Ushus-Journal of Business Management
2020, Vol. 19, No. 3, 79-88
ISSN 0975-3311 | https://doi: 10.12725/ujbm.52.5

Fat Tail Analysis on S&P 100 Stocks-before and after US President Election

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Abstract

The main aim of this paper is to determine whether the volatility in the stocks can be created by events like the US Election and whether it leads to Fat Tail in the stocks. Fat Tail analysis is a key factor in determining volatility and has been used in the economy as well as in many other fields like climate and health. Log return has been used to determine the Fat Tail. To make the work more reliable, two Presidential election periods, that of Barack Obama and Donald Trump is selected and is compared for volatility and Fat Tail. For this study, stocks from the S&P 100 are selected and observed. The results show that the US economy is not at all driven by who comes in power and when but rather by the present economic condition. Stocks showing heavy tails during the Obama presidency are primarily because the economy was under Sub Prime Crisis too.

Keywords: Fat-Tail, Volatility, S&P 100, Gaussian Distribution, US Election, Barack Obama, Donald Trump

1. Introduction

The United States plays a major role in the world. From the Tech Bubble Bust to highly inflated housing prices before the Global Financial crisis, it has changed the volatility rate in stock price. Investors' perceptions, both institutional and retail are driven by a

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lot of factors. Many stock prices went too high and fell in a day or two to its lowest in years creating unusual Fat Tails.

A Fat Tail is a property of probability distributions that exhibit extremely large kurtosis, especially with the ubiquitous normal distribution that is an example of a thin tail distribution itself. In academic terms, leptokurtosis is called the condition of distribution of probability that exhibits Fat Tail(s). A Fat-Tail risk in financial markets refers to significant market swings that cannot be forecasted based on the normal distribution of the probability of return alone (Cook Pine Capital LLC, 2008). The effective calculation of volatility requires not only the mean and variance analysis but also sufficient detection of the conditional distribution, Fat Tails, and price spikes. The study of the fat tail can also provide many facts about the data set. It can specify the type of distribution the data has (kurtosis) and whether the data has long-tail or heavy tail.

Long Tail: A long-tail distribution has tails that gradually taper off rather than sharply drop off. In simple terms, if the data points for most of the observations are distributed far from the mean point, such type of distribution is said to have a long tail distribution. They are a subset of heavy-tailed distributions. Visualising the idea of a long-tailed function is easy while making it concrete is slightly harder (Whitt & Feldman, 1998).

Heavy Tail: This type of distribution has a tail that is thicker than linear distribution (Bryson, 1974). In other words, a thin tailed distribution goes to zero, slower than one with weak tails. Under the curve of the probability distribution function, there will be more mass. There are many outliers with very high values of heavy-tailed distributions. The longer the tail, the greater the likelihood that a sample would contain one or more excessive values.

Fat Tails are also very significant when it comes to specific events prevailing in the economy. The unpredictable event can create a heavy weighted fat tail and a stable Gaussian distribution can be seen when the market is in favour of the event that is happening in the economy.

One such unpredictable event is the US President Election. It is usually a highly anticipated time for most companies and investors as a new government can bring up new reforms which in turn make their investments sling. During 2008, Barack Hussein Obama II ran for US President. He graduated from Harvard Law School, where he was Harvard Law Review's first African American representative and then returned to help the community in Chicago, Illinois. The closure of local steel plants hurt some of the communities, so Barack helped them rebuild their buildings and other structures (Washington et al., 2017). He worked as a civil rights lawyer in Chicago after assisting the communities in Chicago. He later taught at the Law School at the University of Chicago, helping students acquire more expertise. He ran for the House of Representatives of the United States in 2000 but lost. He was always against going to war in Iraq and at a protest in October 2002, he spoke against it. He ran and won for the U.S. Senate in 2004. He became even more popular when he spoke on behalf of John Kerry at the 2004 Democratic National Convention. Barack stood against John McCain for president in 2008 (Elkatawneh, 2016).

He won 28 out of 50 states, receiving more than 66 million votes to 58 million from John McCain. On Tuesday, November 4, 2008, the first African American President was elected. The time was very critical as economies across the globe were hit by the housing crisis and companies stock went south. But Obama made many reforms to make sure that things get back on track. (Ramadhani, 2014) During Obama's precedence, the stability in the market was unpredictable and that is under study in this paper.

Donald John Trump portrayed a completely different picture from what the former did. Trump was a real estate developer and businessman who operated, controlled, or leased his name to several world hotels, casinos, golf courses, resorts, and residential properties. Trump has also given his name to dozens of retail companies since the 1980's- including licensed brands of clothes, cologne, food, and furniture- and Trump University, which conducted real-estate preparation seminars from 2005 to 2010 (Immelman & Ph, 2019). His private conglomerate, the Trump Organisation, comprised some 500 businesses in the early 21st

century, including hotels and resorts, residential properties, merchandise, and entertainment and television.

Trump announced in June 2015 that he would be a candidate for the 2016 U.S. Presidential Election (Lynch, 2017). Pledging to "make America great again," Trump vowed to generate millions of new workers; sanction American companies who shipped jobs overseas; dismantle Obama's biggest policy victory, the ACA and many more (Wickett, 2017).

2. Literature Review

Distribution is an accurate instrument characterising the excellent danger and chance inherent in fat-tailed information. Crashes or booms on the equity market are extreme realisations of the fundamental distribution of returns. EVT (Extreme Value Theory) frames the issue of extreme occurrences elegantly in the context of restricting sample maxima and minima distributions. (Lebaron & Samanta, 2004) Significant uncertainty about the value of the tail-index is often unavoidable when insurance claims are governed by fat-tailed distributions. Applied to claims resulting from general distributions of Pareto, the resulting premium is shown to be the proportion of the two biggest anticipated claims, for which the proportion of the real claims is both an unbiased and consistent estimator (Calculation & Risk, 2005). Recent empirical results indicate that macro-economic factors are rarely distributable. For instance, with Laplace Fat Tails, the distributions of aggregate production growth-rate time series in many OECD countries are well approximated by symmetric exponential-power (EP) densities. In this work, we evaluate whether the Real Business Cycle (RBC) and standard New Keynesian (NK) medium-scale models are capable of replicating this statistic regularity. We simulate both models drawing shocks distributed between Gaussian and Laplace and investigate the statistical characteristics of simulated time series. The findings cast doubts on whether the model's RBC and NK can provide a satisfactory representation (Ascari, Fagiolo, & Roventini, 2012).

In many modelling methods, normal distributions are frequently used to define reality, but in many instances, truth follows a fat-

tailed distribution that is not ordinary. This critical hypothesis leads to possibly incorrect models, particularly when modelling extreme occurrences such as danger or shifts in the financial market. (Beleidy, 2014) Recent events in the economic and insurance industries and the looming difficulties of a changing global climate point to the need to rethink how we measure and handle disastrous and dependent hazards. Management can be just as useful as our measuring instruments (Crime & America, 2005).

The latest financial crisis has underscored the significance of modelling and handling extreme risk, particularly savings on pension. However, virtually all conventional models of ideal stock-bond distribution suppose that the risk is normally distributed (bell-shaped). Inventory market risk exhibits "Fat Tails". Allowing for "Fat Tails" can add significant computational complexity to the already quite complicated conventional optimisation structure. It is widely known that financial asset returns distributions show fatter tails compared to normal distribution. It means that when VaR is calculated with the expectation of naturally distributed returns, the downside probability of a portfolio comprising fat-tailed assets as assessed by value-at-risk is underestimated. This implies that incorrect calculations of the VaR will be given through parametric conversion for divergent condense rates as adhered to by the Basle Committee regulatory framework. It is no surprise that it was appropriate to ‘ad hoc-ly' multiply the VaR by 3 to provide the Basle capital requirements with a bigger, more representative number (Huisman, Pownall, & Koedijk, 1998). In the case of ReHFT, financial Reynolds figures were significantly higher, culminating in a more reliable positive tail exponent or α. The detection points for standard Re were significantly lower relative to ReHFT. It implies a significant difference in the exponent to tailor the magnitude of α. This novel insight parallels research on Indian indexes in the past (Pan & Sinha, 2008). Nonetheless, this study focussed on the log-returns produced from index observations, and compared to the current research it would be distinctly different.

The complementary study on Financial Reynolds number, a proxy for stock market volatility, has been found to follow the same pattern as well (asymptotic decay) (Ghosh & Krishna, 2019). Similar studies also reflect undue bubble and unexplained random

volatility either led by herd or by some unknown parameter sputtering unnecessary volatility finally leading to a crash point (Ghosh, B., & Kozarević, 2019; Ghosh, B., Krishna, Rao, Kozarević, & Pandey, 2018; B. Ghosh, 2017).

The emerging capital market is highly volatile and hard to predict. Financial investors' behaviour is significantly influenced by the instability in emerging capital markets of trading mechanisms. Despite being an increasingly attractive financial environment, developing markets are exposed to diversified risks and structural deficiencies. Consequently, for optimal portfolio selection and risk management strategies, financial econometric analysis and its degree of accuracy have a major significance. Therefore, when measuring the importance of the fat-tailed distribution concept, certain aspects should be considered to ensure that the consequences are significant- risk management, portfolio selection of financial assets, valuation of derivatives, and financial hedging respectively. In other terms, mispricing and unsatisfactory hedging require an inadequate layout of the underlying asset. On the other hand, to predict rare events, the latest global financial crisis exposed the serious need to model and handle extreme risk. (Birău, 2013)

3. Data Set

The data set in this paper is for S&P 100 stocks and is from two different timelines, i.e. one when Obama was elected as the President and another when Trump was elected as the President. The exact timestamp for the data set is from 02nd September 2008 to 30th January 2009 for Obama Presidency and from 1st September 2016 to 30th January 2017 for Trump.

4. Methodology and Interpretation

The analysis of the fat tail in this paper is done in a simple way using an excel sheet by calculating the return for the period on all S&P 100 stocks and converting those returns to a percentage. Thereafter, the data is sorted out in decreasing order. The bracket for the normal tail is between +5% and -5%; beyond that, all the data set are considered as a part of the tail. The positive tail for the

data set consists of return value more than +5% and is counted as Right/Positive Tail. Similarly, the negative tail is obtained by data points having to return more than -5% and are counted as Left/Negative Tail. The Total Tail weight is calculated by the sum of both positive and negative tail and the ratio of this with respect to the total observations for a particular stock gives the percentage tail weight.

This process is repeated for all the S&P 100 stocks for both the time stamp, i.e. election for both Presidents.

Company Name	Company Code	Tail % During Obama President Election Period	Tail % During Trump President Election Period
Bank Of America	BAC	57	2
3m Company	MMM	8	0
Abbott Laboratories	ABT	4	0
Accenture	ACN	15	1
American International Group	AIG	57	0
Allergan Plc	AGN	12	2
Altria Group	MO	9	0
Bank Of New York Mellon	BK	42	0
Berkshire Hathway B	BRK-B	15	0
Boeing Co	BA	22	0
Bristol-Myers Squibb Company	BMY	12	6
Caterpillar Inc	CAT	25	1
Citigroup Inc	C	59	0
Coca-Cola Company	KO	8	0
Colgate Palmolive	CL	10	1
Danaher Corporation	DHR	14	0
Duke Energy Corporation	DUK	12	0
Dupont Inc	DD	26	0
Eli Lilly And Company	LLY	18	3
Emerson Electric Company	EMR	24	0
Exelon Corporation	EXC	26	0
Exxon Mobil Corp	XOM	19	0
Fedex Corporation	FDX	22	1
Ford Motor Company	F	41	0
General Dynamics Corporation	GD	14	1
General Electric Company	GE	37	0
Goldman Sachs Group Inc	GS	42	1
Home Depot Inc	HD	21	0

Honeywell International Inc	HON	21	1
International Business Machines	IBM	13	0
Jhonson & Jhonson	JNJ	7	0
Jpmorgan Chase & Co	JPM	51	0
Lockheed Martin Corporation	LMT	14	2
Lowe's Companies Inc	LOW	28	1
Mastercard Inc	MA	34	0
Merck & Company Inc	MRK	18	1
Metlife Inc	MET	50	2
Morgan Stanley	MS	56	1
Nike Inc	NKE	18	0
Occidental Petroleum Corporation	OXY	37	2
Pepsico Inc	PEP	8	0
Pfizer Inc	PFE	13	1
Philip Morris International Inc	PM	15	0
Procter & Gamble Company	PG	9	0
Schlumberger Nv	SLB	38	1
Simon Property Group Inc	SPG	54	0
Southern Company	SO	7	0
Target Corporation	TGT	31	2
Union Pacific Corporation	UNP	30	1
United Parcel Services Inc	UPS	13	0
United Technologies Corporation	UTX	16	0
Unitedhealth Group Incorporated	UNH	31	0
Verizon Communications Inc	VZ	15	0
Visa Inc Class A	V	25	0
Walgreens Boots Alliance Inc	WBA	14	0
Walmart Inc	WMT	9	0
Walt Disney Company	DIS	23	0

5. Conclusion

Volatility in stocks is very common as each investor perceives differently thereby having different strategies. But these volatilities also have a limit and often they cross the limit depending on the situation prevailing in the market. Fat Tails in stocks can be directly linked to the magnitude of movement- more the movement, heavier or longer will be the tails. Considering the US Election as one such event in any country's economy, the stocks of S&P 100 are observed. Two different periods, i.e. Obama in power and Trump in power are taken both before and after. After analysing all the stocks for both periods it is evident that events like elections have very little gauge when it comes to developed countries. Most of the

stocks which are showing very heavy tail (like, AIG, CITI, GM, and so on) are all in the period when Obama was elected as the US President but it cannot be linked to that event as during the same timestamp Sub-Prime Crisis had already encompassed many companies and few countries. To make the work more reliable when the same process is applied to the other period, i.e., when Trump was elected as the President, very few stocks, show a heavy tail indicating the fact that events like presidency election does not have a short term effect on volatility and in turn does not create Fat Tails.

There might be a significant effect of the election of a new government in the stocks of developing countries and therefore can be taken up for further research.

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