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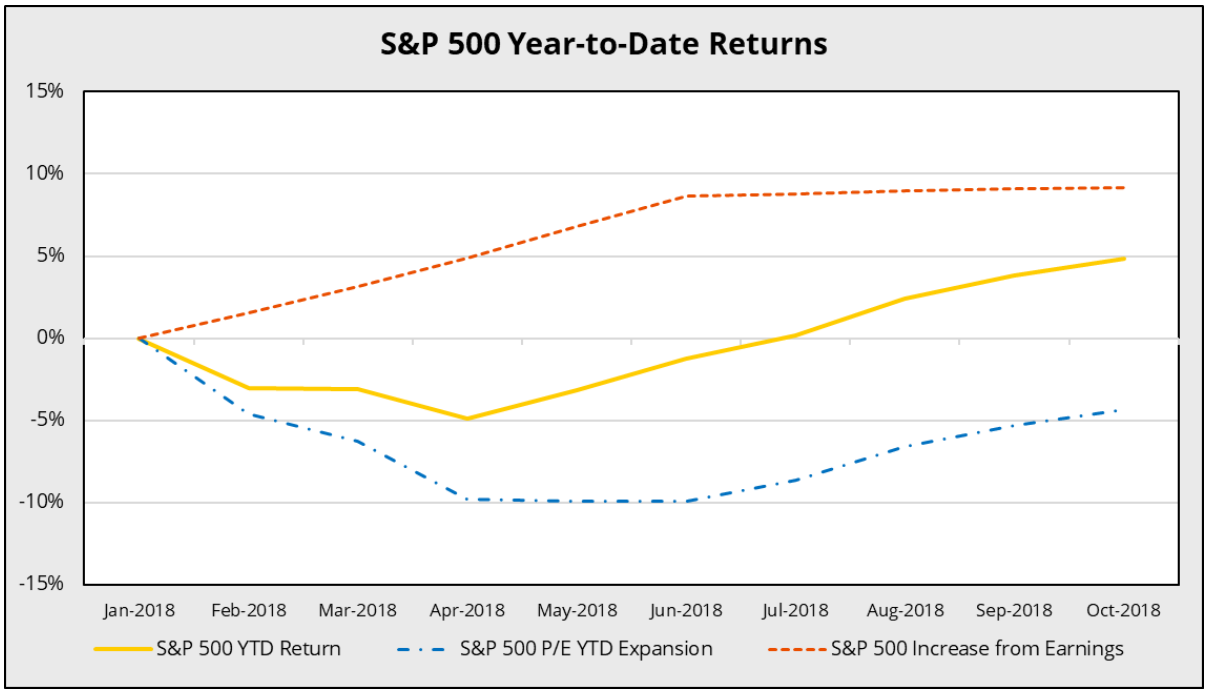
The Relationship Between S&P 500 Returns, Earnings Growth, P/E Expansion, and Interest Rates

The S&P 500 increased from 2,789.80 on January 1, 2018 to 2,924.59 on October 1, 2018, a year-to-date return of 4.83%. As shown in the graph below, this return was fueled by a solid increase in earnings of 9.20% but was partially offset by a contraction of 4.37% in the P/E ratio.



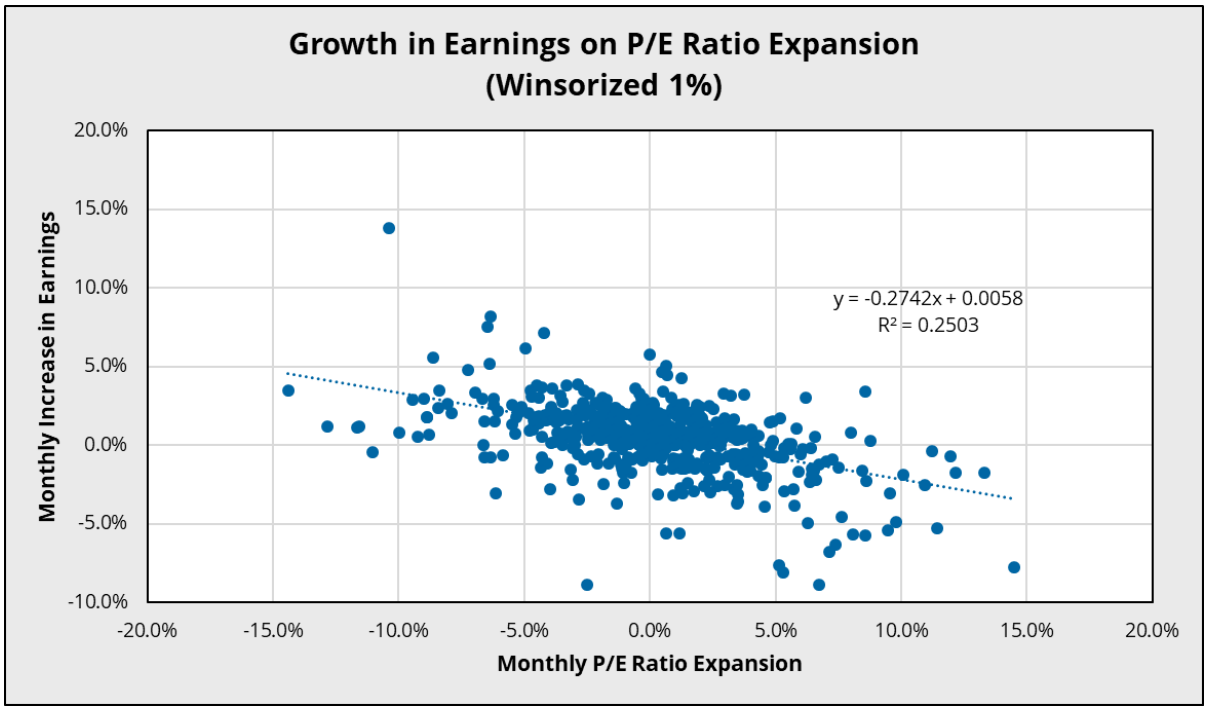
While S&P 500 returns result from both P/E ratio expansion and increases in earnings, these factors have historically been negatively correlated. This means that the offsetting effect that we see above holds for monthly data over a longer period of time. In fact, the relationship for the period January 1970 through October 2018 as determined by linear regression is:

Monthly Increase in Earnings = 0.58% – 27.42% × (Monthly P/E Ratio Expansion)

Based on this regression, a 2% decrease in the P/E Ratio will likely be accompanied by a 1.1% increase in earnings, yielding a negative 0.9% S&P 500 return.

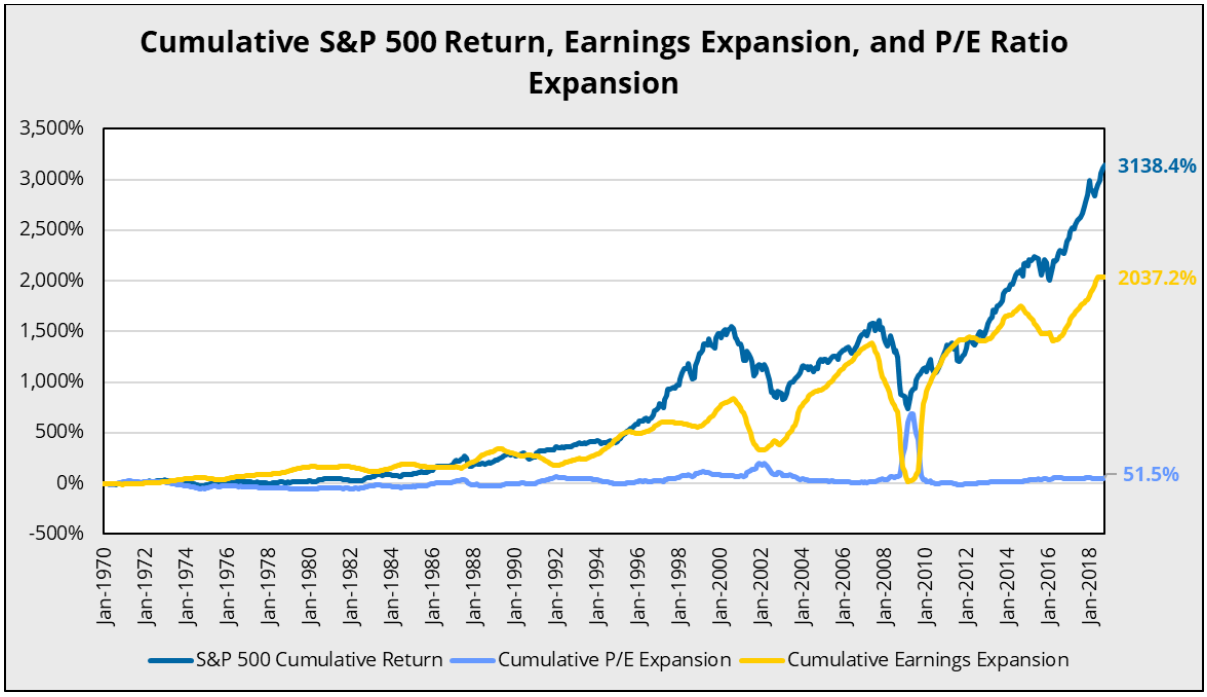
Monthly P/E Ratio Expansion	Monthly Increase in Earnings	Monthly S&P 500 Return
-2.0%	1.1%	-0.9%
-1.0%	0.9%	-0.2%
0.0%	0.6%	0.6%
1.0%	0.3%	1.3%
2.0%	0.0%	2.0%

The graph below illustrates the historical relationship of monthly increases in earnings and monthly P/E Ratio expansion.

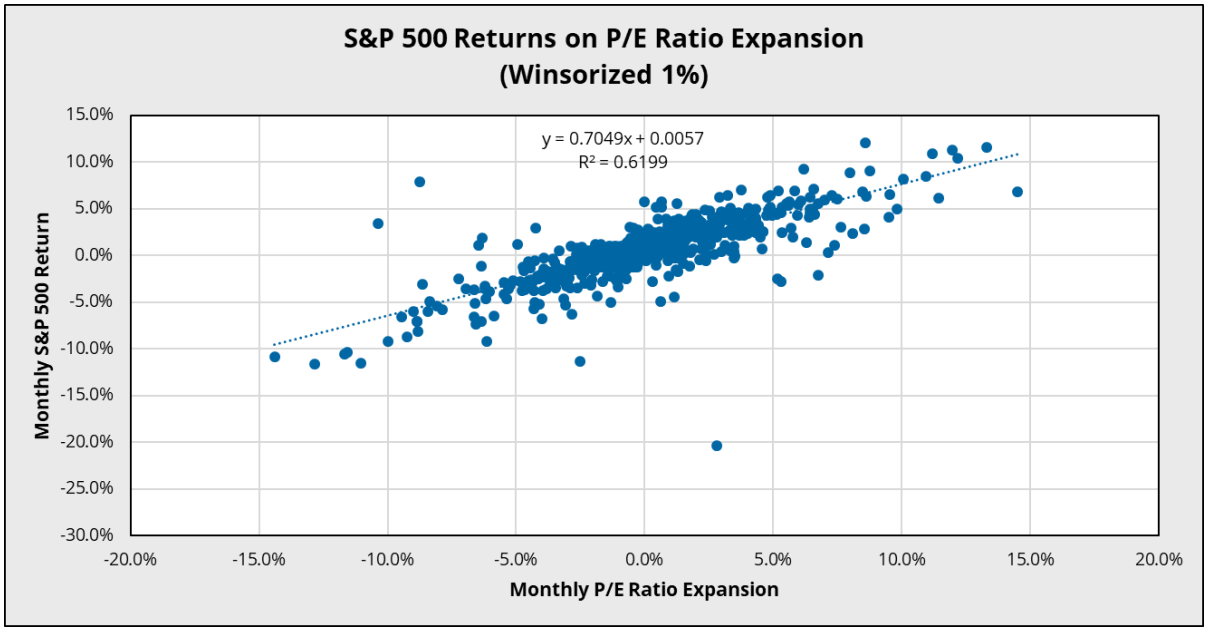


While we see an offsetting effect in monthly P/E ratio expansion and monthly increases in earnings, both factors have contributed to cumulative S&P 500 returns since January 1970. The index has increased 3,138.4% over this period, while earnings have expanded by 2,037.2% and the P/E ratio has increased by 51.5%.[1] If we allocate the multiplicative component of the S&P 500 to earnings expansion and P/E ratio expansion, we find that 97.5% of the cumulative return in the S&P 500 since January 1970 has come from expansion in earnings, while 2.5% of the cumulative return is attributable to the growth in the P/E ratio. The chart below depicts the cumulative S&P 500 return.

[1] 3,138.4% = (1 + 2,037.2%) × (1 + 51.5%) - 1



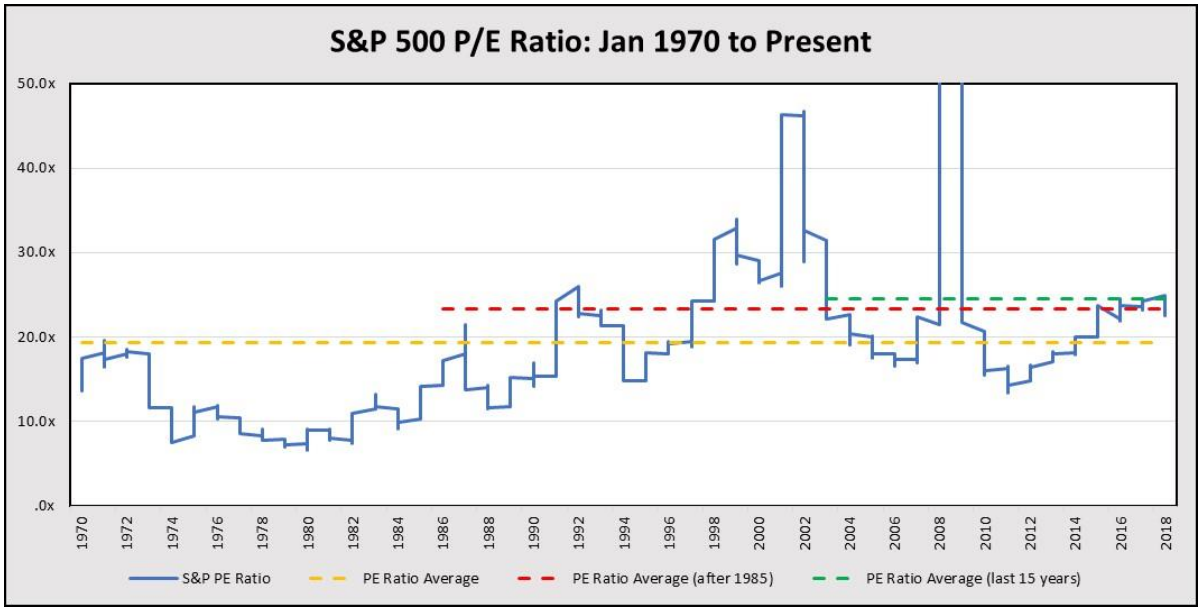
While S&P returns over long periods of time are attributable to earnings expansion, the variation in monthly returns is primarily explained by changes in the P/E ratio (approx. 62%). The chart below illustrates the relationship between monthly S&P 500 returns and the monthly percent change in the P/E ratio.



Historical Distribution of the P/E Ratio

During the period January 1970 to October 2018, the S&P 500 P/E ratio averaged 19.5x. However, for the majority of the period, the P/E ratio was less than the 19.5x average. The P/E ratios had remained above the average for the last 48 months.

During the period January 1987 to October 2018, the P/E ratio averaged 23.5x and the median P/E ratio was 20.5x. In the last 15 years, the average P/E ratio has moved further upwards to 24.5x.



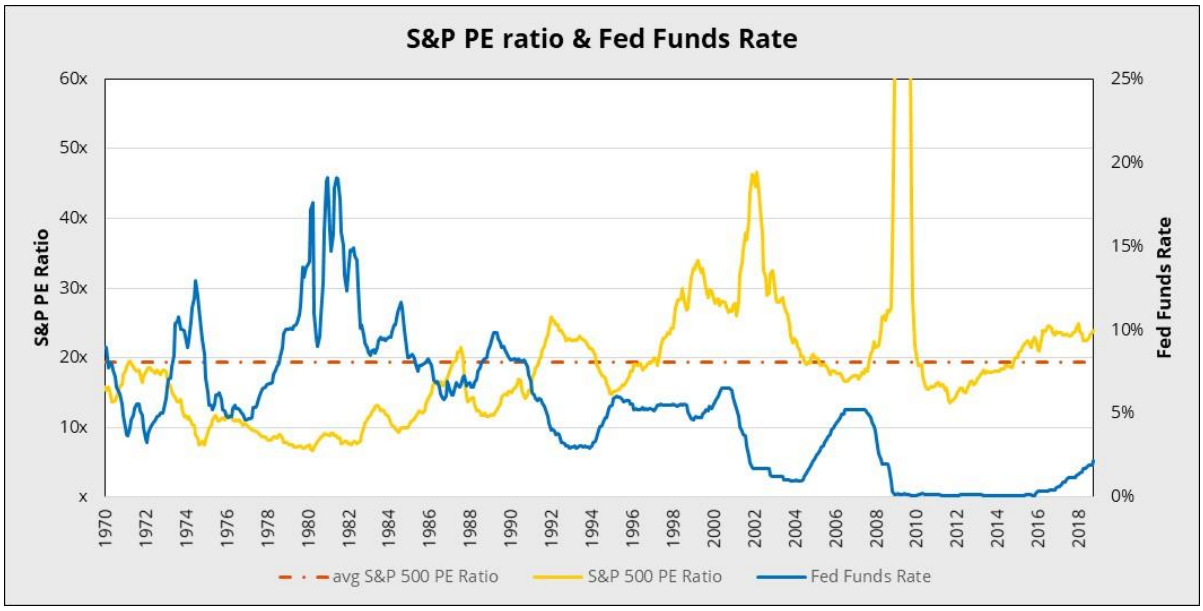
The S&P 500 P/E ratio as of October 1, 2018 was 23.9x, which is 22.6% higher than the historical average of 19.5x. At the same time, it was trading below the last 15 years average of 24.5x.

Interest Rates Compared to P/E Ratio

From our prior paper[2] discussing S&P 500 returns, we know that the P/E ratio is theoretically a function of the long-term growth rate in earnings and the required rate of return. From January 1970 to October 2018, the Federal Funds Rate averaged 5.23%. At the same time, the S&P P/E ratio averaged 19.5x. From 1973 until the end of 1991, interest rates were almost always above the historical average. Most notably, in 1980 and 1981, the Federal Funds Rate rose to 20.00% on four occasions over the two-year period, the highest interest rate in United States history. However, the Federal Funds Rate has averaged 3.50% since 1986 and for the last 25 years, interest rates have remained below the historical average, plummeting to 0.15% in 2009. For the following seven years, the

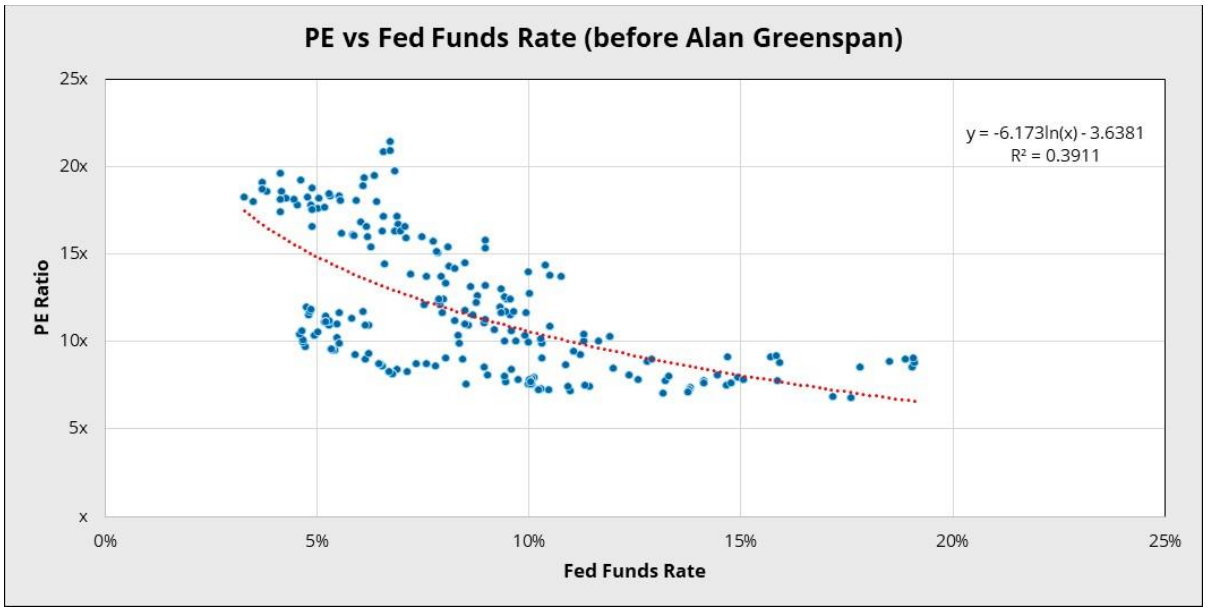
[2] https://www.valuescopeinc.com/resources/white-papers/the-sp-500-pe-ratio-a-historical-perspective/

interest rate remained low and only began to increase in December of 2015 when the Federal Reserve determined that economic growth had stabilized. Due to low interest rates since the great recession, the Federal Funds Rate has averaged 1.34% in the last 15 years. It can be seen that the average interest rates have been falling for a long time and had only recently picked up. With some recent increases, as of October 2018, the Federal Funds Rate was 2.20%.



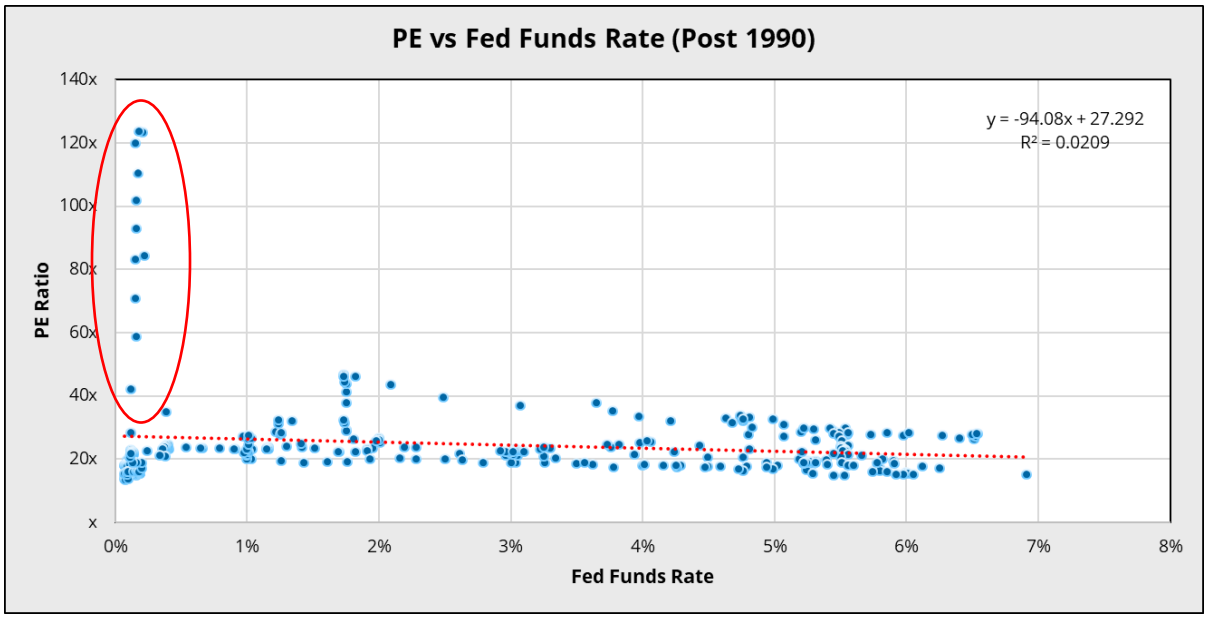
It can be observed that the relationship between the P/E ratio and Federal Funds Rate changed during this long period. It appears that the change happened somewhere near 1990. Before August 1987, the P/E ratio and Federal Funds Rate displayed the following logarithmic relationship:

P/E ratio = -6.173 ln (Fed Fund Rate) – 3.6381

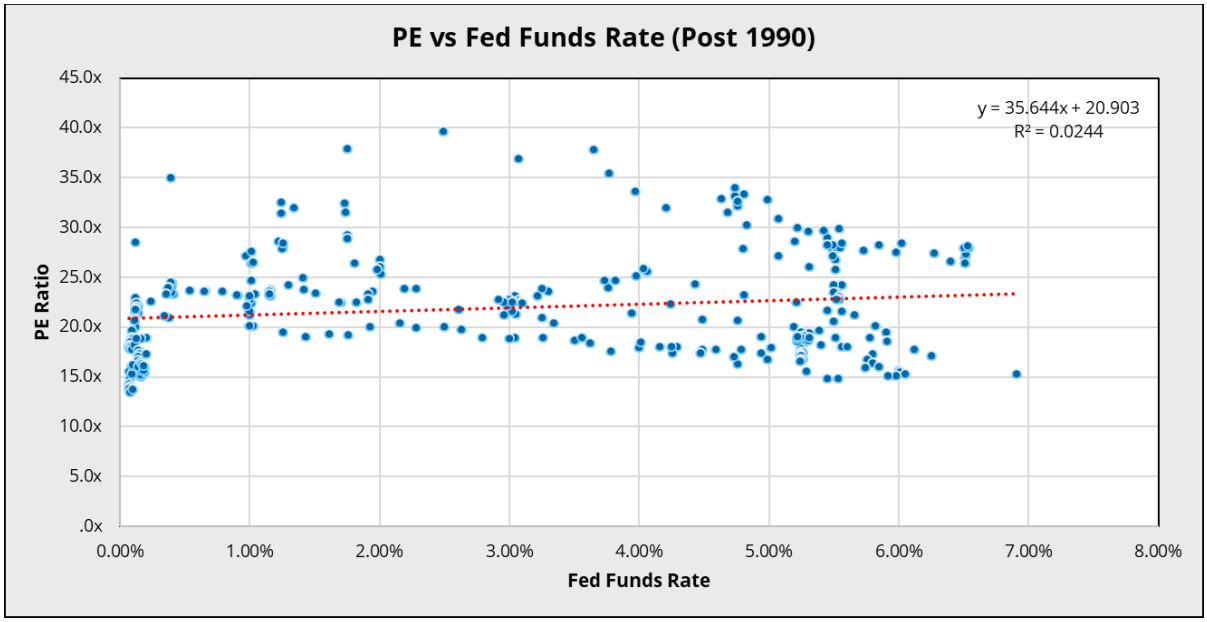


Alan Greenspan took over as Fed Chairman in August 1987. He supported an easy money policy and started reducing interest rates soon after. With a change in the Fed's policy, the relationship between the P/E ratio and interest rates changed to a very weak linear relationship.

P/E ratio = 27.292 – 94.08 (Fed Funds Rate)



The outliers circled above occurred during recessionary periods. After removing the outliers, the relationship between the P/E Ratio and Federal Funds Rate remains weak, as shown in the chart below.



Conclusion

Analysts estimate an 80.7% chance of at least one more increase in the Federal Funds Rate[3] before the end of the year. While the prior relationship and financial theory would predict that increasing the Federal Funds Rate would lead to a decline in the P/E ratio through an increase in the required rate of return, our analysis shows that this relationship no longer holds. In future papers, we will investigate the determinants of the S&P 500 required rate of return by examining the implied equity cost of capital.

[3] CME Group, FedWatch Tool, November 8, 2018

Marty Hanan is the founder and President of ValueScope, Inc., a valuation and financial advisory firm that specializes in valuing assets and businesses and in helping business owners in business transactions and estate planning. Mr. Hanan is a Chartered Financial Analyst and has a B.S. Electrical Engineering from the University of Illinois and an MBA from Loyola University of Chicago.

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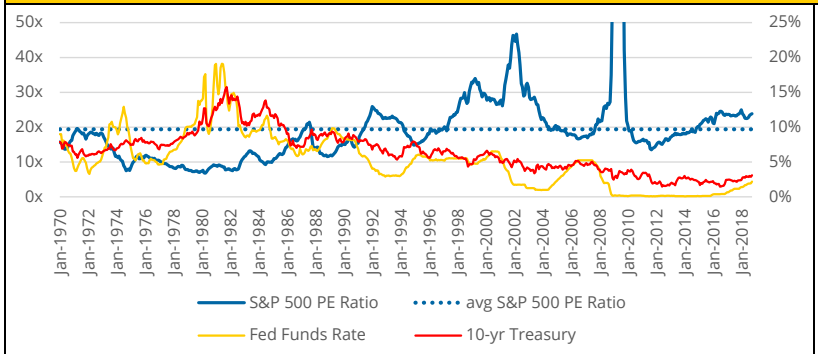
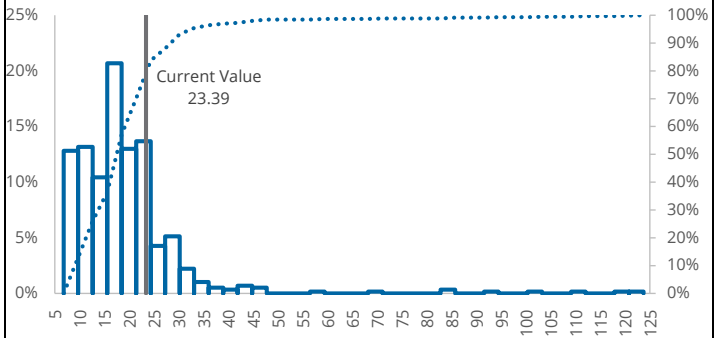
APPENDICES

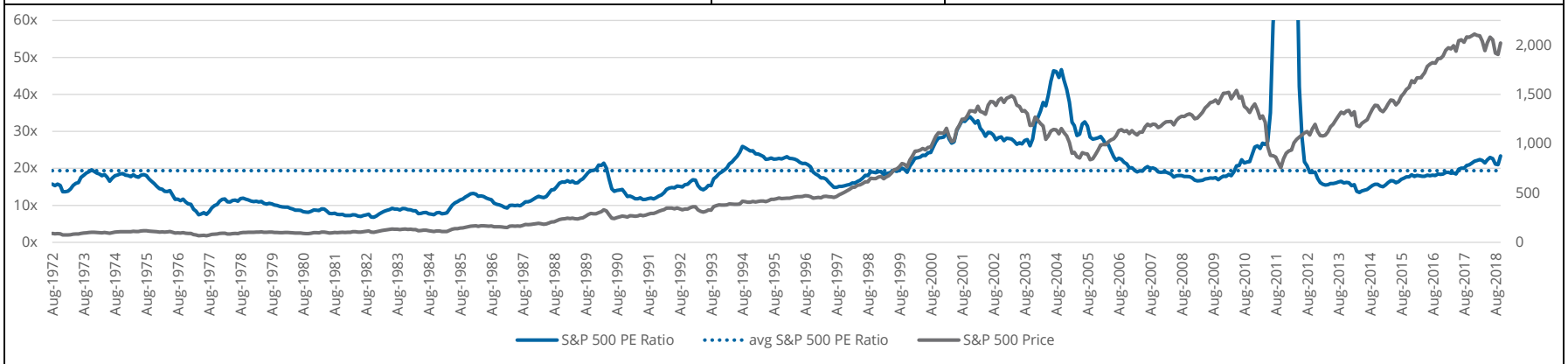
Appendix A

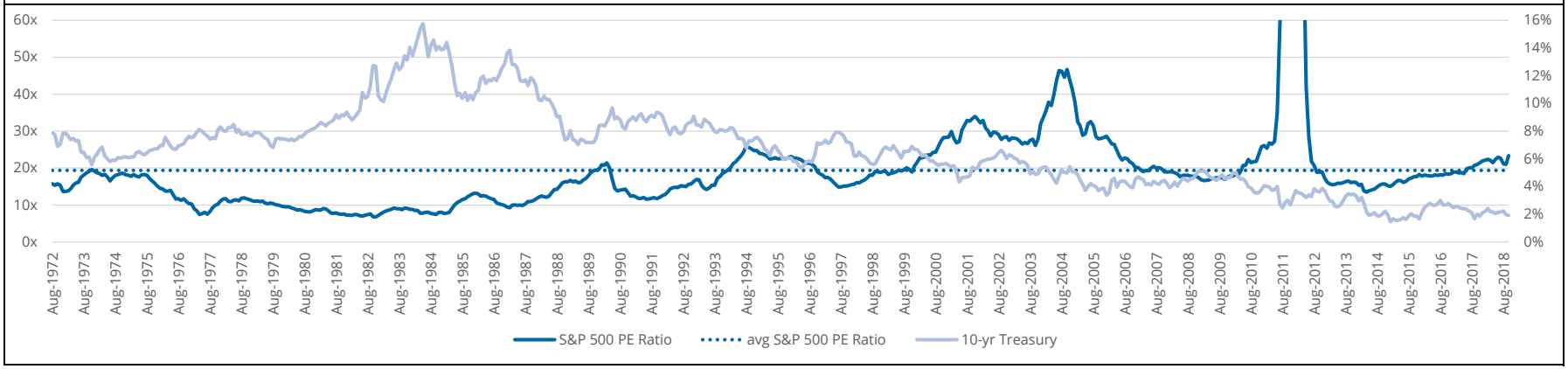
S&P 500 PE Ratio; 1970 to Present



Current PE	**23.88**
Percentile	*82.3%*
Min	6.8x
5%	7.9x
25%	12.4x
Median	17.8x
Mean	19.4x
75%	22.6x
95%	32.8x
Max	123.7x

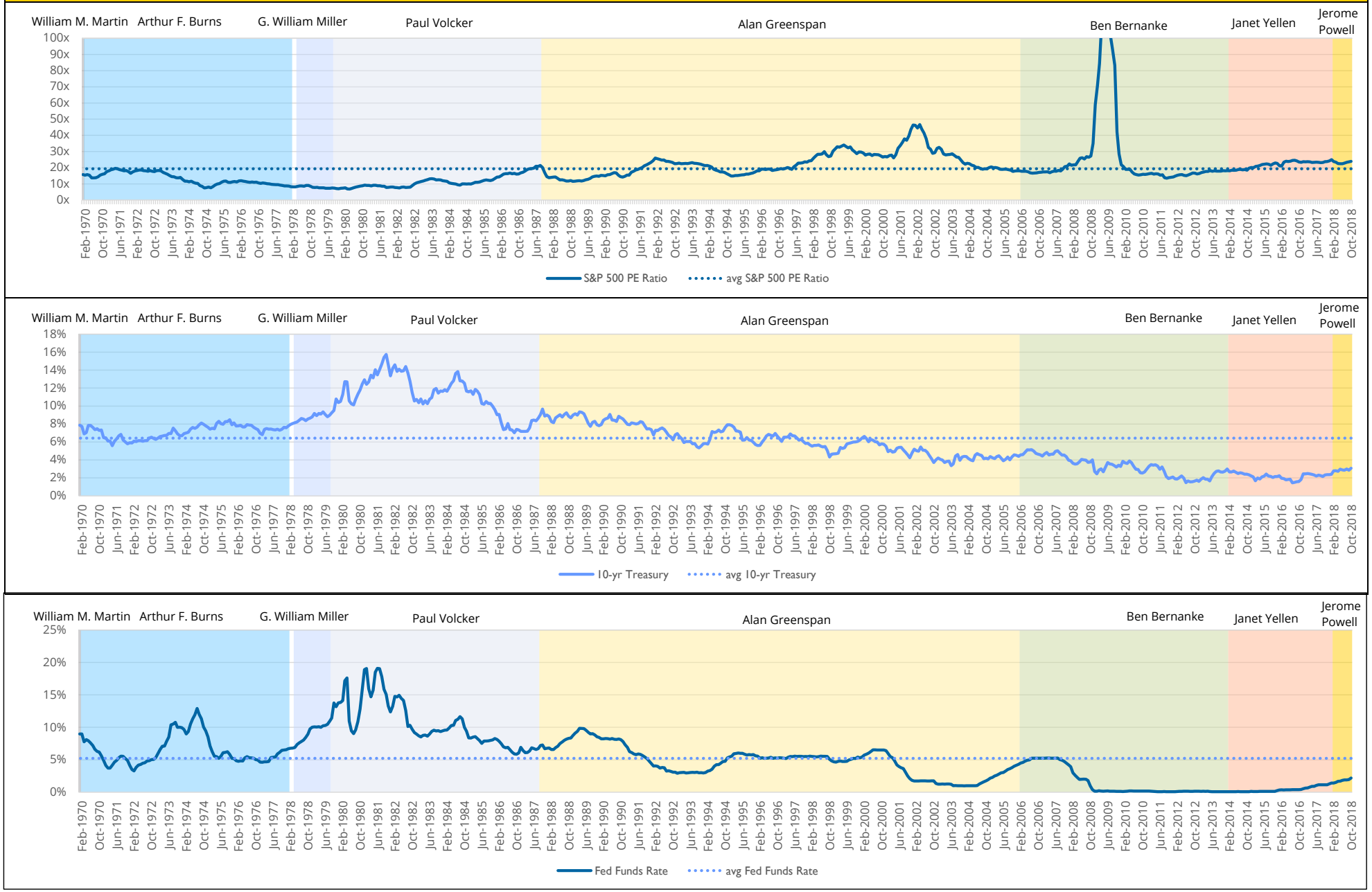






Appendix B

S&P 500 PE Ratio, Fed Funds Rate and 10-yr Treasury; 1970 to Present



Appendix C

S&P 500 PE Ratio, Fed Funds Rate and 10-yr Treasury; 1970 to Present