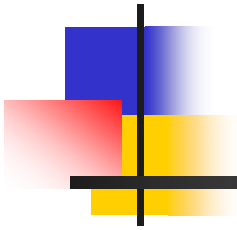


What you should know about stock market volatility

(and how that might help you sleep better at night . . .)



G. William Schwert

October 3, 2013

Eisenberg Rotunda, 12:00-1:00 PM

http://schwert.ssb.rochester.edu/GWS_161003.pdf

From Presidential Debate, October 7, 2008

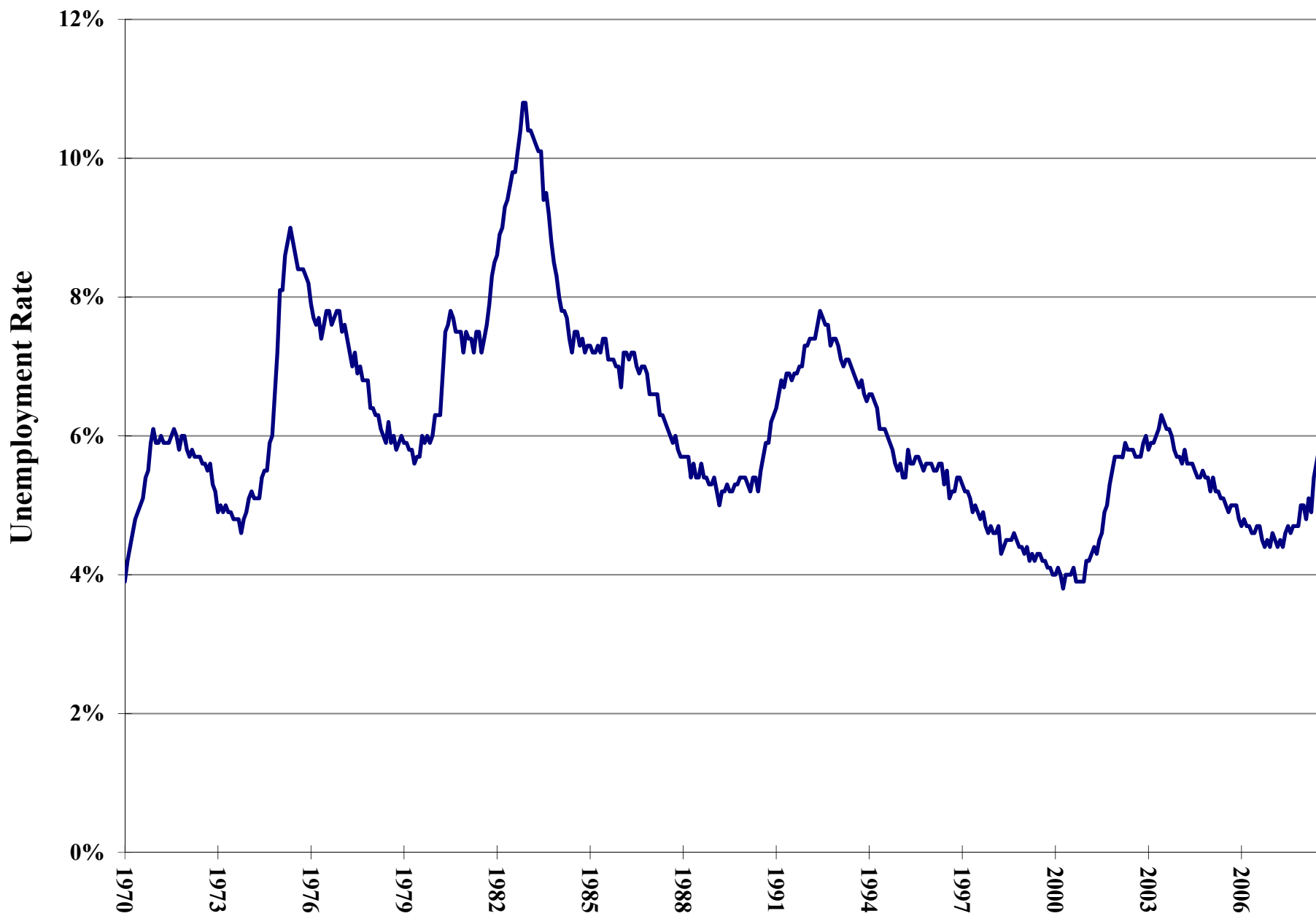




So What Was Candidate Obama Talking About?

- September 2008 unemployment rate was only 6.2%
 - Up from 4.7% a year earlier, but much lower than many times in the prior 38 years
 - On its face, this does not seem like the basis for making analogies to the Great Depression . . .

Civilian Unemployment Rate, 1970-2008





Stock Volatility Was Very High from mid-September through October 7

<u>Date</u>	<u>DJIA</u>	<u>Change</u>	<u>Pct Change</u>	<u>Rank</u>
Sep-15	10917.51	-504.48	-4.42%	15
Sep-16	11059.02	141.51	1.30%	
Sep-17	10609.66	-449.36	-4.06%	17
Sep-18	11019.69	410.03	3.86%	16
Sep-19	11388.44	368.75	3.35%	26
Sep-22	11015.69	-372.75	-3.27%	35
Sep-23	10854.17	-161.52	-1.47%	
Sep-24	10825.17	-29.00	-0.27%	
Sep-25	11022.06	196.89	1.82%	
Sep-26	11143.13	121.07	1.10%	
Sep-29	10365.45	-777.68	-6.98%	1
Sep-30	10850.66	485.21	4.68%	9
Oct-01	10831.07	-19.59	-0.18%	
Oct-02	10482.85	-348.22	-3.22%	
Oct-03	10325.38	-157.47	-1.50%	
Oct-06	9955.50	-369.88	-3.58%	37
Oct-07	9447.11	-508.39	-5.11%	13

Red indicates among the 40 largest decreases of all time

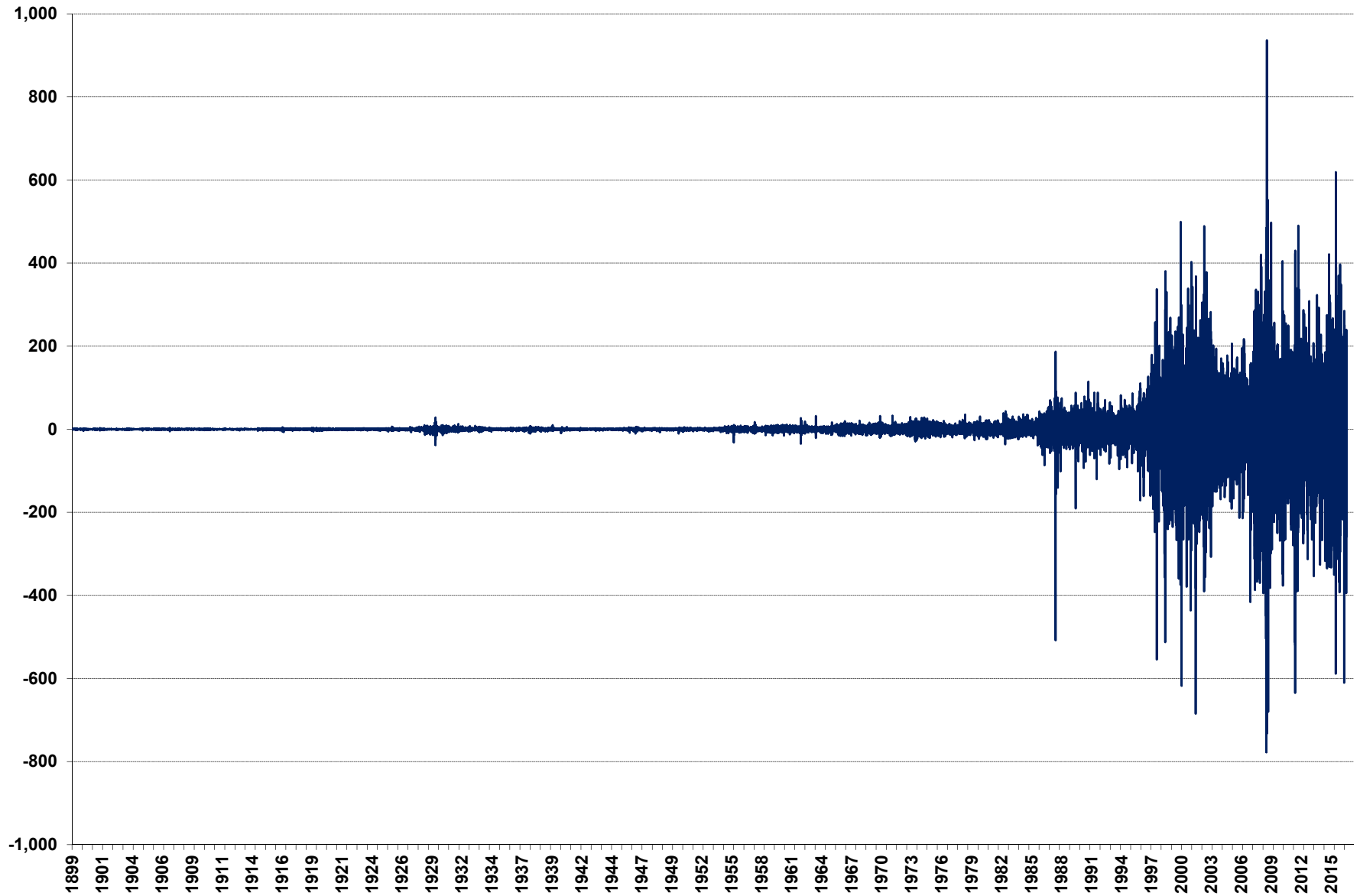
Green indicates among the 40 largest increases of all time



What Is Market Volatility?

- Big changes in prices
- But, it turns out that it makes more sense to look at PERCENT CHANGES

Daily Changes in the Dow Jones Industrial Average, 1899-2016





How to Lie with Statistics – Plot the Changes in the Dow

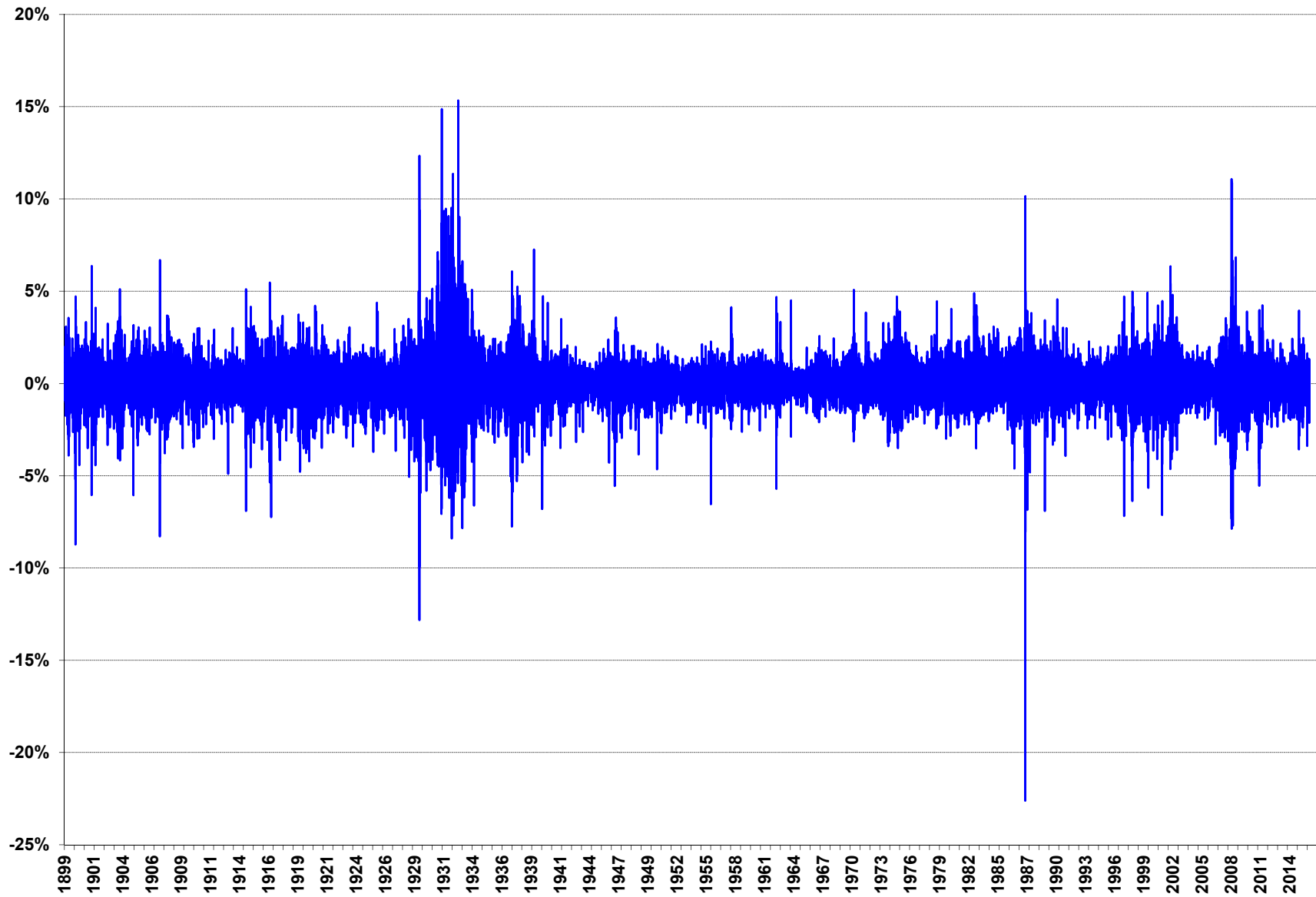
- This plot looks like a seismograph with an earthquake at the end
- This is why newspapers often write that recent days have had some of the largest changes in the Dow Jones Index in all of history . . .



Looking at the Percent Change of Stock Indexes Is Relevant . . .

- This measures the rate of return on the investment
 - i.e., how many more dollars you would have at the end of the day if you invested \$100 at the beginning of the day
 - The following plot of daily percent changes in the Dow looks much more regular (and recent data do not look that unusual)

Daily Returns to the Dow Jones Industrial Average, 1899-2016

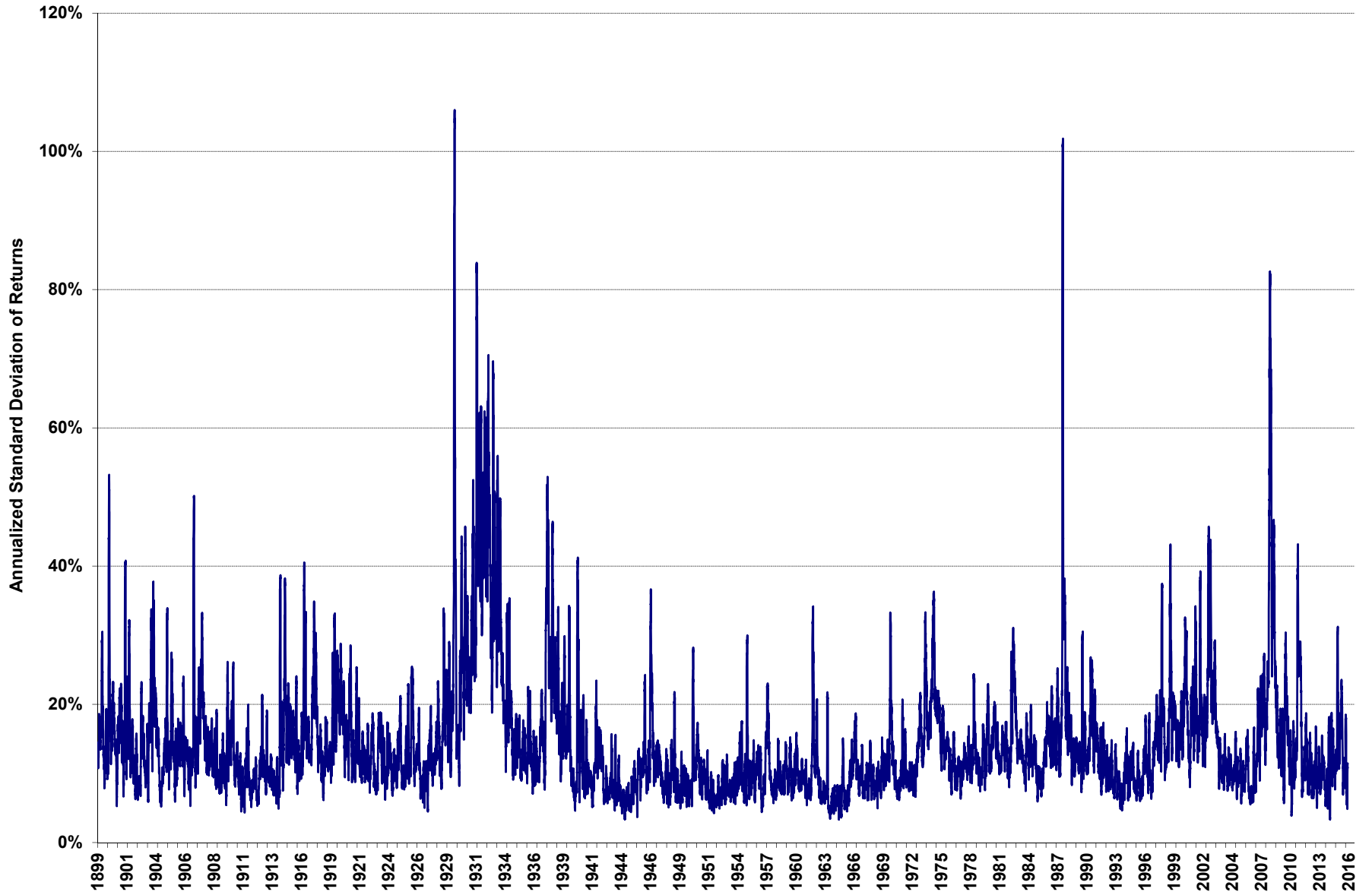




Standard Deviations of Returns Measure Dispersion

- How likely is it that we will see a big percent move in the Dow?

Volatility of the Dow Jones Industrial Average, 1899-2016

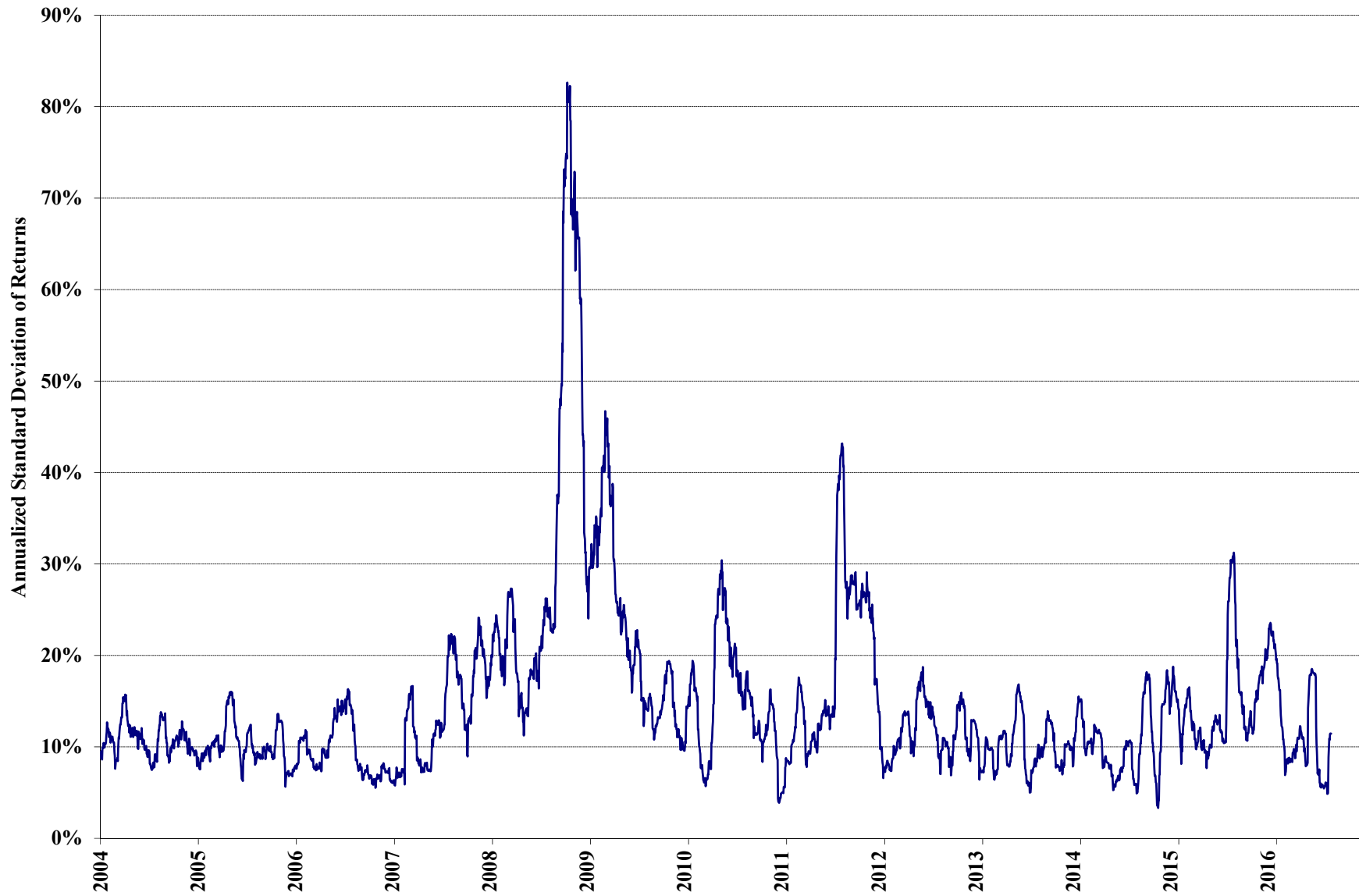




Another Way to Lie with Statistics -- Focus on Very Recent History

- Newspapers often focus on the last few years in discussing current conditions
 - On this basis, people would think stock volatility was unbelievably high in 2008-2009
 - This is misleading when viewed from the perspective on the longer history we have available to us
 - Compare the plots of rolling standard deviations from 2004-2016 versus the plot from 1897-2016
 - Good news is that things seem to have settled down a bit now (compared to 2008)

Volatility of the Dow Jones Industrial Average, 2004-2016

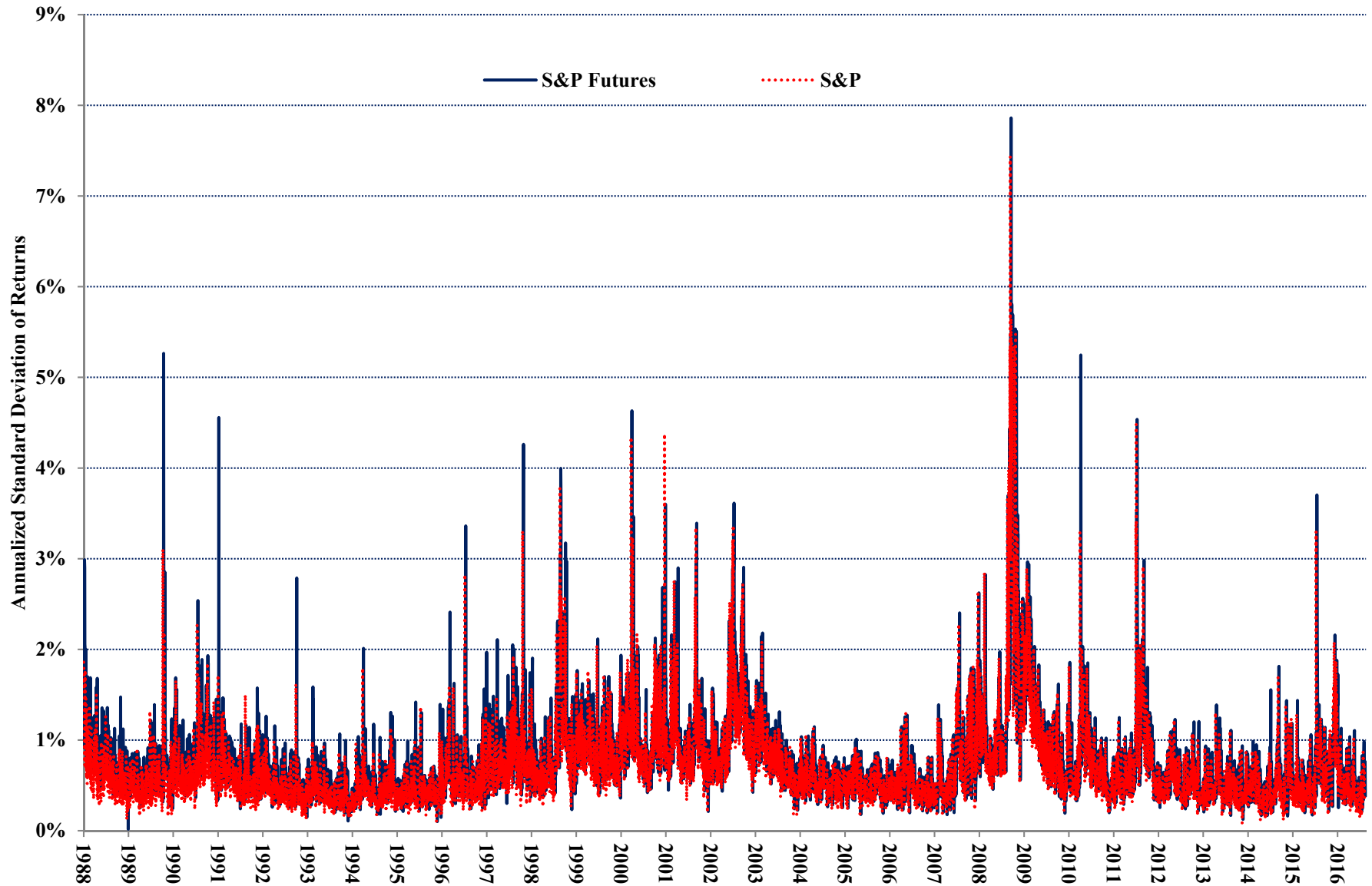




Similar Conclusions from Recent Intra-day Data: 15-minute Returns to the S&P 500 and S&P Futures

- These estimates of annualized volatility are independent from day-to-day
 - Not overlapping
 - Volatility was very high in late 2008, but now looks fairly “normal”
 - Focusing on the post-2004 period is misleading

Volatility of the S&P 500 and S&P Futures, Based on Intraday 15-minute Returns, 1988-2016



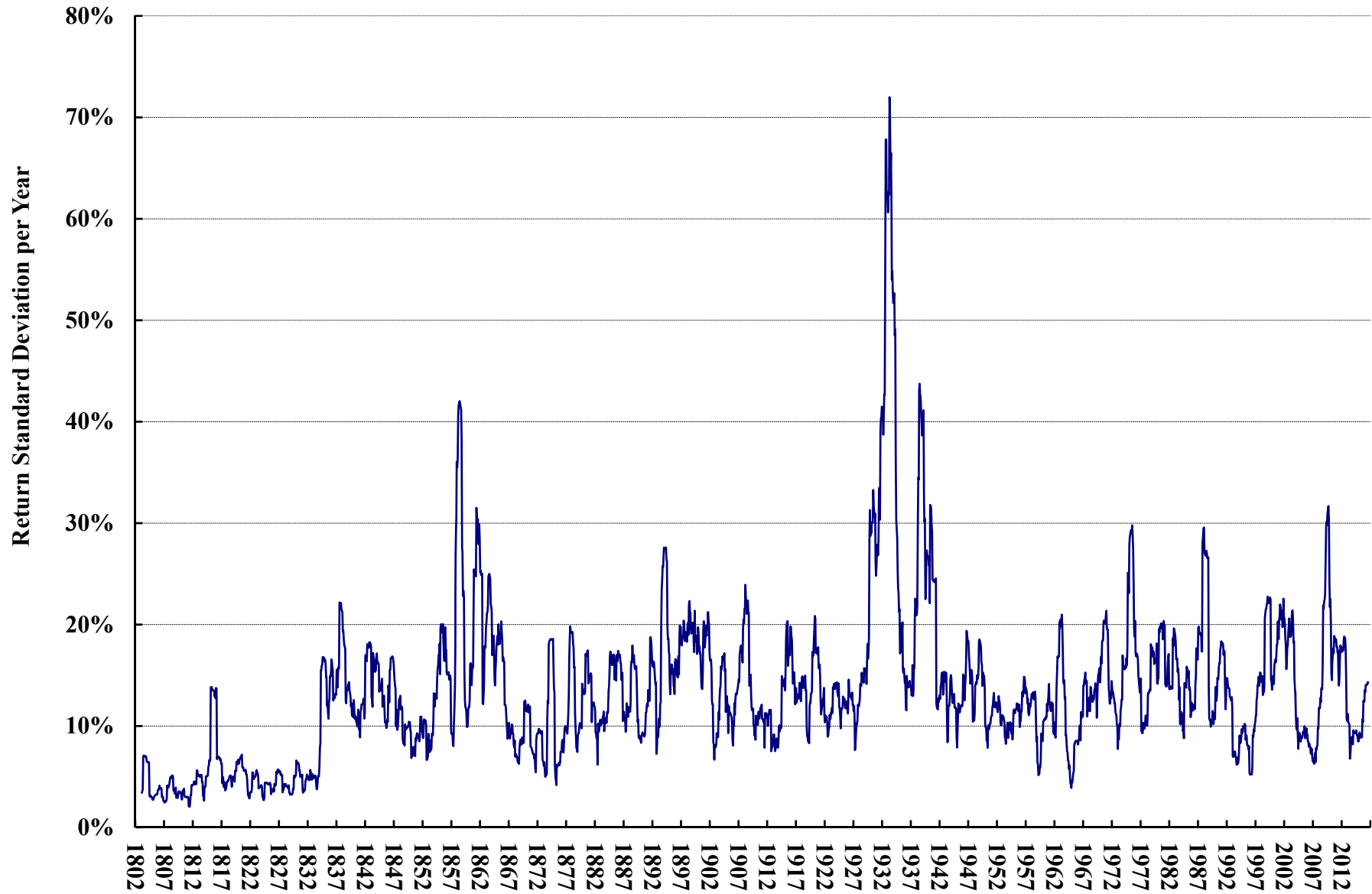
(c) G. William Schwert, 2009-2016



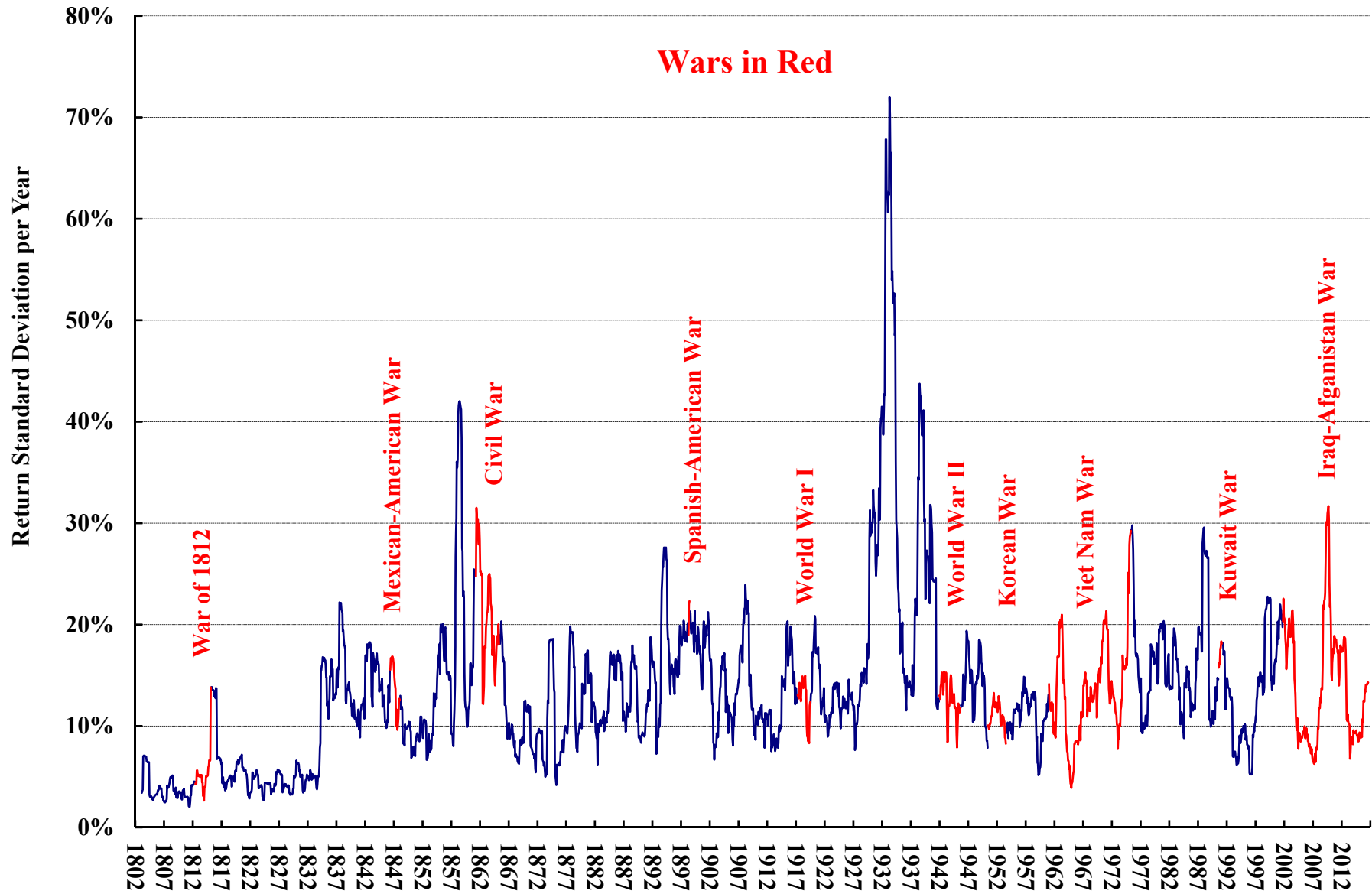
Stylized Facts/Questions: A very long-term view!

- Market-level volatility has been remarkably stable over time
 - Data back to 1802, covers many wars, financial crises, depressions/recessions
 - Also, major changes in the composition of the US economy
 - Mainly banks, insurance companies, canals in early 1800s
 - Railroads started being important after 1834
 - Great Depression is the most notable period of prolonged high volatility

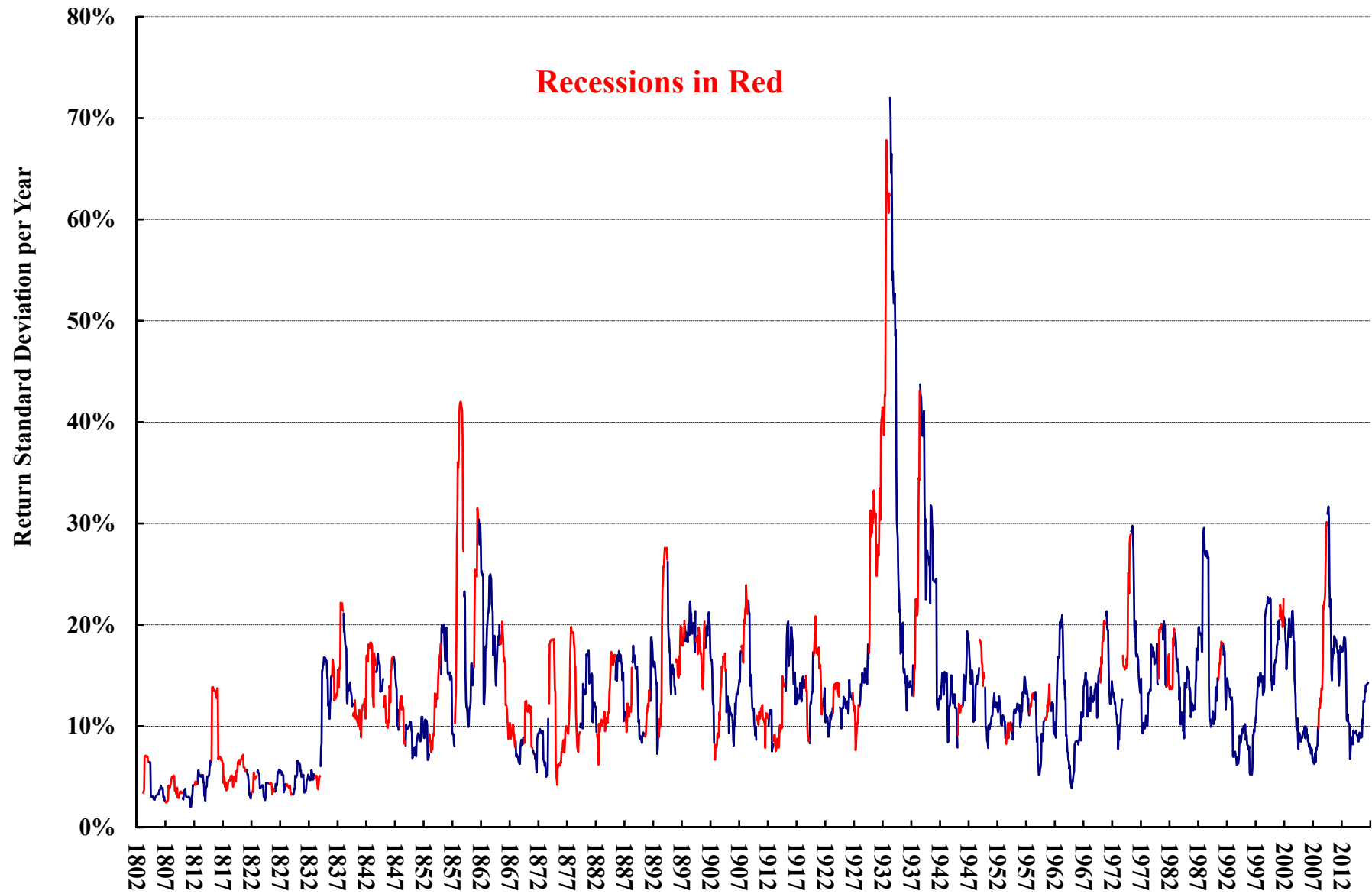
Annualized Standard Deviations of U.S. Stock Returns from Monthly Returns in the Year, 1802-2016



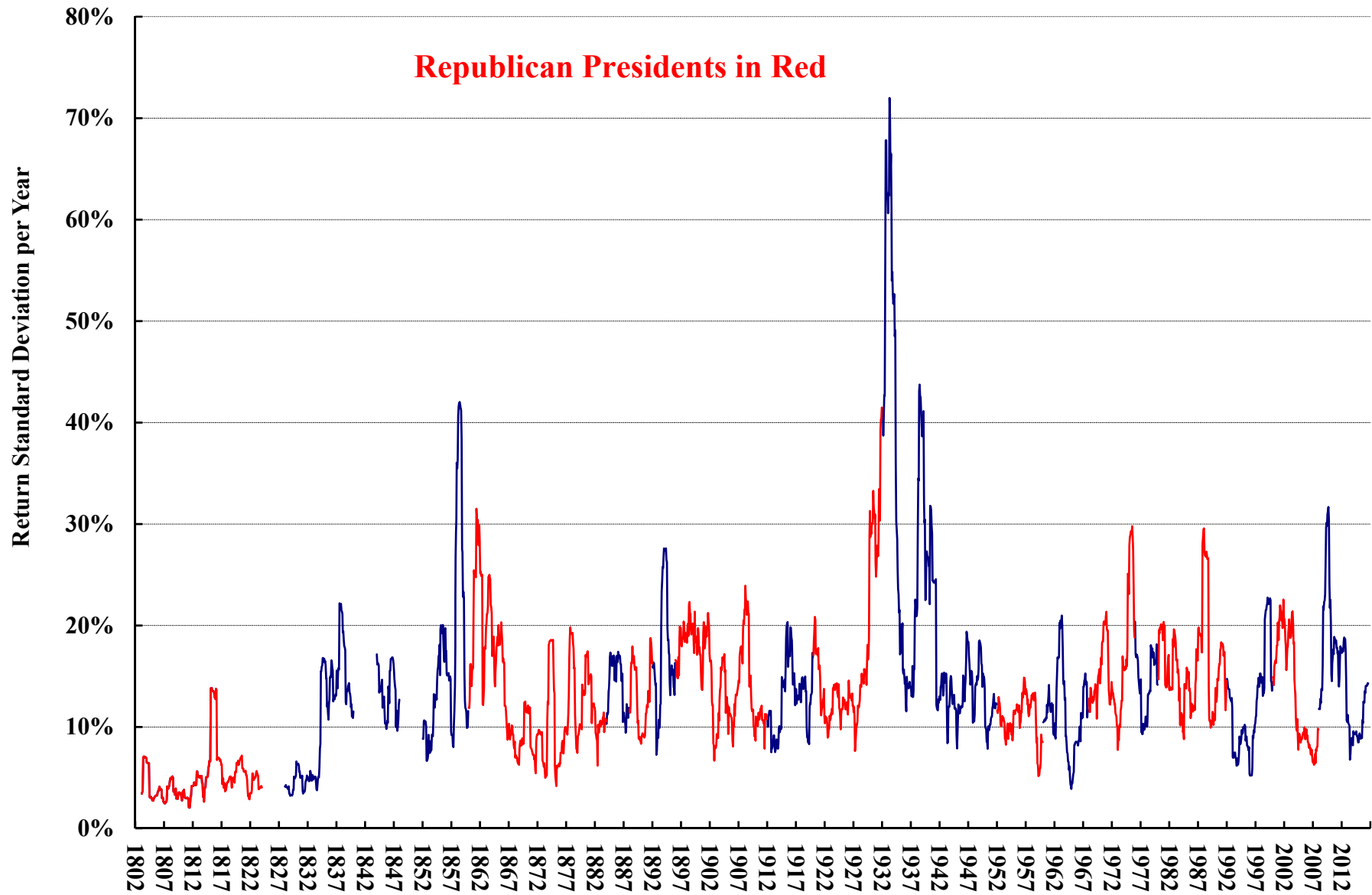
Annualized Standard Deviations of U.S. Stock Returns from Monthly Returns in the Year, 1802-2016



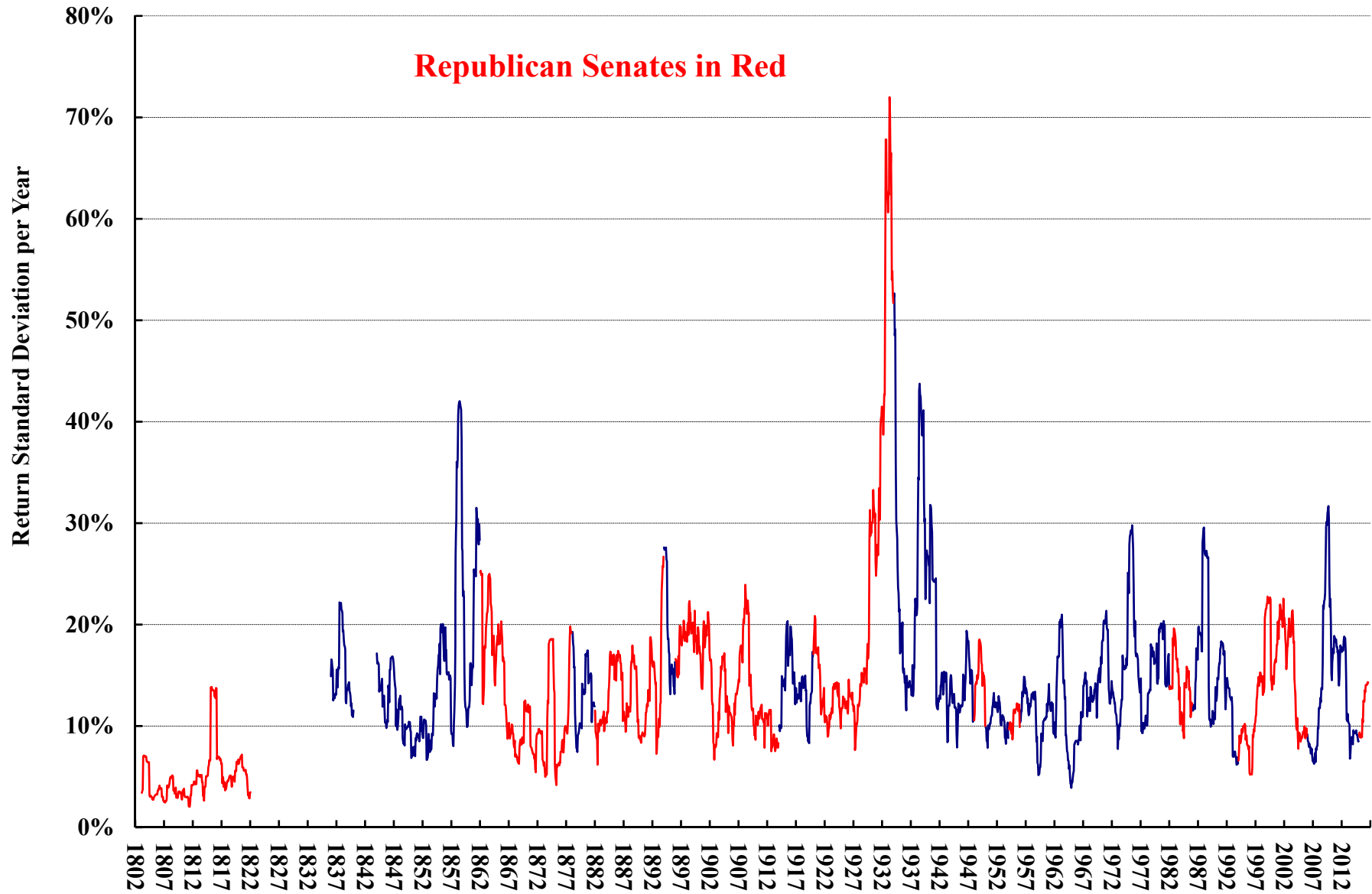
Annualized Standard Deviations of U.S. Stock Returns from Monthly Returns in the Year, 1802-2016



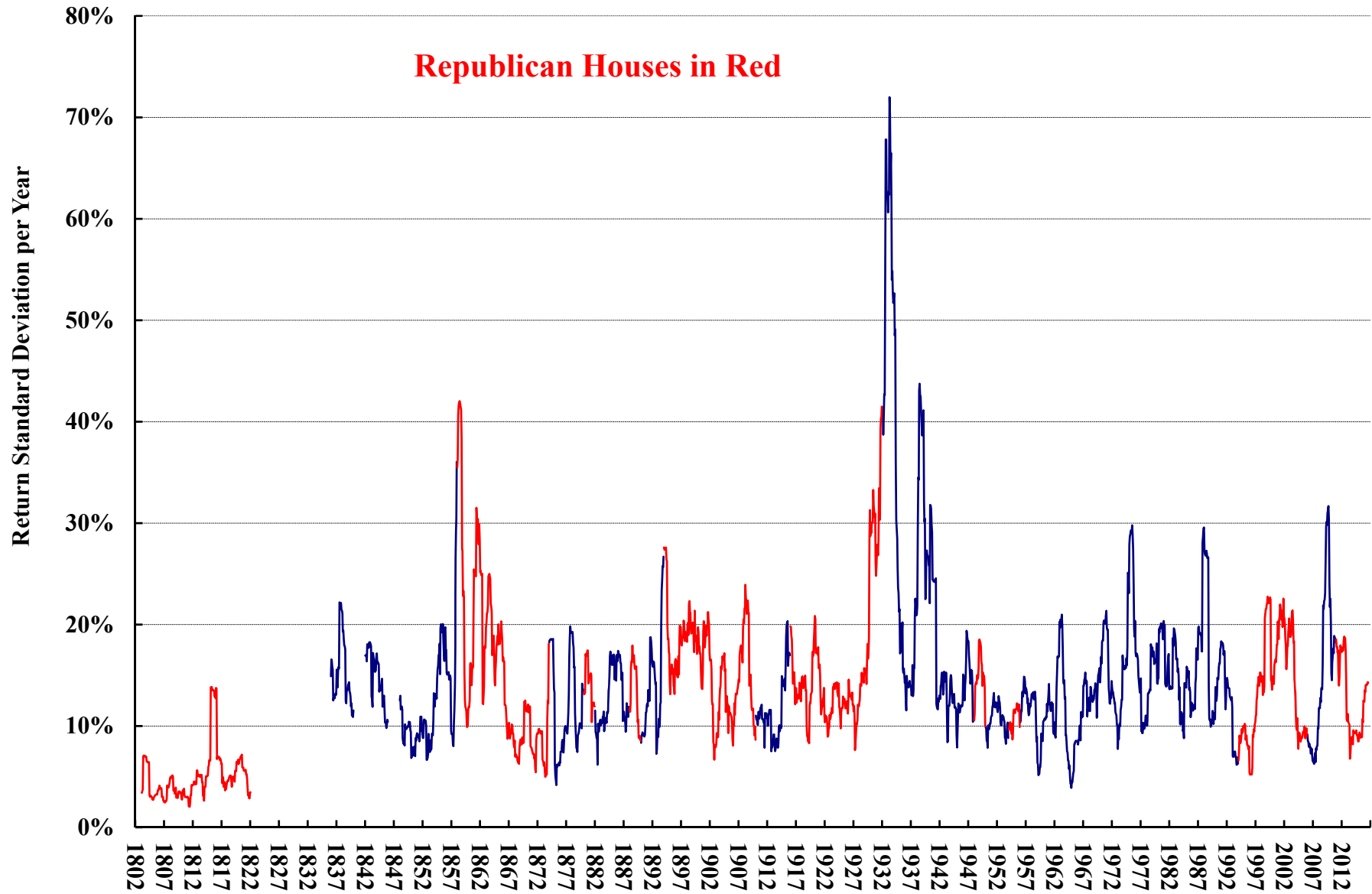
Annualized Standard Deviations of U.S. Stock Returns from Monthly Returns in the Year, 1802-2016



Annualized Standard Deviations of U.S. Stock Returns from Monthly Returns in the Year, 1802-2016



Annualized Standard Deviations of U.S. Stock Returns from Monthly Returns in the Year, 1802-2016

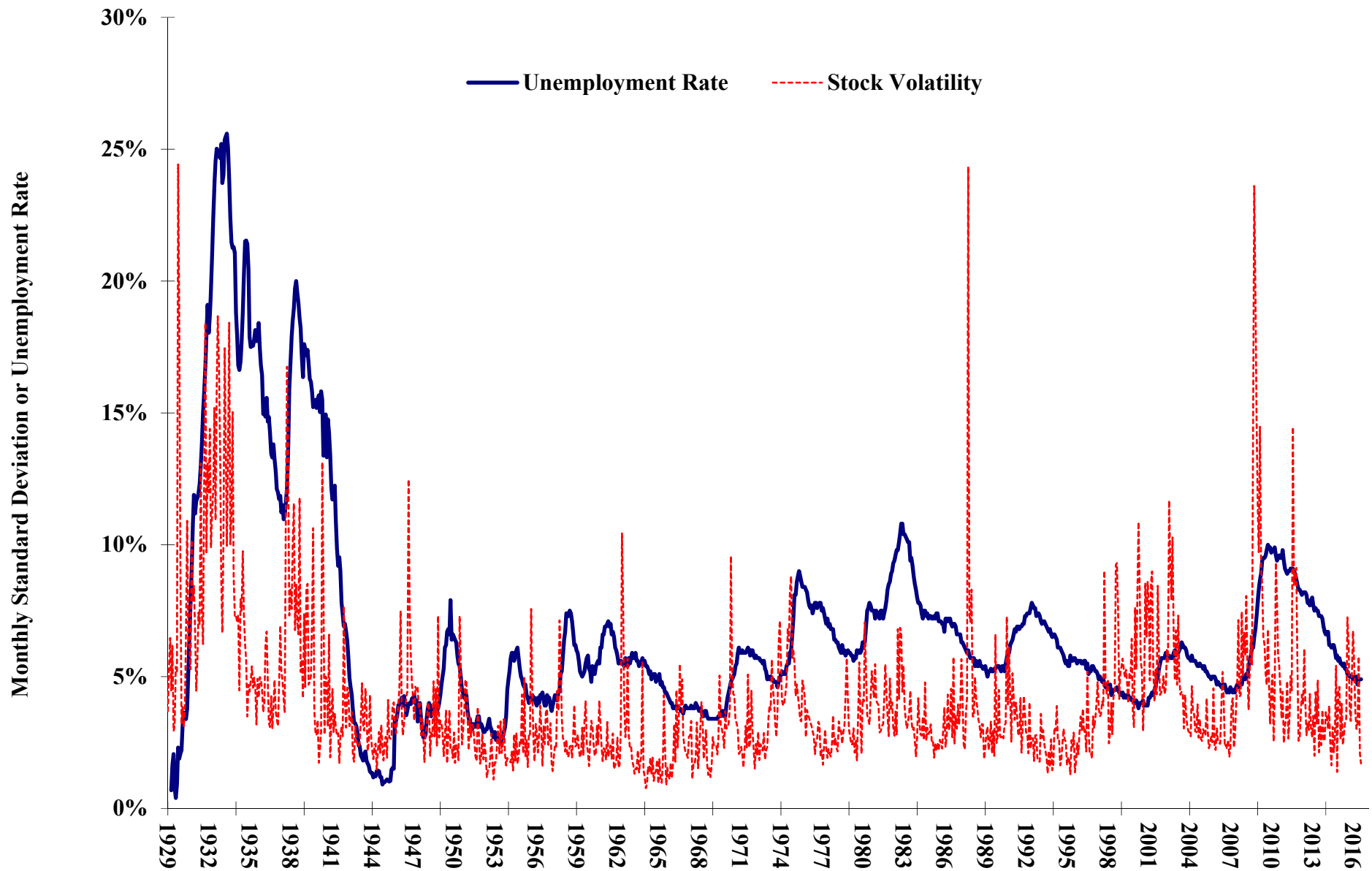




Links to Real Economic Activity: The Unemployment Rate

- During the Great Depression, the unemployment rate and stock volatility moved closely together
- Not true since that time
- While Candidate/President Obama's statement alluding to the Great Depression was accurate for stock volatility, it is far off for the unemployment rate
 - The unemployment rate since 2008 has **not** been greater than it was from Sept-82 through June-83

Standard Deviation of Monthly Stock Returns from Daily Returns in the Month and Civilian Unemployment Rate, 1929-2016

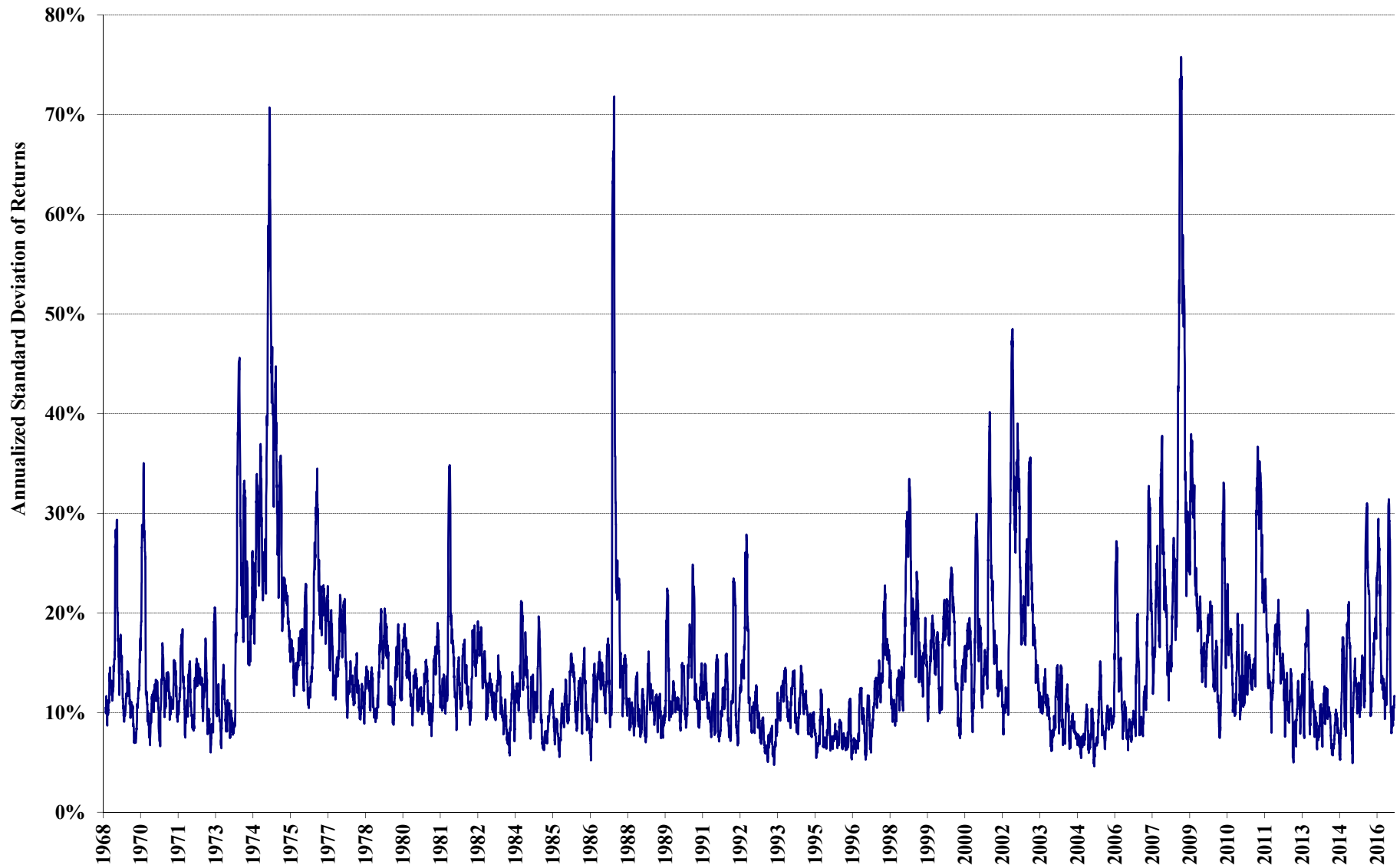




International Volatility

- Following figures show historical volatility for:
 - FTSE All Shares Index in London since 1968
 - the Nikkei 225 and Topix Indexes in Japan, since 1950
 - They all move together, increasing modestly during the Technology “bubble” from 1998-2002
 - Increased substantially in 2008-2009 during the liquidity crisis

Volatility of FTSE All Shares Index, 1968-2016



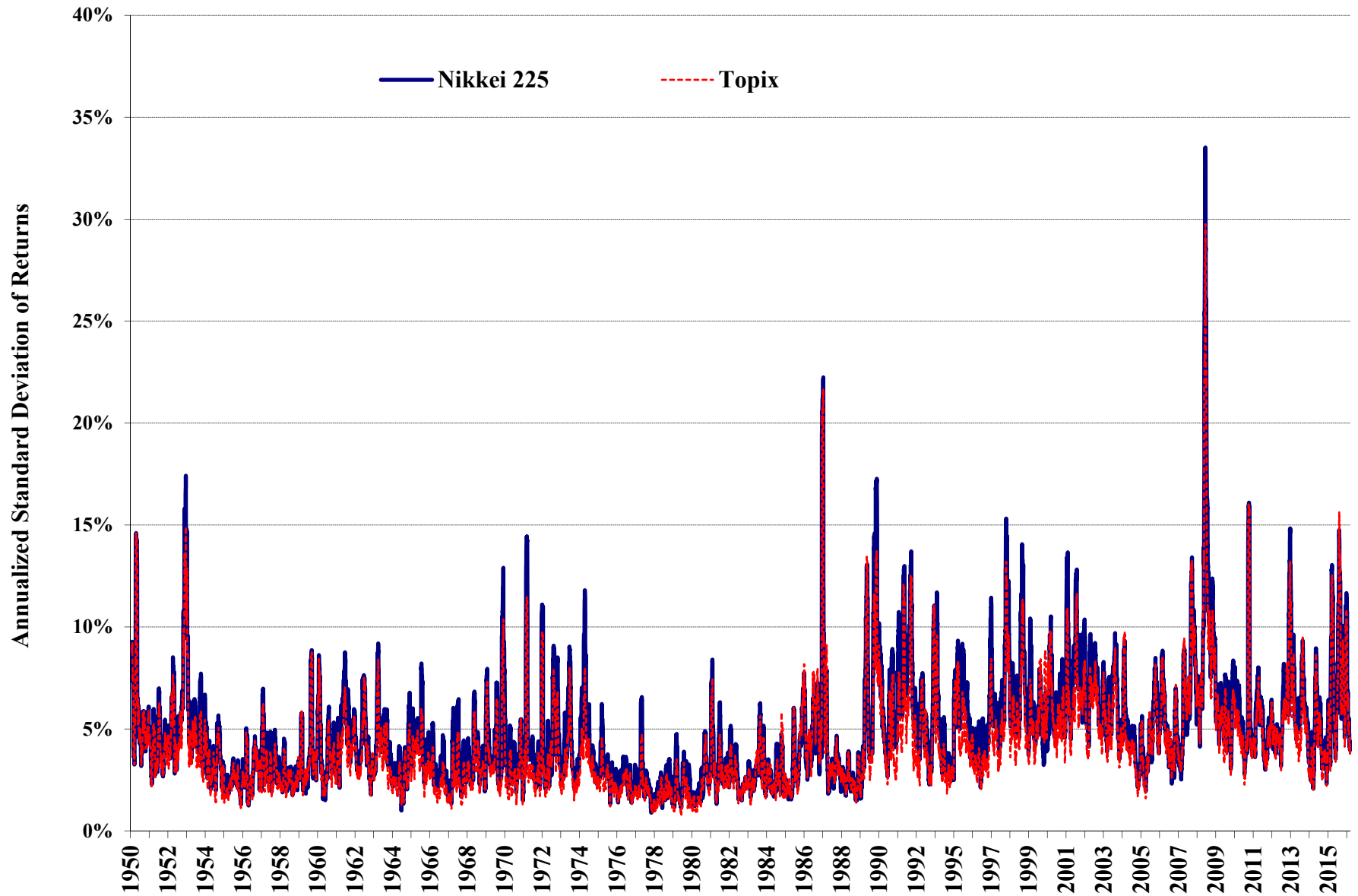
© G. William Schwert, 2001-2016



Foreign Markets – FTSE (UK)

- Volatility in 2008-2009 was similar to late 90's early 2000's, and similar to US levels
- Also similar to 1973-74 (first OPEC crisis)
- By comparison, “Brexit” seems pretty modest . . .

Volatility of Nikkei 225 and Topix Indexes, 1950-2016





Foreign Markets – Nikkei 225 and Topix (Japan)

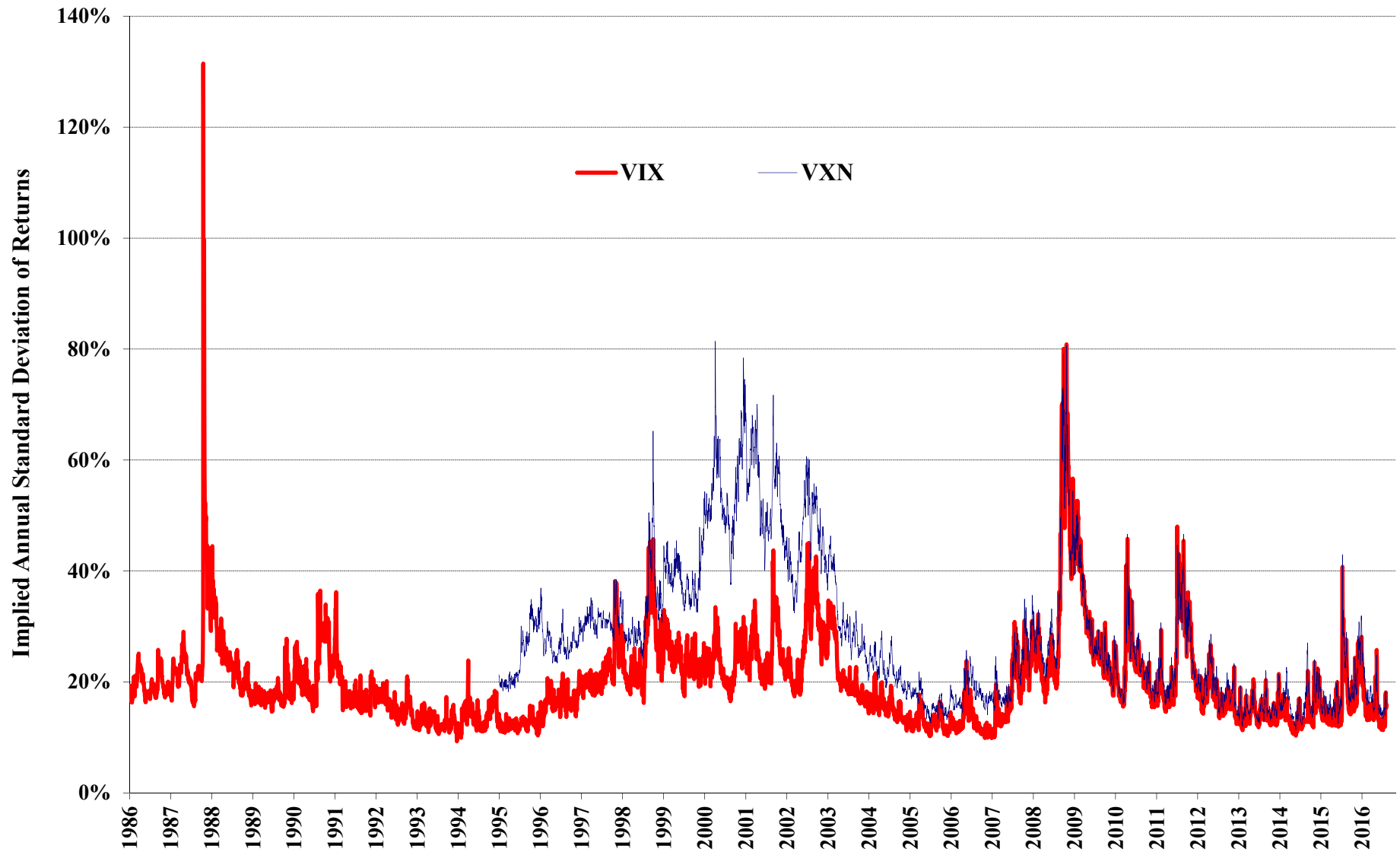
- Volatility in 2008-2009 was similar to 1989-2003, and similar to US levels
- Also similar to 1973-74 (first OPEC crisis)



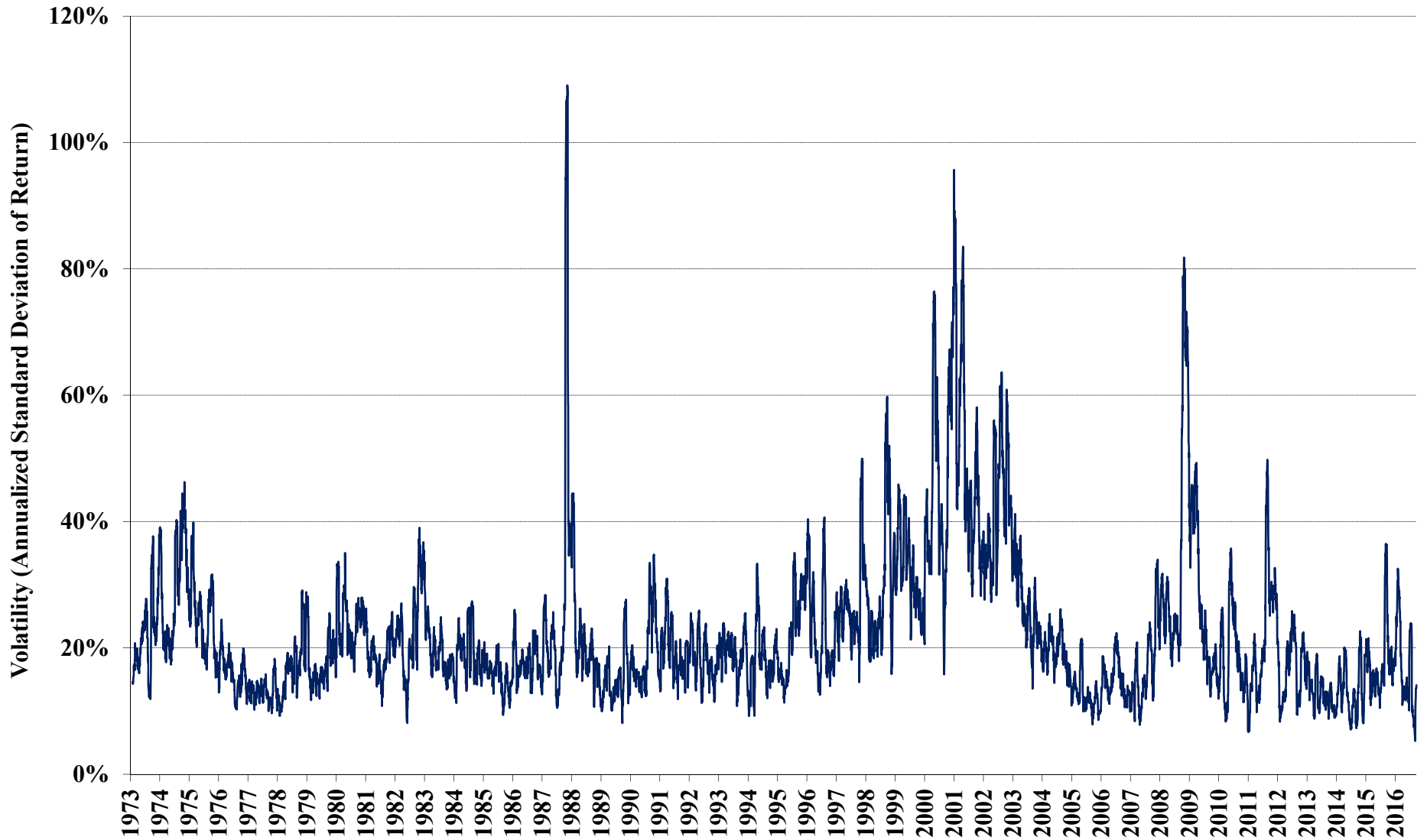
Sometimes Sectors Drive Market Volatility: Technology in 2000-2002

- Next figure shows the implied volatility series published by CBOE with ticker symbols VIX (S&P) and VXN (Nasdaq)
 - VXN is much higher, especially in 1998-2002; similar since mid-2007
- Also, Datastream Index of US Technology Stocks, 1972-2016

Implied Volatility for S&P 500 (VIX) and Nasdaq 100 Portfolio (VXN), Annualized Standard Deviation of Returns, 1986-2016



Volatility for Datastream Index of US Technology Stocks, Annualized Standard Deviation of Returns, 1973-2016



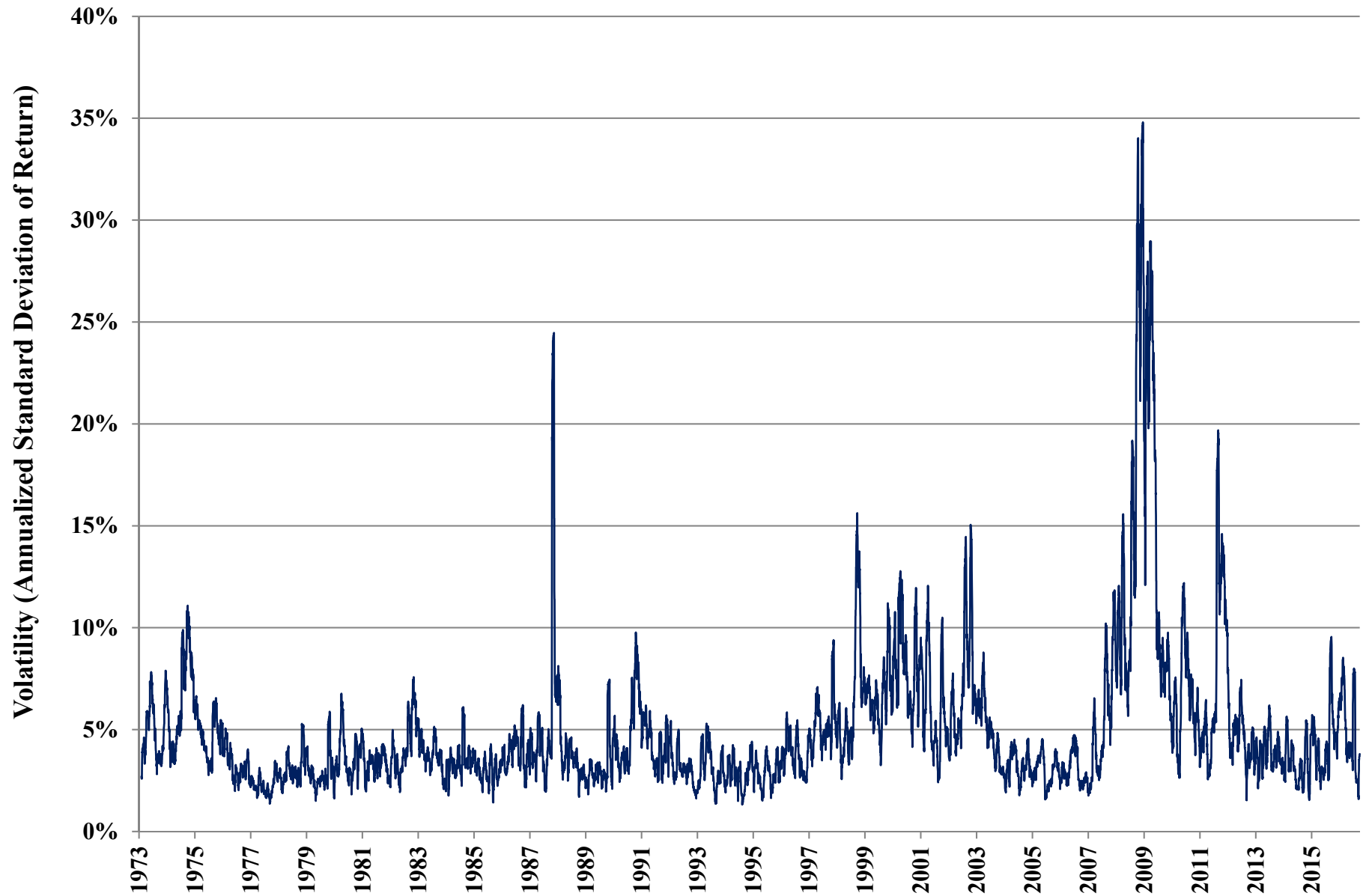
(c) G. William Schwert, 2009-2016



Was the 2008 Credit Crisis a Finance “Bubble”?

- Next figure shows historical volatility for:
 - the S&P 1200 Financial portfolio and the Datastream US Financial portfolio, since 1973
 - They move together, increasing modestly during the Technology “bubble” from 1998-2002
 - Increased substantially in 2008-2009 during the liquidity crisis

Volatility for Index of Financial Stocks, Annualized Standard Deviation of Returns, 1973-2016





Summary

- Market-level volatility often rises after prices fall
 - Recent good performance of the market is consistent with the lower levels of volatility [counter-cyclical]
 - Inflation of index levels exaggerate perceptions of increased volatility



Summary

- Because volatility is easy to see in real time, it has become a major focus of the news media and politicians
 - and, therefore, of main street America
- For most people, who should be buy-and-hold long-term investors, short-term burst of volatility should not be a cause of concern