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A Welcome Note from the Editor-In-Chief:

Nowadays, the complexity of the markets has presented a broad research field not only for the field of economics, but also finance, leaving several challenges for research. Therefore, our magazine offers an opening for the publishing of works which are in the border of theoretical advances and recent research practices.

The evolving field of finance has fascinated many and also baffled many, including finance experts, government and regulators, especially after the sour tsunami kind of effect experienced in the last couple of years. It is natural that these phenomena would have offered vast opportunity to researchers for studying theoretical or application issues of policies, practices, regulations and their effectiveness, needs for new regulations, governance of the firms and many more. We, therefore, encourage researchers to capture the global nature of business enterprise through their creative conceptual and theoretical discoveries. We, welcome papers from all sectors: conceptual papers, application papers, meta-analysis, survey based papers or contemporary research topics, encompassing international flavor in the field of finance and economics.

Articles with well-articulated theoretical development and empirical works in our field, as long as consistent and relevant for the development of the field, are welcome for publishing in the JIFE, which always seek to contribute to the advance of research in Economics and Finance.

In recognition for the need to offer increased high quality publishing opportunities in international finance and economics, we at the Academy of International Business and Economics (AIBE) publish the ***Journal of International Finance and Economics*** (JIFE). The JIFE, a quality refereed journal, has the ISSN number **(ISSN: 1555-6336)** and the Call Number **(HG3879.J6772)** issued by the Library of Congress, Washington. JIFE is a registered trademark of the IABE.

All work submitted to JIFE goes through a rigorous double blind review process of experts. Several such scholars offered their time and expertise to produce each issue of JIFE. To these colleagues we are indebted for their time, diligence and useful comments. Also, without the tireless work of our board members, who devote time for the cause of academics and research, a publication of this scale and scope would not be possible. We applaud our all of our colleagues' dedication and diligence. Similarly, we are equally indebted to all the authors who underwent a rigorous review process to have their work published in the JIFE Volume 16, Number 2.

Thank you for your continued readership and for considering JIFE as a quality outlet for your research findings.

Best Wishes,

Dr. James Estes

Editor-In-Chief

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VISUALIZATION OF EQUITY RETURN VARIABILITY AND THE FUNDS RATE

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ABSTRACT

Global capital markets link real economies around the globe. The Federal Reserve has expanded the role of monetary policy in attempting to influence the real economy through various monetary transmission mechanisms. Data visualization is used to illustrate the role of the funds rate in influencing economic activity and equity returns. In addition to employing the funds rate to portray important return shock dynamics and volatility stylizations, the paper includes political party affiliation, inflation-adjusted median home prices, and consumer sentiment to explore monetary policy interactions in a visual context. A return shock is identified relative to a funds rate adjustment in the current period in conjunction with a change in the index level only when the present adjustment is followed in the next period by a funds rate movement of the same sign.

Keywords: Data visualization, S&P 500, Creeper Vine, Funds Rate, Transmission, Returns, Volatility

1. INTRODUCTION

Financial market integration, characterized by rapid growth of financial innovation, is a key component of the global economy. Central banks, including the Federal Reserve, have attempted to influence their real economies through monetary policy well after the financial crises of 2008-09 ended.

The monetary transmission mechanism connects policy instruments and aggregate demand via different channels which include the credit, wealth, interest-rate, and exchange-rate mechanisms. The first two channels incorporate interest-rate linkages to asset prices that are expected to influence the real economy. The life-cycle model of Ando and Modigliani (1963) predicts a change in aggregate consumption resulting from long-term asset price changes that are expected to vary inversely with central bank interest rate adjustments. Alternatively, Bernanke and Gertler (1989) suggest a linkage exists between interest-elastic asset prices and macroeconomic aggregates tied to asset values that underlie collateralized debt instruments.

The expected importance of asset prices in the monetary transmission mechanism illustrates the significance of the interaction between asset price volatility and monetary policy. Bernanke and Kuttner (2004) find a robust equity market response to unexpected changes in the federal funds rate. In this paper, we focus on visualizing the S&P 500 index returns and the related volatility following adjustments in the effective federal funds rate (hereafter, EFFF or funds rate).

Quarterly data from 1971Q1 to 2015Q2, approximating 1600 data points, are utilized for this paper to visualize the variability of equity returns in response to changes in the funds rate. Time period for the nine data sets used in this paper is referred to as the sample period. The data incorporated into the different visualizations include: funds rate, S&P 500 Index, IBM stock prices, U.S. 30-yr average fixed mortgage interest rate, U.S. median home price index adjusted for inflation, U.S. President party affiliation, U.S. real GDP growth rate, Index of Consumer Sentiment, and U.S. recessions.

2. VISUALIZATION CONCEPTS

Visualization entails a creative process of organizing, summarizing, and presenting a combination of data elements such as statistics, images, icons, or charts to underscore patterns and associations in

the underlying data. Data visualization advances the foundation for successful data interpretation and analysis by allowing one to draw insights from integrated visual representations. The need to incorporate and summarize large heterogeneous econometric time-series data using visualizations will become increasingly important in the future since the volume of economic data is expanding rapidly.

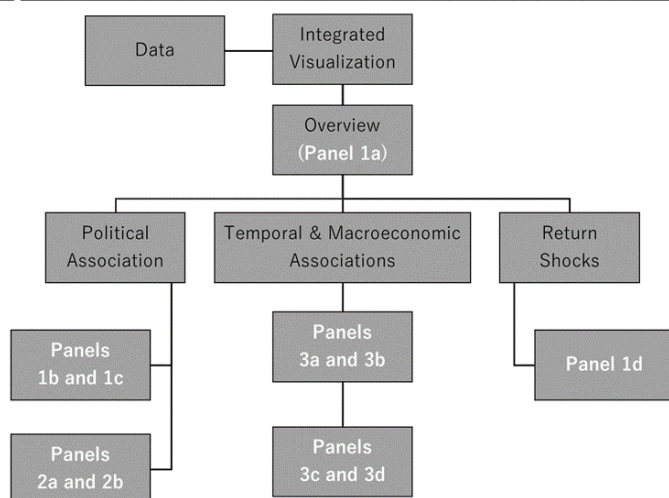
Einav and Levin (2014) note that large data aggregation and predictive modeling techniques incorporate economic theory in the operation of sophisticated auction market mechanisms. Data visualization has only recently begun to enter mainstream economics literature (Schwabish, 2014). Data visualization commands a strong rationale for inclusion in the economist's toolkit because of its potential to summarize and illustrate information contained in granular and complex data sets.

The primary objective of our paper is to offer a fresh perspective on empirical data in the form of integrated visual representations to enable inference of the interrelationships, if any, among the designated data sets. An accompanying goal is to help provide insights into macro-financial interactions and, perhaps, stimulate research to complement traditional economic models.

3. VISUALIZATION DESCRIPTION AND EXPLORATORY FINDINGS

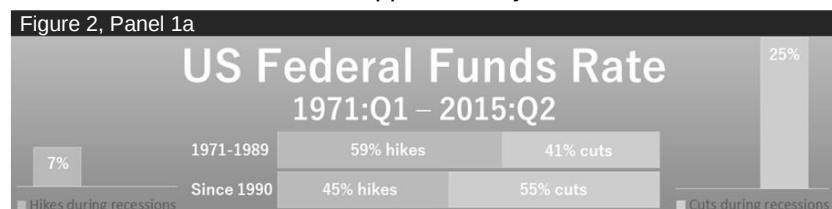
Figure 1 presents a meta visualization or schema that summarizes the integrated visualization discussed in the following sections of the paper. The underlying data are represented in a visual context through a series of visual elements (Figure 2 panels).

Figure 1: Visualization Schema



3.1 Panel 1a

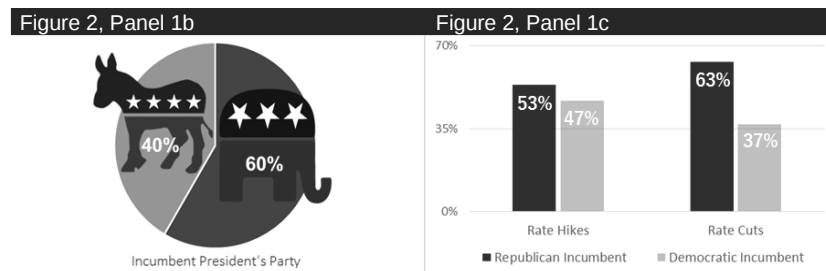
Between 1971 and 1989, approximately 59% of all funds rate



changes were increases. In comparison, since 1990 less than half of all adjustments in the funds rate have been hikes. Seven percent of all increases, as opposed to 25% of all cuts, over the sample period, occurred during a U.S. economic recession. More rate reductions than increases during downturns would be the expected behavior of central bank members. Seven percent of all funds rate increases during recessions was not expected.

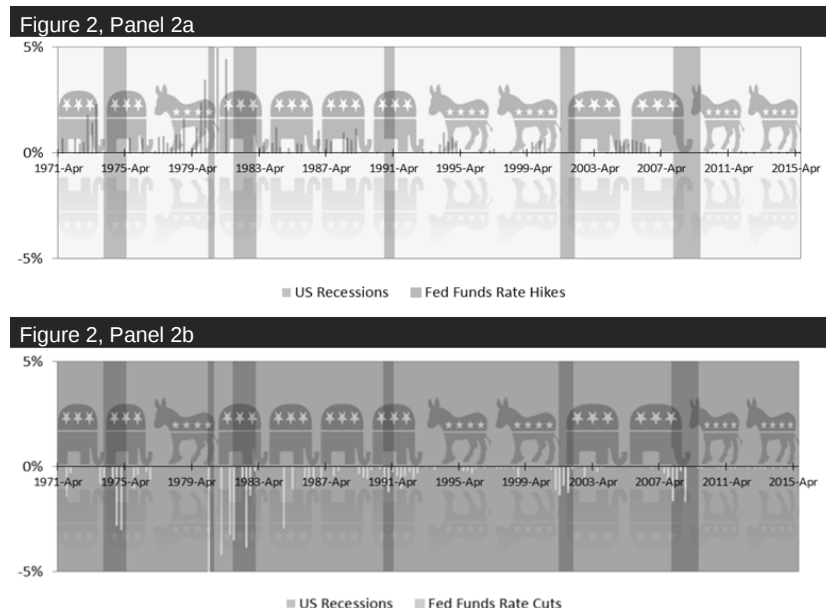
3.2 Panels 1b and 1c

A Republican president occupied the White House 60% of the time as opposed to 40% for a Democratic president during this paper's time frame. On average, approximately 5 out of 8 cuts in the funds rate have occurred during the term of a Republican president. The point that roughly 60% of the funds rate increases and decreases occur during the term of a Republican president coincides with Republican presidents being in office 60% of the time. This suggests, as expected, that the implementation of monetary policy is not meaningfully altered by the political occupant of the White House.



3.3 Panels 2a and 2b

Funds rate increases occurred more often in the first 40 quarters of the sample while decreases were more frequent in the last 40 quarters. The average magnitude of the funds rate changes in terms of both hikes and cuts was greater during the first decade of the sample period. The 10-year span beginning in 1971 coincided with the new exchange rate regime in the U.S., the 1973 and 1979 oil crises, and increasing expectations of inflation.



Panel 2b confirms that rate cuts were more pronounced during recessions (represented by vertical bars), which supports the corresponding percentage shown in Panel 1a. Quantitative easing began in

the U.S. in 2008, but at the time this paper was written the upturn in inflation that many had expected from the large increases in the quantity of money had not occurred. There were no more rate reductions than rate increases over the last 16 quarters of the sample period.

3.4 Panels 3a and 3b

The longest uninterrupted span of funds rate hikes in the sample period between 1976Q4 and 1979Q4 was primarily under Democratic leadership, and is indicated by the lighter shade of the small rectangle at the end of the panel bar. This encompassed the 1979 oil crisis and the genesis of the early 1980 U.S. recession. The annual return volatility of IBM, an important indicator of U.S. equities at that time, was 13.3% during the 1976-1979 rate hike period. The corresponding variation in the return on the S&P 500 index was 9.6%. These volatility estimates are smaller compared to IBM (the S&P 500) annual volatility of approximately 34% (25%) during 1987 and 33% (19%) during 2008. There were approximately the same number of positive and negative returns for both IBM and the S&P 500 index over the 1976-1979 rate hike period.

Figure 2, Panel 3a: EFR Chg. 0.01%

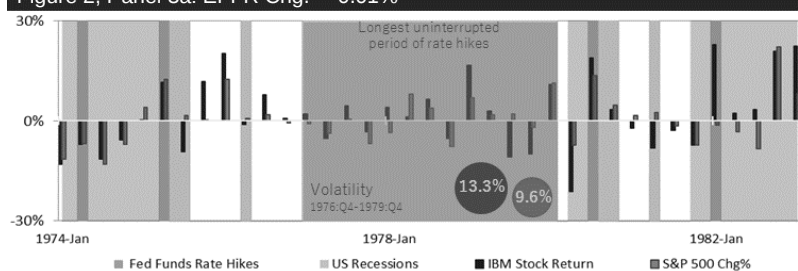
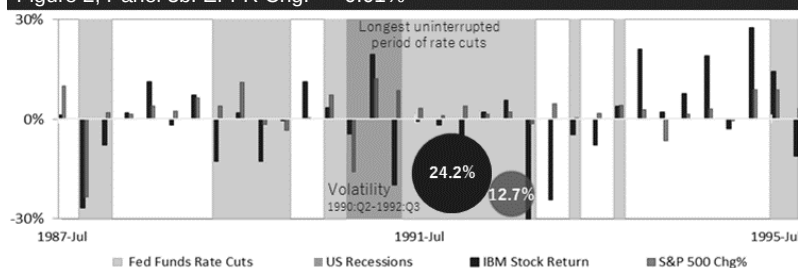


Figure 2, Panel 3b: EFR Chg. -0.01%



The longest uninterrupted rate reduction period, 1990Q2 to 1992Q3, had higher annual volatilities of approximately 24% and 13% for IBM and the S&P 500 index, respectively, as shown by different-sized bubbles. This period which spanned the 1990-91 U.S. recession had a greater proportion of positive S&P 500 quarterly returns. In comparison, IBM had a relatively higher share of negative returns over the same period. This may have been an early indicator of the business challenges that IBM would face in the coming decades.

3.5 Panels 3c and 3d

Consumer sentiment variability in the two longest periods of uninterrupted funds rate adjustments is

Figure 2, Panel 3c: EFR Chg. 0.01%

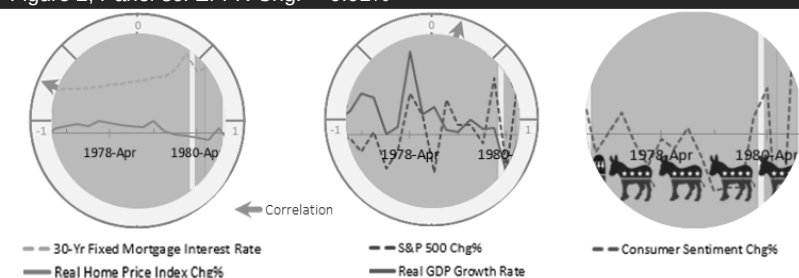
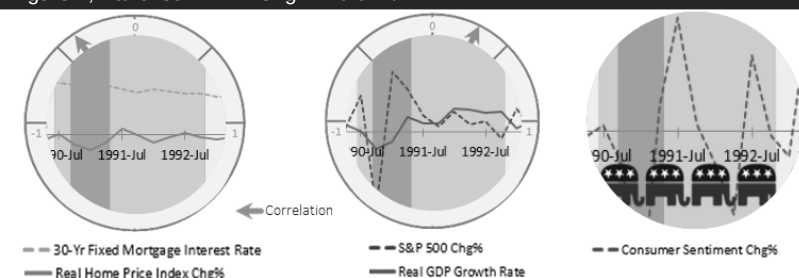


Figure 2, Panel 3d: EFR Chg. -0.01%



greater during the funds rate cut period. The correlation meter, depicted by the dial with an indicator arrow, shows marginally different positive correlation coefficients between the S&P 500 index returns and the real GDP growth rate for the rate increase and decrease periods. However, for a lower correlation coefficient during the rate increase period, the two variables exhibit greater covariance per unit dispersion in the corresponding S&P 500 returns. The relatively stronger positive correlation between S&P 500 index returns and real GDP growth

rate during the rate reduction period was expected as monetary easing in the short term increases real output which should result in higher equity returns.

The correlation between the 30-year fixed mortgage rate and the percentage change in the real home price index is more evident during the rate increase period than the rate decrease period. The higher (lower) mortgage rates appear highly correlated, on average, with lower (higher) percentage changes in the real home price index. Funds rate increases result in a stronger negative association between mortgage interest rates and real home price changes during the rate increase period. This is expected since higher mortgage rates, over time, are expected to make residential investment less attractive, thereby easing demand pressure and curtailing the growth rate of housing prices.

3.6 Panel 1d

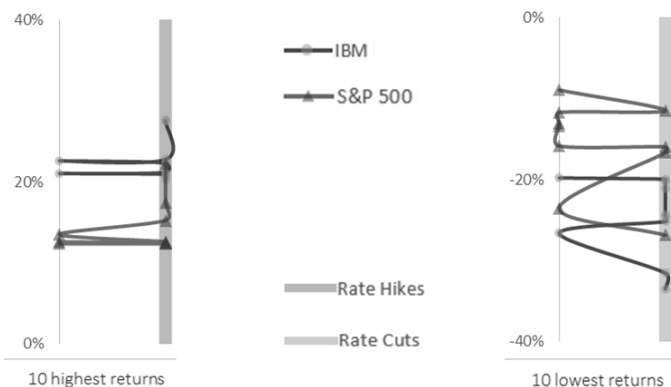
The visualization identifies a negative (positive) return shock relative to a funds rate adjustment when two conditions are jointly fulfilled: (i) a rate cut (hike) in the current quarter is associated with a contemporaneous fall (rise) in the related price or index level, and (ii) the present rate cut (hike) is followed by downward (upward) funds rate adjustment in the next quarter.

Unexpected changes in equity returns are shown in this panel using an algorithmically-derived graphic that resembles a "creeper" vine. The more bunched-up are the returns along the axis of support, in conjunction with fewer loops around the thicker "stem" axis, the greater is the number of return shocks. The bottom 5% of S&P 500 returns tend to be associated with a greater share of return surprises as compared to the top 5% of returns. Thus, a greater percentage of the ten lowest S&P 500 returns was linked to unexpected equity return fluctuations in response to funds rate changes.

The ten lowest returns for IBM, in comparison, were less likely to coincide with a return shock as with an expected movement in returns. IBM stock return volatility appears to be affected by the source of the variation across the negative returns spectrum. The greater share of negative return surprises for the broad equity market index may reflect the aggregation of unexpected variations in negative returns across the constituent stocks. This produces a pattern of volatility clustering or persistence as reflected in the S&P 500 return shock creeper for the ten lowest equity returns.

For positive return surprises at the top of the respective returns spectra, the IBM and the S&P 500

Figure 2, Panel 1d



return creepers are confined along the individual stem axes. The implication for the respective positive returns spectra of IBM and the S&P 500 index is that expected variations in returns are more likely to be consistent with the top five percentile of the return realizations across the sample period. In summary, while the lowest of the lows and the highest of the highs for IBM appear to be

influenced less by unexpected return variability associated with funds rate adjustments, the most significant stock market crashes may be related to return surprises induced by funds rate reductions.

4. SUMMARY

This paper employs integrated data visualization to illustrate the role of the federal funds rate in influencing equity returns and economic activity. Federal Reserve funds rate reductions, on average, appear to result in greater variability in broad stock market returns. In comparison, the volatility in real economic activity is generally unrelated to funds rate adjustments.

Fluctuations in consumer sentiment, which may be associated with potential equity return volatility, appear to be independent of both the direction of funds rate adjustments and the incumbent president's political party affiliation. However, changes in funds rate may have a stronger influence on future consumer outlook. Although a more detailed analysis shows that the 30-year fixed mortgage rate and the real home price index are weakly correlated over the sample period, our visualization shows significant inverse correlation during a period of sustained funds rate hikes.

Shock-induced return clustering appears to be less pronounced when broad equity market returns were significantly positive, implying that expected return variability is more likely to be consistent with the top five percentile of the S&P 500 index returns across the sample period. Conversely, return surprises in response to funds rate cuts may be associated with stock market meltdowns.

Equity investment managers, finance practitioners, and econometricians can apply the insights obtained from the integrated visualization incorporated in this paper to improve investment strategies, knowledge-transfer services, and econometric models. Data visualization is more likely to be effective when heterogeneous data elements are rendered in color.

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