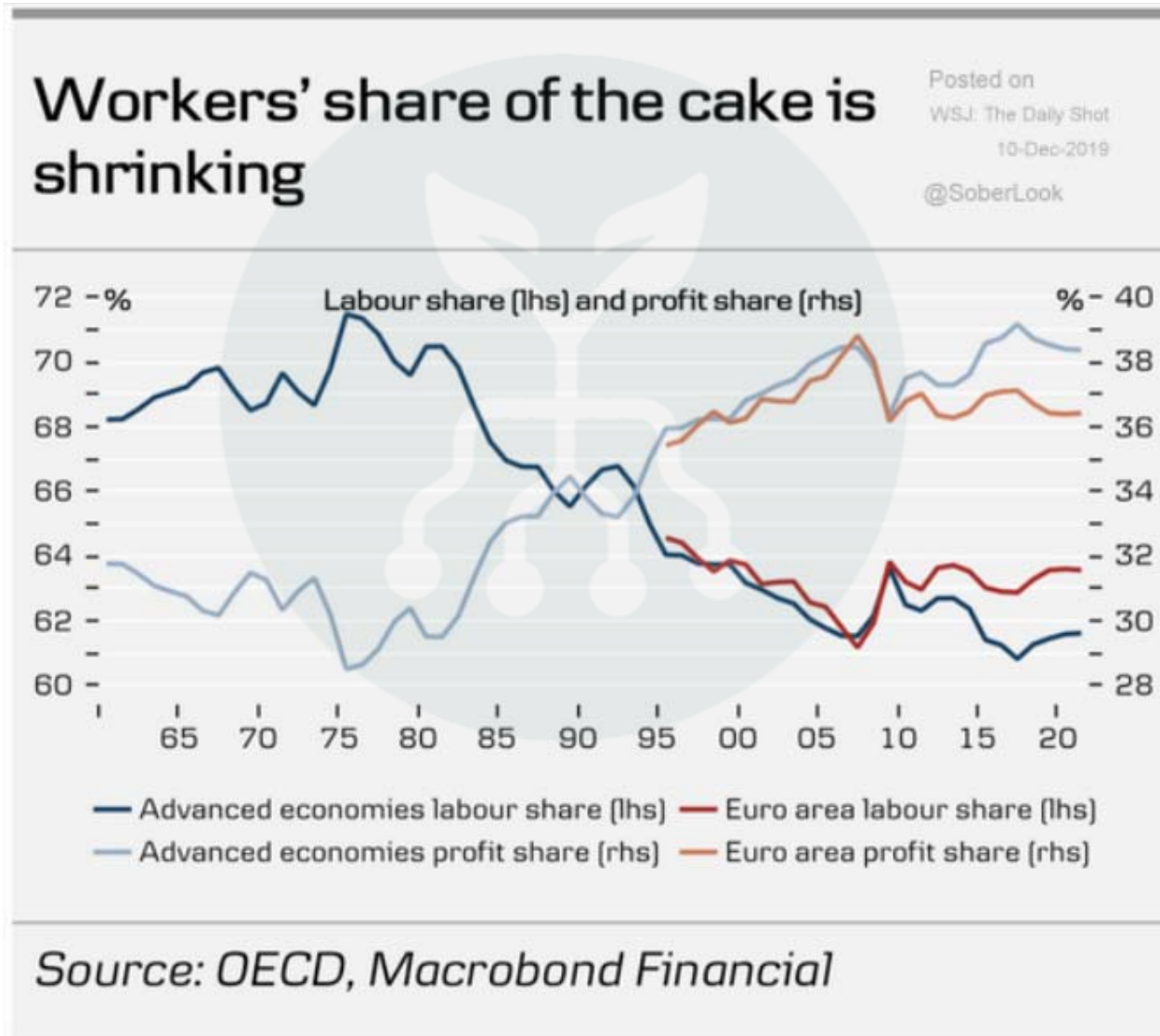
2. Inflation Drivers

There are other catalysts for inflation as well. Namely...

- **Federal Reserve [Revamp](#)** – Fed chairman appears swayed by arguments to target higher nominal GDP which implies a higher inflation target than the arbitrary “2%”. Notable economists such as Larry Summers are advocating for higher inflation in order to raise nominal GDP, which would allow the Fed Funds rate to fall further in the event of a reession.
- **Investors are starting to demand earnings over growth** – Since the financial crisis, investors have been willing to value growth companies very high relative to value in part because of the example of companies like Amazon.
- **Wages are very low relative to productivity and as a portion of GDP** – If wages start rising as a percent of GDP then corporates will be forced to either accept smaller profit margins or increase prices.



2. Inflation Drivers





2. Inflation Drivers

Key conclusions from examining inflation:

1. Inflation has been falling globally for the past 35 year.
2. Some of the reasons inflation fell are likely to persist into the future. These include a lack of shooting wars, more independent central banks, a better understanding of how to stop inflation, and slower economic growth.
3. Some of the reasons inflation fell are unlikely to persist into the future. These include the closing gap between EM and developed economies, increasing percent of workforce dependent on transfer payments, falling labor productivity, falling labor force participation, heightened risks associated with international supply chains, large government debt and growing deficits, exceedingly low unemployment rate, and a growing portion of retirees that will switch from net savers to net spenders, likely rise in commodity prices, pricing pressures on corporates due to potential fall in corporate profits as a share of GDP and rise in debt service payments.
4. As a result ... the inflation outlook is uncertain. Inflation could stay lower for longer. However, it is also entirely possible, perhaps even likely that inflation begins to rise about the central bank historical target of 2% in the near term.



3. Evidence of a Bond Bubble

Market based 10-Year breakeven rates currently sit at 1.65% reflating an expectation that inflation will continue to fall as it has since the mid-1980s.

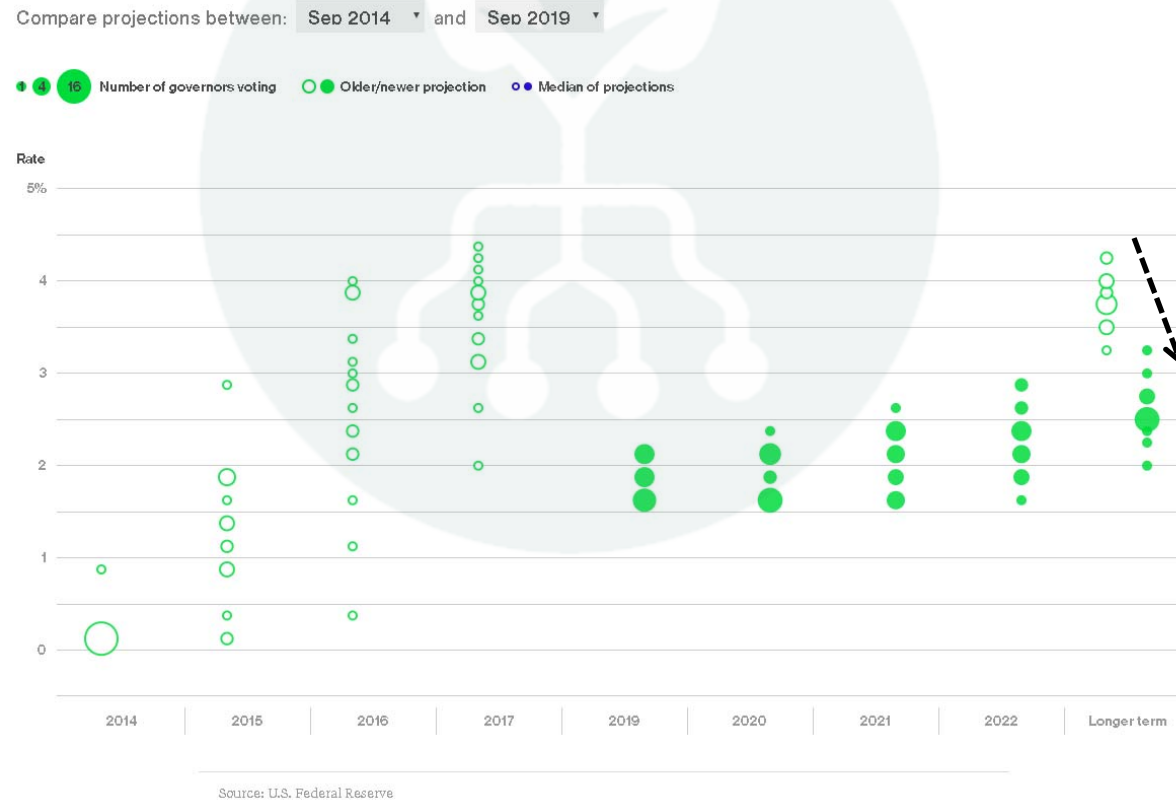


Source: <https://fred.stlouisfed.org/graph/?g=pH6m>



3. Evidence of a Bond Bubble

Federal Reserve dot plots for longer term benchmark rates have fallen from around 3.75% in 2014 to 2.5% in September of 2019 reflecting a perceived drop in the risk of long term inflation.



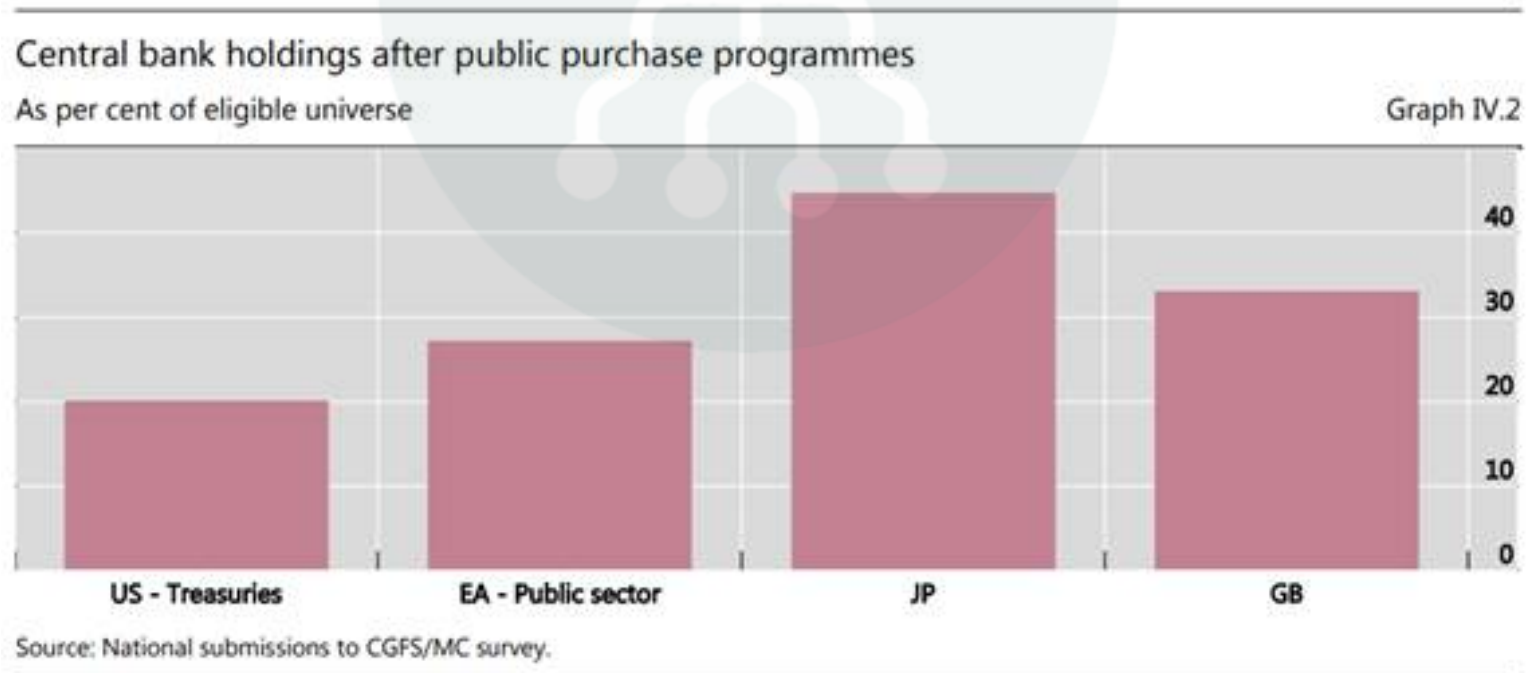
Source: <https://www.bloomberg.com/graphics/fomc-dot-plot/>



3. Evidence of a Bond Bubble

In addition, central bank purchases of sovereign assets have contributed to never before seen negative interest rates. These are not market determined yields ...

“since 2016 is JGB trading volume, which has remained subdued, reflecting a decline in activity of domestic investors...This has resulted in some days when there are no recorded trades, even in benchmark JGBs.” - [BIS](#)





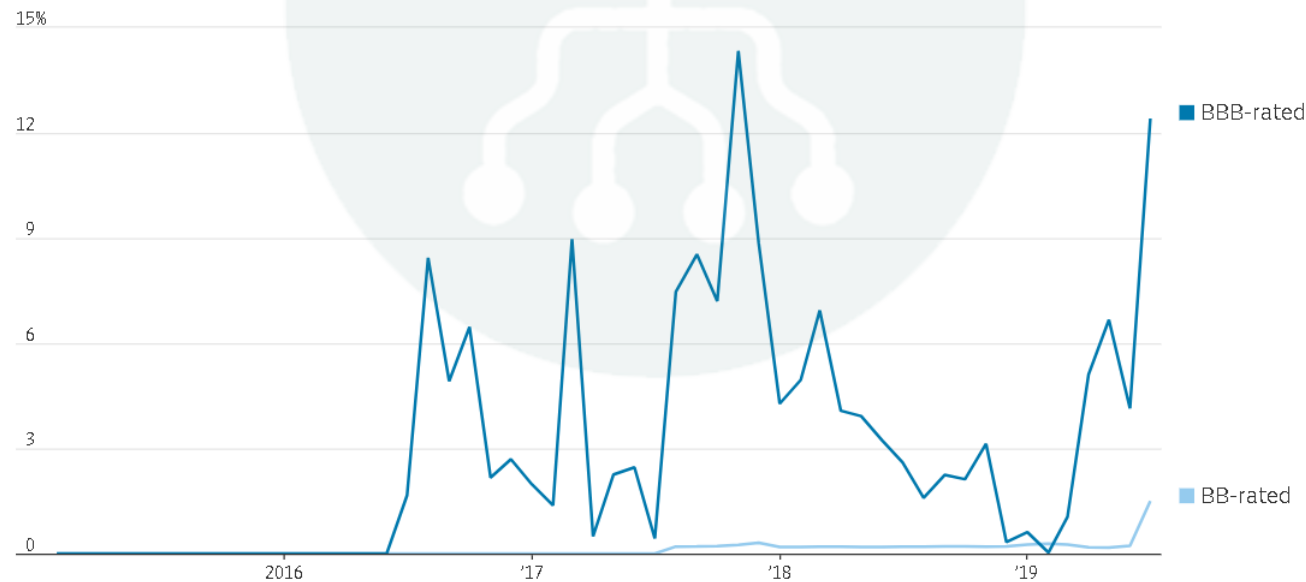
3. Evidence of a Bond Bubble

...but that hasn't stopped investors from using negative yields to price other assets. The result?

Oxymoron Alert: Some 'High Yield' Bonds Go Negative

For junk bonds that have negative yields, peculiar characteristics help explain their especially ultralow

Share of euro-denominated corporate bonds* outstanding that trade with a negative yield



*BBB is investment grade, BB is junk
Source: Bank of America Merrill Lynch



3. Evidence of a Bond Bubble

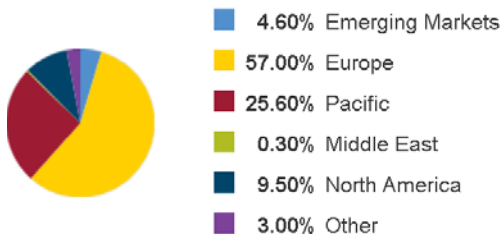
Here is an in-depth example of an absurdly priced security...International IG Bonds.

Vanguard's international investment grade bond index, BNDX, has a yield to maturity of 0.6%. The fund is a diversified basket of bonds with a maturity of 10 years. Geographic weights include 56% Europe and 25.7% Japan...the two areas with negative benchmark yields. S&P puts out an annual corporate bond performance report every year. From 1981-2018 the average default rate on investment grade bonds after ten years was 1.96%. But this historical default rate is based on a period of falling rates and low corporate debt levels compared to today. [Morgan Stanley](#) argues that 1/3 IG bonds should be junk if evaluated based purely on leverage. If so, defaults should be close to 4% or more.

Expected Real Return = 0.6% - 4% - Inflation = negative 3.4% ... minus inflation

Portfolio composition

Region allocation
as of 11/30/2019



Characteristics
as of 11/30/2019

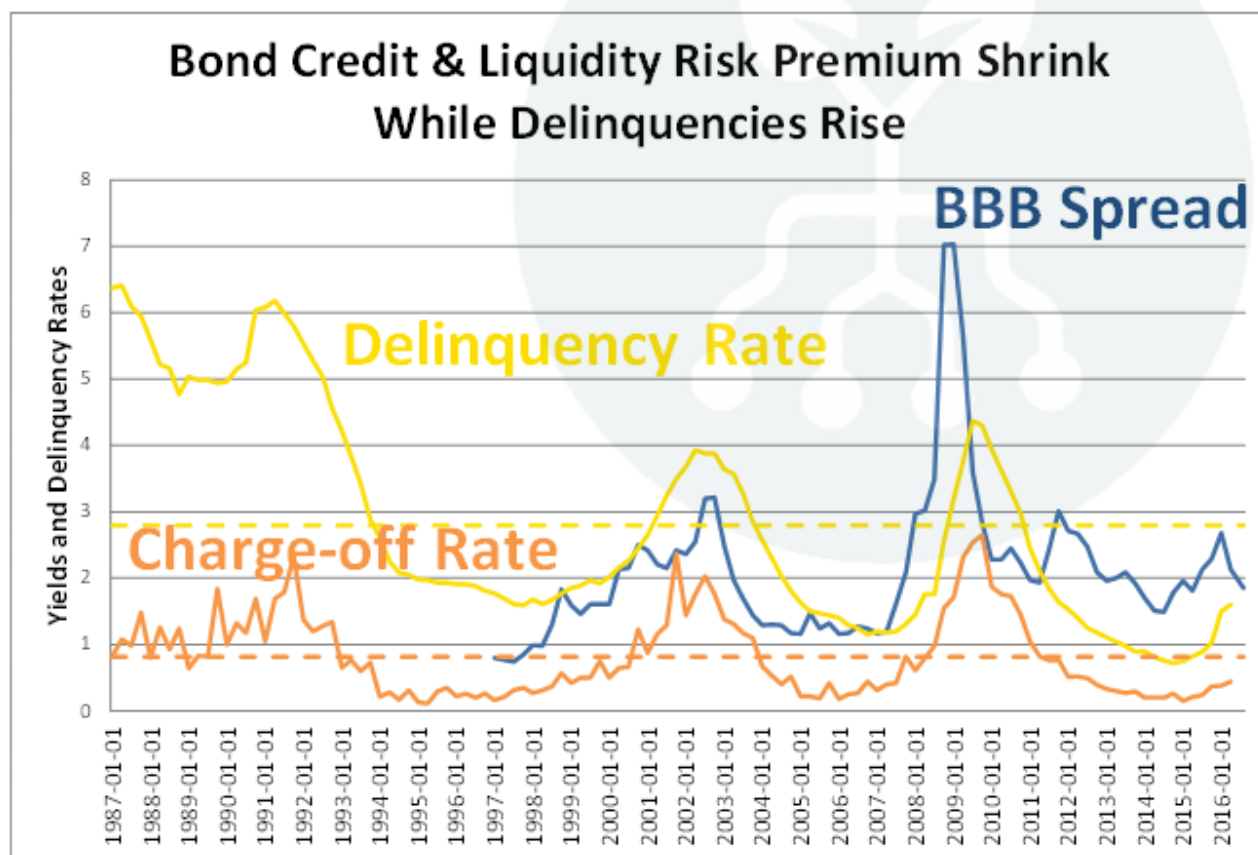
Fund total net assets	\$143.0 billion
Number of bonds	6183
Average effective maturity	9.9 years
Average duration	8.3 years
Yield to maturity	0.6%

Source: [Vanguard's International "Investment Grade" Bond Fund BNDX](#).



3. Evidence of a Bond Bubble

Low benchmark rates are affecting asset prices of all kinds. Leveraged loans no longer have covenants, corporates leverage has never been so high, maturities have never been so long...and yet spreads in the USA are nearing historical charge-off rates.



U.S. Corporate Bonds

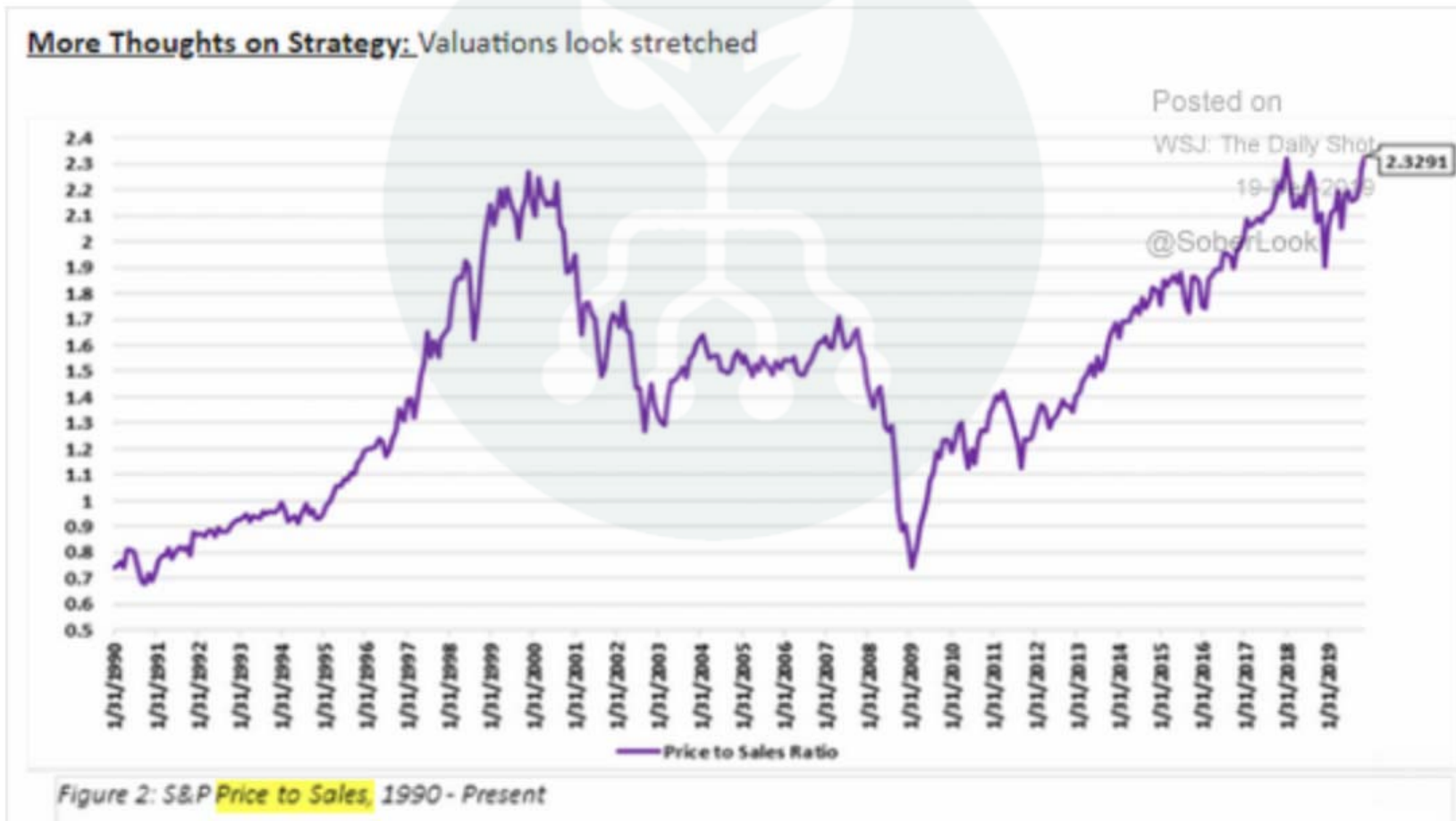
Average Maturity

1996	9.5
1997	10.1
1998	9.2
1999	8.3
2000	7.2
2001	8.9
2002	8.3
2003	8.0
2004	7.4
2005	8.6
2006	10.1
2007	13.5
2008	13.7
2009	12.0
2010	12.9
2011	13.0
2012	13.7
2013	13.7
2014	14.7
2015	17.0
2016	16.0



3. Evidence of a Bond Bubble

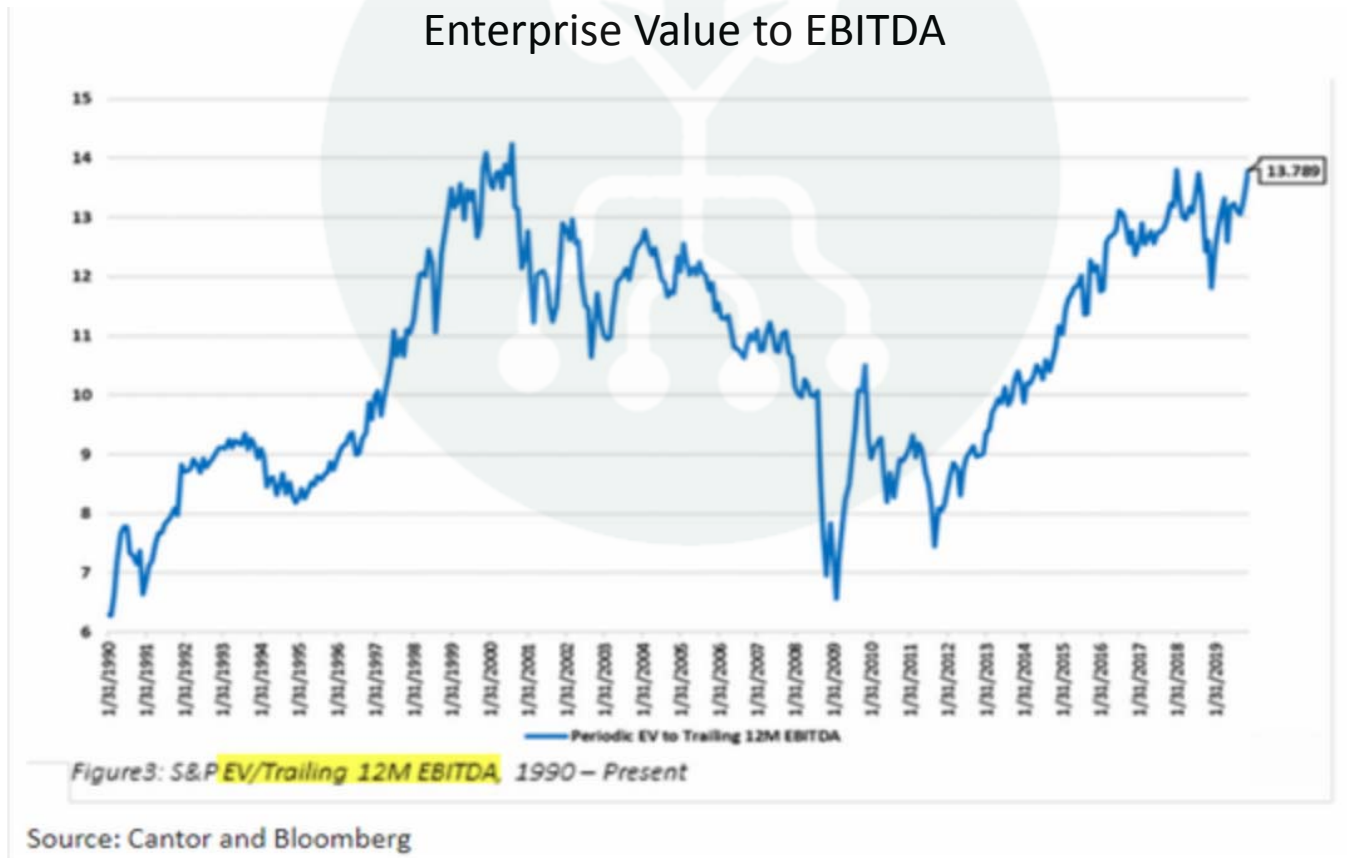
Stocks are also at all time high valuations based on nearly every measure as investors chase yield.





3. Evidence of a Bond Bubble

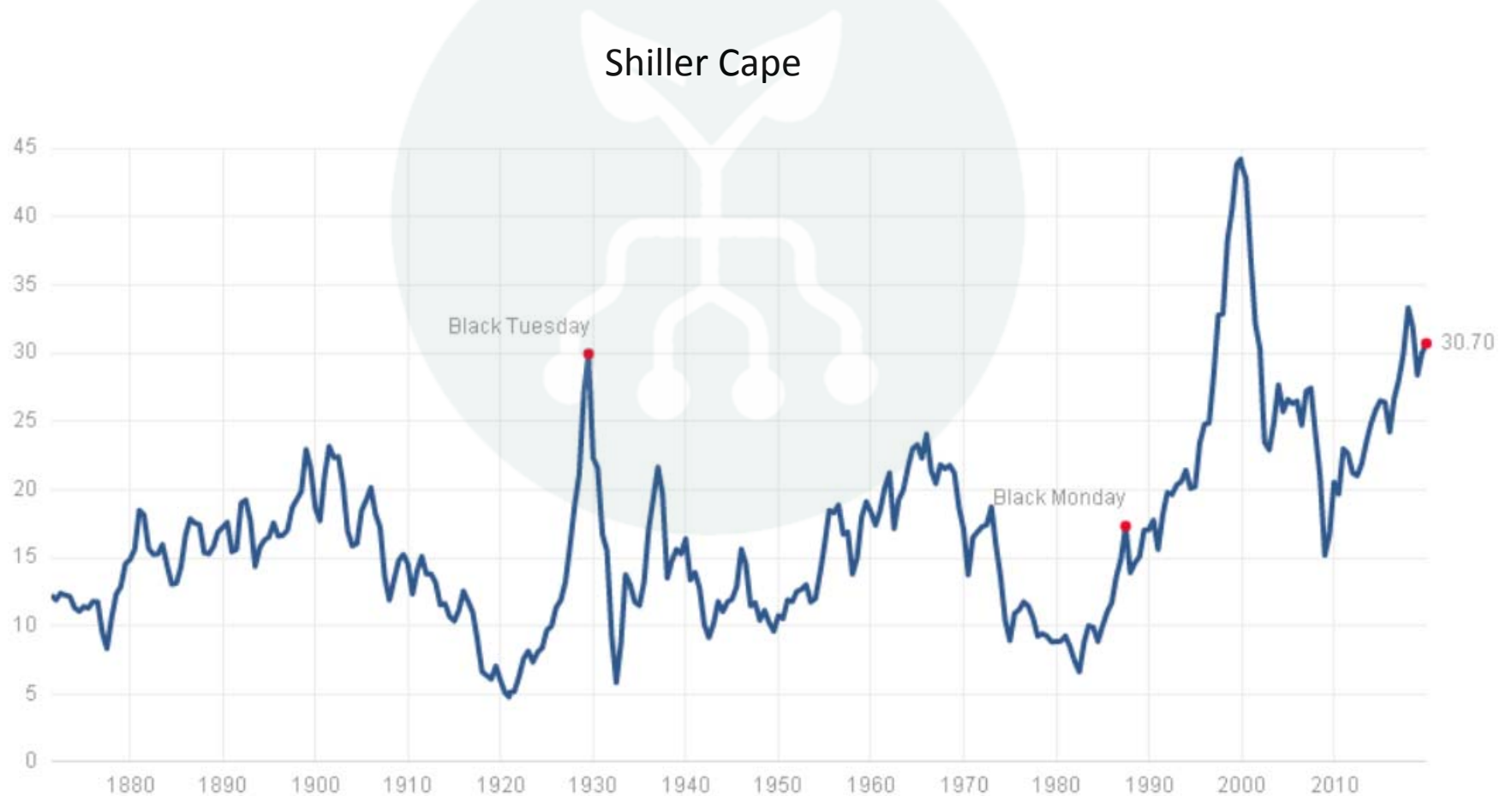
Here are a few valuation measures for the US stock market...





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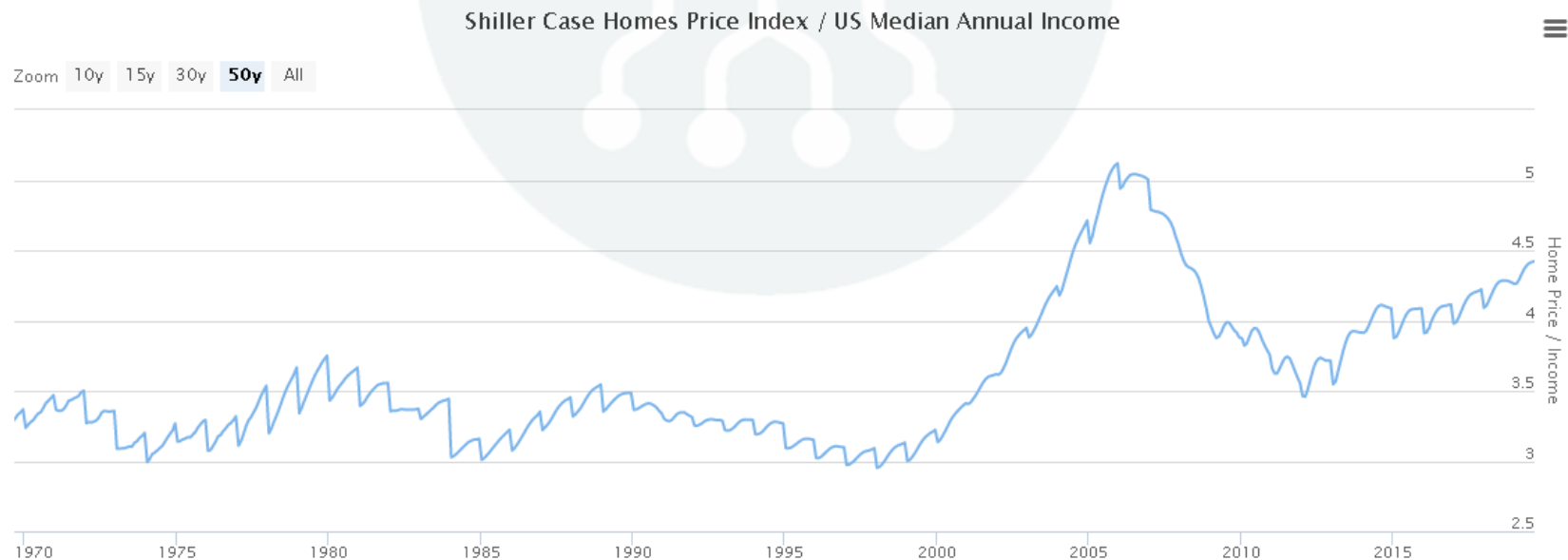




3. Evidence of a Bond Bubble

Investors like to think of real estate as strong protection from inflation...but real estate valuations are also stretched because lower borrowing rates allow greater purchasing power.

What happens to interest rates when inflation rises? How does this impact credit? What happens to property values when credit contracts?





3. Evidence of a Bond Bubble

Key conclusions from examining the bond bubble:

1. Artificially low benchmark rates have led to absurdities in some bond markets. History will reveal that investors chasing negative rates were irrational.
2. Negative benchmark rates are justifying lower prices on all financial assets, because assets exist in a global market.
3. The cause is a combination of exceedingly low historical inflation combined with a lack of price signals due to central bank purchasing of benchmark rates.
4. There is ample evidence that investors have become complacent...believing that historical returns are reasonable approximations of the future, that stocks and bonds are uncorrelated, and that portfolio values can be converted into future purchasing power based on today's inflation rates.
5. Central banks will likely keep interest rates low because corporate and government debt levels are so high that higher rates could lead to widespread bankruptcies. But this strategy will likely end if/when inflation starts to rise. This may trigger the beginning of the end of the Bond Bubble.



4. Strategy Considerations

Prepare for the following scenarios:

1. **Modest increases in inflation above 2%.** Even modest levels of inflation above target such as 3-4% could have large negative impacts on all stocks and bonds.
2. **Treasury bond yields close to nominal GDP growth (4%).** Historically, treasury bonds have traded around nominal GDP growth, compensating investors for inflation plus some real return for the interest rate risk.
3. **Higher than expected corporate default rates.** Underwriting standards in corporate bonds have deteriorated. Historical precedent is unlikely to be the best guide to future returns.
4. **Positive correlation between stocks and bonds, and maybe real estate.** Any material rise in rates would likely usher in a new regime of higher correlations between stocks, bonds, and potentially other assets that generate cash flows including real estate.
5. **Outperformance of commodities, precious metals, TIPS,** and other inflation protected on non-cash generating assets outside of the typical 60/40 stock + bond portfolio.



Appendix – Correlation Benchmark

- My calculation of historical correlation broadly fits with the pattern calculated by Graham Capital.

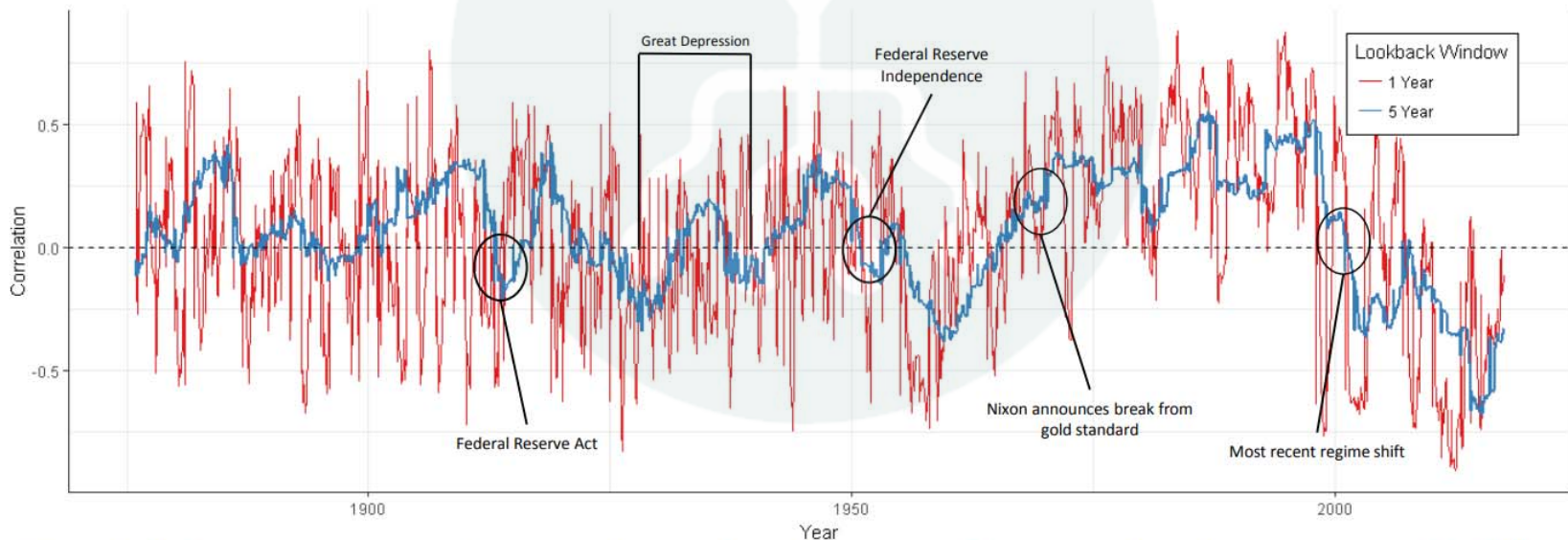


Figure 2. Rolling one-year (red) and five-year (blue) correlation between monthly equity and bond returns dating back to 1871.

Source: [https://www.grahamcapital.com/Equity-Bond%20Correlation Graham%20Research 2017.pdf](https://www.grahamcapital.com/Equity-Bond%20Correlation%20Graham%20Research%202017.pdf)