When it rains, it pours: losses on football fields finding their ways into stock markets

Submitted to

American University of Armenia
Manoogian Simone College of Business and Economics

In partial fulfillment of the requirements for the degree of BA in Business

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Yerevan 2019

Abstract

Football has been a subject of interest to economists and other researches for decades. Most of this research treats football match outcomes as the dependent variables, trying to predict the said outcome. This paper takes those outcomes as independent variables. The aim is to understand whether or not the results of international football matches between national teams have an impact on the playing countries' stock markets. Prior research is inconclusive. While some point out volumes of trade and even returns are affected, others deem the markets efficient and irresponsive to football matches. This paper's main conclusion is that the French stock market index CAC-40 was affected by the performance of the France national football team, namely, on the trading days following the national team's loss the CAC-40 index trailed behind the FTSE AW01 all-world average stock index by -0.22% (percentage points).

Keywords: stock market, football, finance, investor sentiment

Acknowledgements

I would like to acknowledge that this work would not be possible without the people who helped me during the writing process. The list of those people includes first and foremost my supervisor: Dr. Vardan Baghdasaryan, who helped me with any kind of questions and identified how exactly I can make this research possible; Doctors Gayane Barseghyan, Aleksander Grigoryan and Knar Khachatryan, who, although were not my supervisors, also contributed a lot to the creation of this work; numerous friends, family members and peers, who, at one point or another helped we with a piece of advice or sometimes supported me morally.

All remaining errors are mine.

Table of Contents

List of tables

List of graphs and figures

Introduction

With the advancements in big data analysis, football matches are being scrutinized more and more using more sophisticated techniques which aim to predict the match outcomes. I am not so naïve to think I can predict those outcomes. After all, matches are played by humans, prone to errors, over-performance, and many other random swings that tip the scales in one or another direction. Besides, as they say, the house always wins, doesn't it? But what if those same match outcomes lead to changes in other places where one would not expect to see? I hope to find an impact on countries' stock markets caused by football matches. In order to achieve the goal, first a cross-sectional analysis of some of the most unexpected international results will be conducted, followed by time-series case-study on the current world champions: France.

Literature Review

Football is the most popular sport in the world. Almost half the world population watched at least one of the World Cup 2018 games in Russia. The popularity has led to a vast amount of research done on football, trying to predict match outcomes, tournament outcomes, but at the same time some research has been done taking football results as independent variables and trying to find their influence on other aspects of life. Since we know that people are emotional, that their decisions are not always rational (more on that later), but most of the time can be influenced by outside factors that should not interfere with the decision making process, the stock markets can be influenced by sporting events as well.

A good starting point to my research was the paper by Michael Ehrmann and David-Jan Jansen of the European Central Bank mainly considered the effect on trading volumes rather than

the direction and found that trading volumes can decrease by as much as 50% during important international games (Ehrmann & Jansen, 2012). The drop in volumes is explained by the fact that people who would otherwise be trading are more concerned with the on-field action. Furthermore, match events themselves contributed to temporary decreases in trading volumes. For example, an additional five percent of activity was lost in case a goal was scored. They also found a divergence in the movement of stocks, but that is a topic more intricately studied by Edmans, Garcia and Norli in 2007, Ashton et al. in 2003, Bankers in 2014 and Astika 2010. The ECB paper serves as proof of football matches being of great importance in the developments on the stock markets. Investors and traders, after all, are all human, hence have their preferences and emotions, which ultimately have an impact on their activities. Whether international football matches also have a say in the movement of the world's leading markets is what I want to find out.

The research by Edmans, Garcia and Norli is quite similar to what this paper was intended to be initially. This research based on outcomes of more than 1100 matches across different competitions studies whether sports sentiment plays a role in stock market fluctuations of countries whose national team played a game the day before. The data they use is on 39 countries (the quantity constraint mainly coming from the fact that not all countries have active stock exchanges, thus, while desirable, it would be impossible to track the activity fluctuations of all 211 FIFA member countries). Their findings are quite intuitive: they show that wins mostly do not contribute anything to the deviations while losing a game results in the countries' leading indices trailing behind the world (Edmans, Garcia, & Norli, 2007). This goes in line with the concept of loss aversion, which implies that losses and gains of an equivalent amount (or of the equivalent caliber like one's country winning or losing in a World Cup quarter-final) do not

result in an equivalent utility change. The pain from losing something is always higher than the pleasure from gaining an equivalent thing. As they went further into details they discovered cases of arbitrage opportunities arising due to sports sentiment driving investors instead of the fair value. Company stocks listed in two stock markets could deviate by significant margins on the days following an international loss. The difference between my methodology and that of Edmans, Garcia and Norli 2007 is that I want to concentrate my research on specific matches, the outcomes of which were rather unexpected, hence reinforcing the effect.

Pieter Bankers in (Bankers, 2014), Amy Astika in (Astika, 2010) John Ashton, B. Gerrard and Robert Hudson in (Ashton, Gerrard, & Hudson, 2003) have done certain case studies on three of the most passionate football countries: Brazil, Holland and England respectively. In all three cases the researchers track the country's leading stock index over a long period of time (10-20 years) and try to find whether the national team results have a significant impact on the day-to-day fluctuations. Interestingly, while Ashton, Gerrard and Hudson found that the movements of the FTSE (Britain's main stock index) were influenced by the national team's performances, Bankers found no significant impact of the Brazilian national team's performance on the Ibovespa stock index, the main stock index in Brazil, which was created in 2008 due to the merger of Brazil's two major stock exchanges. Astika's findings further reinforced Bankers' viewpoint that the stock markets are efficient and do not react to the event that should not impact the financial markets. It might be the case that there are differences across countries, however taking into account the fact that football is more of a cultural treasure rather than just a sport for Brazilians it is quite unexpected to see that only the English index is influenced by the on-pitch results of the national team. The English case has been reconsidered by Klein, Zwergel, Fock in (Klein, Zwergel, & Fock, 2009) challenging the model of Ashton et.

al. 2003, bringing different reasoning for the apparent impact of England's national teams performances on the FTSE index fluctuations, such as weekdays bias, etc. In the second part of my research I create a model quite similar to the ones in the aforementioned papers to examine the deviations in CAC-40 index of France.

The sheer existence of investor sentiment is also in question and the research on the topic was well presented in the opinion piece by Noah Smith in the Bloomberg Website (Smith, 2018).

The first mention in the opinion piece is the book by his colleague Justin Fox called "The Myth of the Rational Market: A History of Risk, Reward, and Delusion on Wall Street". In this book one may find a detailed description of how the markets should operate and how they actually do. The book comes to a simple conclusion that factors other than the fundamental values of assets drive prices up or down, and those factors are highly exposed to emotions and sentiment (Fox, 2011). The main conclusion from the opinion piece states: "In other words, even markets with some rational participants can behave irrationally. Speculation can move prices around for irrational reasons, and rational traders often either can't or won't bother to correct them. However, it's worth noting that the effect is less pronounced in 2012-2016 than in 2007-2011, suggesting the possibility that this particular market inefficiency may have been a temporary phenomenon." (Smith, 2018)

Overall, the research until now has demonstrated that investor sentiment does indeed play a role in stock market fluctuations. The extent to which sports sentiment plays a role is still an open question with varying sources and varying methods coming to varying conclusions. I hope my research may contribute to the existing ones in the idea that not all games should always have an impact, rather the ones that highly diverged from the expected results.

Theoretical Framework

At the initial stages of my research my aim was to find out the impact especially unexpected outcomes had caused in the stock markets of England, France, Italy, Spain, Portugal, Greece, Russia and other countries that actually have an actively functioning stock market. A sample of 40 observations was gathered that represented some of the most surprising events in football during the last 15 years. My research question was the following: Is there a significant short-term impact on a country's stock market whose football team has played significantly different from expectations?

Hence, the null hypothesis was that stock markets are not affected by unexpected football match outcomes, which if rejected, would indicate that the national team's results do affect the country's stock market.

The observations included three variables:

1. The playing country's stock market's leading index return for the day following the match played (if the match was played on a Friday, Saturday, or any other day that preceded a non-working day, the following Monday's or working day's return was considered);
2. The FTSE AW01 all-world average stock index return for the day following the match played (the same logic was applied to non-working days' issue as with country indices);
3. A dummy variable indicating the country's national team having played significantly different from expectations. The variable assumed the value of 1 if the country had an unexpectedly positive outcome (16 cases) and 0 if the said outcome was unexpectedly negative (24 cases).

Table 1: Summary of the variables of Model 1

Variable	Observations	Mean	St. Deviation	Minimum	Maximum
Country	40	0.0976	1.0899	-1.7146	2.6445
World	40	0.0710	0.8328	-1.7668	2.0428

Empirical Analysis

The initial model was quite simple and probably too simple. Taking the first variable as the dependent, and the other two as independent variables I obtained the first model that indicated that my variable of interest was not significant at any confidence interval (see Appendix Graph 1 and Figure 2). This meant that I had to change my approach and try out a different strategy. So the main research I have conducted concerns the reigning world champion France national football team (referred to as France or national team hereafter) and their performances over the last 15 years. France provides a very convenient data to examine, as the country has experienced both highs and lows during those years, reaching 3 major tournament finals and winning one of them, simultaneously heading out of two tournaments during the initial group stage.

The summary of the data of the daily returns for the French national stock index CAC-40 and the FTSE AW01 (referred to as CAC and AW respectively hereafter) is presented in the table below:

Table 2: Summary of CAC and AW index returns and their difference

Variable	Observations	Mean	St. Deviation	Minimum	Maximum
CAC-40	3576	0.0208	1.3569	-9.0368	11.1762
World	3576	0.0265	1.0102	-7.0231	9.2886
Difference	3576	-0.0057	0.7537	-5.2815	5.5641

A comparative graph analysis of the returns of the two indices can be found in the Appendix (Graph 2). AW has outperformed CAC during the period from August 2004 to July 2018 by an average of 0.0057% per day. This has led to the CAC recording total growth of 50% during the given timespan, while AW has grown more than twice.

Since I am most interested in the response of CAC to the outcomes of the national team's performances, but France is not alone in this world I have generated a new variable called "Difference", which is the difference between the daily growth rates of CAC and AW on a given day. In this way I capture the deviations between the two indices and can perform analysis not on the CAC returns in isolation, but on its deviations from AW. Since the variable "Difference" is a difference between two growth variables, the problem of non-stationarity does not exist, which can be proven both visually and using the Dickey-Fuller test for unit root. The test statistic for the Dickey-Fuller test is -67.399, while the critical value is -3.430 for the 99% confidence interval. Hence, with 99% confidence the data is stationary and simple linear regression can be used to understand the impact of the national team's performances. The data is normally distributed (see Appendix Graphs 3 and 4, Figure 3).

The independent variables are based on the national team's performance. Three variables: W, D and L, represent dummy variables indicating whether France had won, drawn or lost their game prior to the trading day. Below is a summary of the national team's performance from August 2004 until July 2018:

Table 3: France national team's performance summary

	Total Games	Won	Drawn	Lost
Number	189	111	44	34
% of total	100%	58.73%	23.28%	17.99%

The initial model for this dependent variable is the following:

Model 2: Difference = $\beta_0 + \beta_1*W + \beta_2*D + \beta_3*L$ (see Appendix Figure 4)

The equation obtained from Model 2 is the following:

Difference = -0.0043 - 0.0527*W + 0.1891*D - 0.2231*L

The counterintuitive negative sign for the coefficient of wins can be neglected since the variable is insignificant at any confidence interval. On the days following a draw for the France national team the difference between the returns of CAC and AW is expected to increase by 0.1891, while after losses the expected decrease is 0.2231. A more detailed interpretation can be found below in further sections. Model 3 was created since Model 2 contained an insignificant variable. Model 3 is an updated version of Model 2, where the insignificant variable is omitted.

Model 3: Difference = $\beta_0 + \beta_1*D + \beta_2*L$

Figure 1: regression of "Difference" on only significant match outcomes

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. regress difference drew lost
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Source	SS	df	MS		
Model	3.26876027	2	1.63438013	Number of obs	= 3576
Residual	2027.51652	3573	.567454944	F(2, 3573)	= 2.88
				Prob > F	= 0.0563
Total	2030.78528	3575	.568051825	R-squared	= 0.0016
				Adj R-squared	= 0.0011
				Root MSE	= .7533

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
drew	.190838	.1142757	1.67	0.095	-.0332141	.4148901
lost	-.2213946	.1298155	-1.71	0.088	-.4759146	.0331254
_cons	-.0059386	.0127367	-0.47	0.641	-.0309105	.0190332

The equation obtained from Model 3 is the following:

Difference = -0.0059 + 0.1908*D - 0.2214*L

On the days following a draw for the France national football team the difference between the returns of CAC and AW is expected to increase by 0.1908, while on the days after France lost, the difference is expected to decrease by 0.2214.

The first finding was quite surprising. One would expect the draws to have no effect whatsoever on investors' mood, hence no sentiment and deviation from the rest of the world. However, considering that France has drawn two major finals and eventually lost them either on penalties (WC 2006 final against Italy), or in additional time (Euro 2016 final against Portugal), those draws might have affected the overall level and nature of sentiment in the country. Still the fact that lost finals drive CAC up is counter-intuitive. This can be explained using the same logic as was used to explain the 1.8% rise in the Brazilian stock market after they lost humiliatingly to Germany with a score line of 7-1 in the semi-final of the World Cup 2014 in Brazil. The sudden and counterintuitive rise in the stock market was explained by the fact that the humiliating loss

would lead to the then president Dilma Rousseff's loss on the presidential elections later that year, hence increasing optimism among investors (Edmans A. , 2014). While French people are regarded as less irrational and impulsive than Brazilians, the theory might be true.

As for the coefficient of the "Loss" variable, its interpretation is quite simple and logical. Investors and traders come to work with much less optimism than they had before, they did not expect their country to lose, which becomes a negative shock. The fact that wins did not have a similar impact in the opposite direction is again in line with the concept of loss aversion discussed in the literature review part.

As for the diagnostics of the final model, since the independent variables were dummy variables, the frequently used heteroscedasticity tests like the Breusch-Pagan test would not result in any meaningful insight. However, the errors (residuals) of the model were normally distributed as presented in the Appendix Graph 5. The random pattern of the residuals over time is also presented in the Appendix Graph 6.

Conclusion

Overall, this research has come to surprising and countering conclusions. On the one hand, the first model which took only highly unexpected football match outcomes from all over the world found no effect on the stock markets of the playing country regardless whether the country's result was unexpectedly positive or negative. On the other hand, the main stock index of France CAC-40 is actually affected by the results of the national football team. Draws move the gap between France and the World in favor of the former, while losses move it in favor of the latter. Hence, the line on the cover page turns out to hold for France in terms of finance and

football. When it rains, it does indeed pour. When the national football team loses, investors' sentiment changes, namely, investor's optimism wanes, hence making them more prone to sell their assets and overall, have a grim outlook at anything. This drives the French index lower, or more specifically, grow at an even slower rate compared to the world, than it would otherwise.

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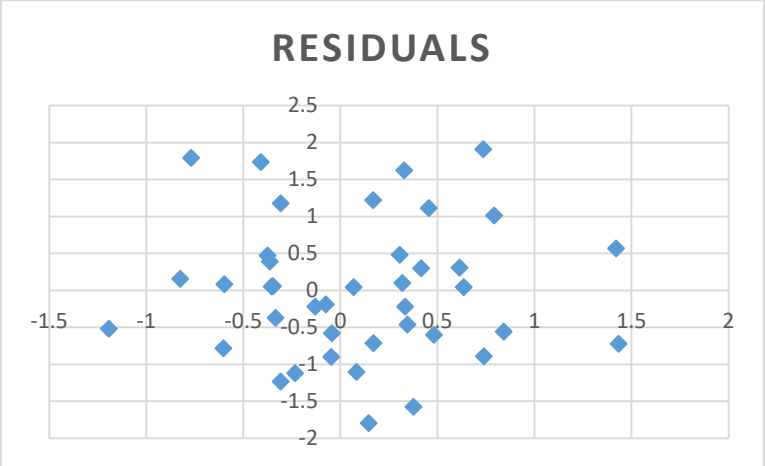
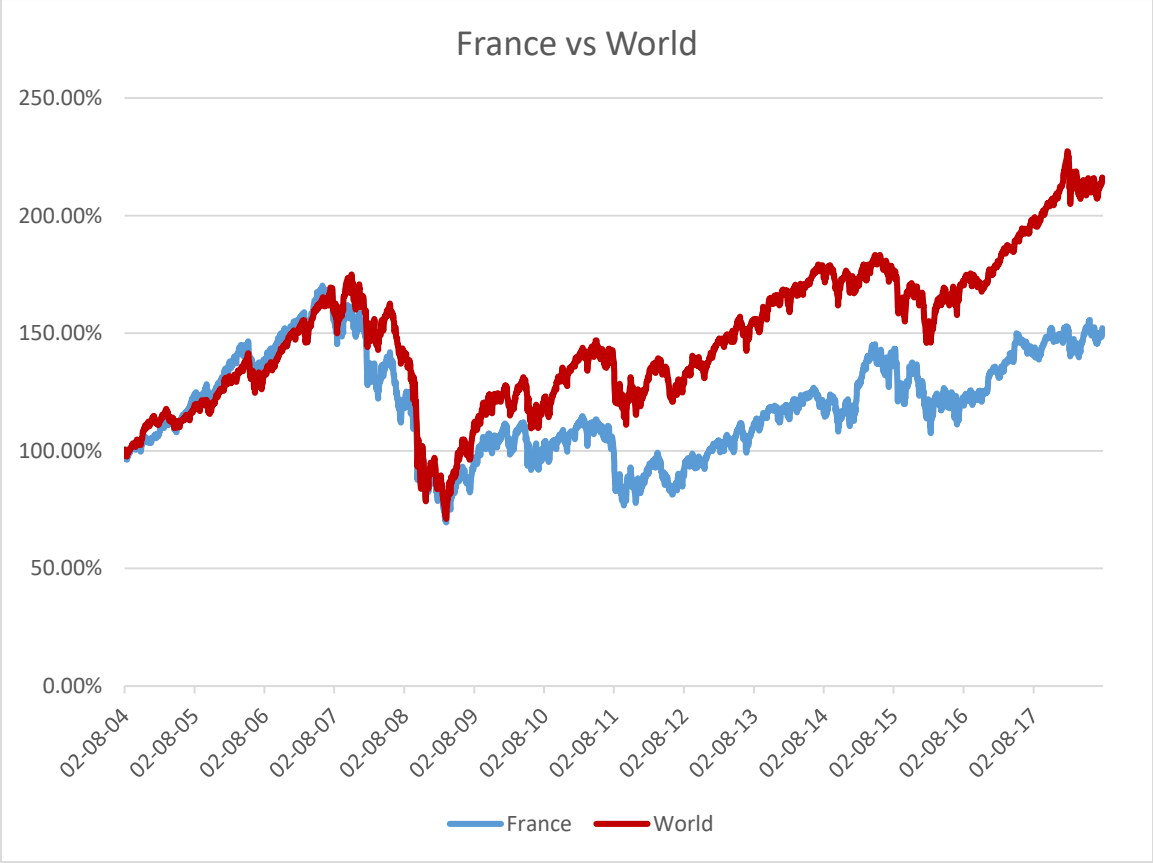
Appendix

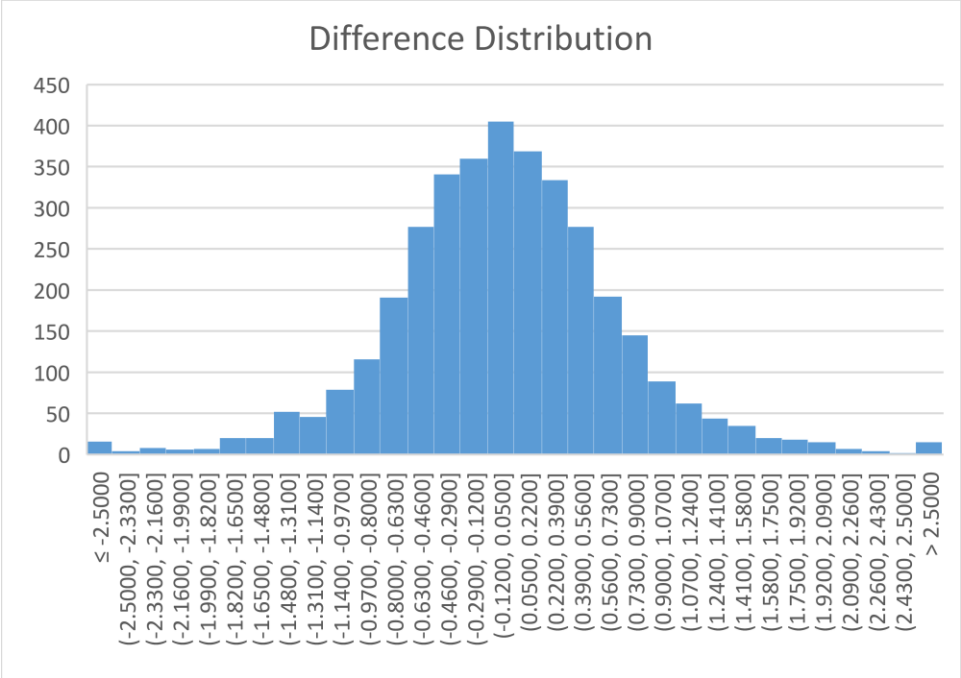
Graph 1: residuals against fitted values (Model 1)



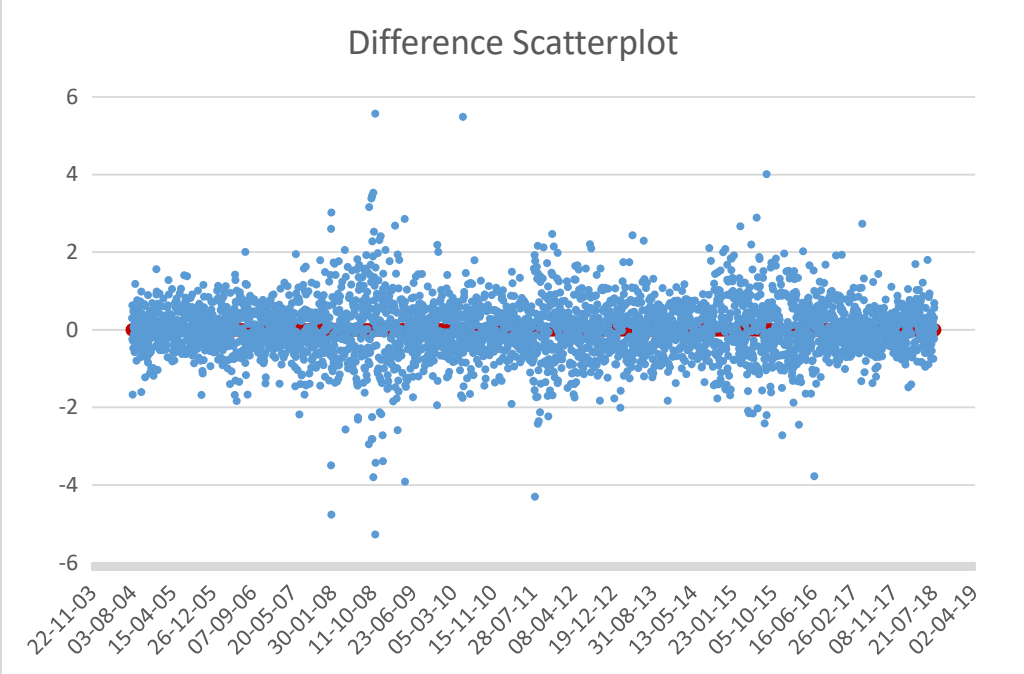
Graph 2: CAC and AW 2004-2018 (indexed at August 2004=100%)



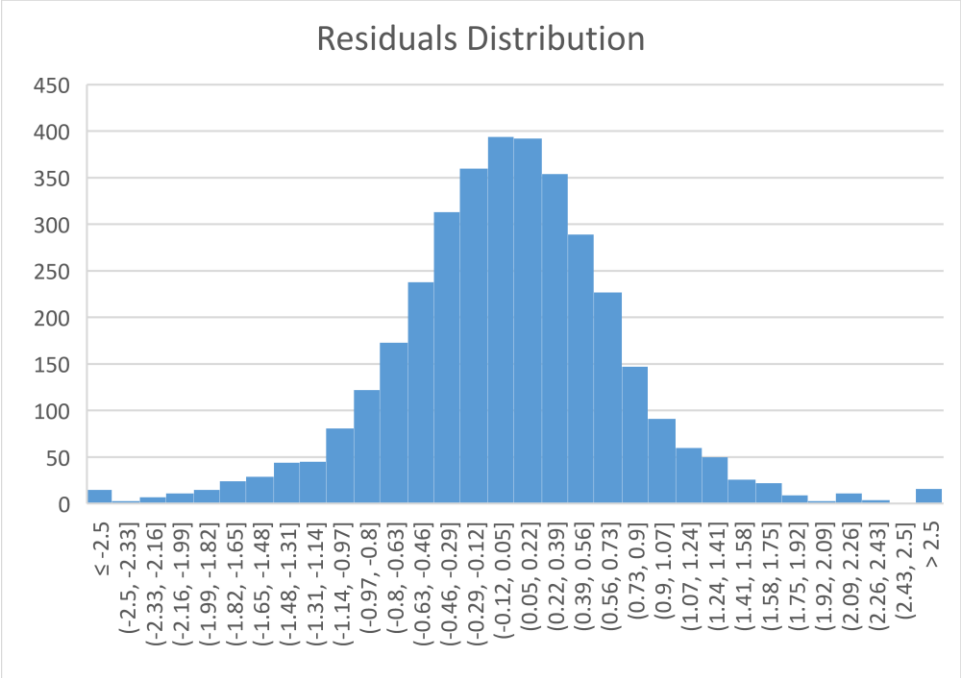
Graph 3: distribution of variable "Difference"



Graph 4: scatterplot of variable "Difference"



Graph 5: distribution of residuals of Model 3



Graph 6: scatterplot of residuals of Model 3

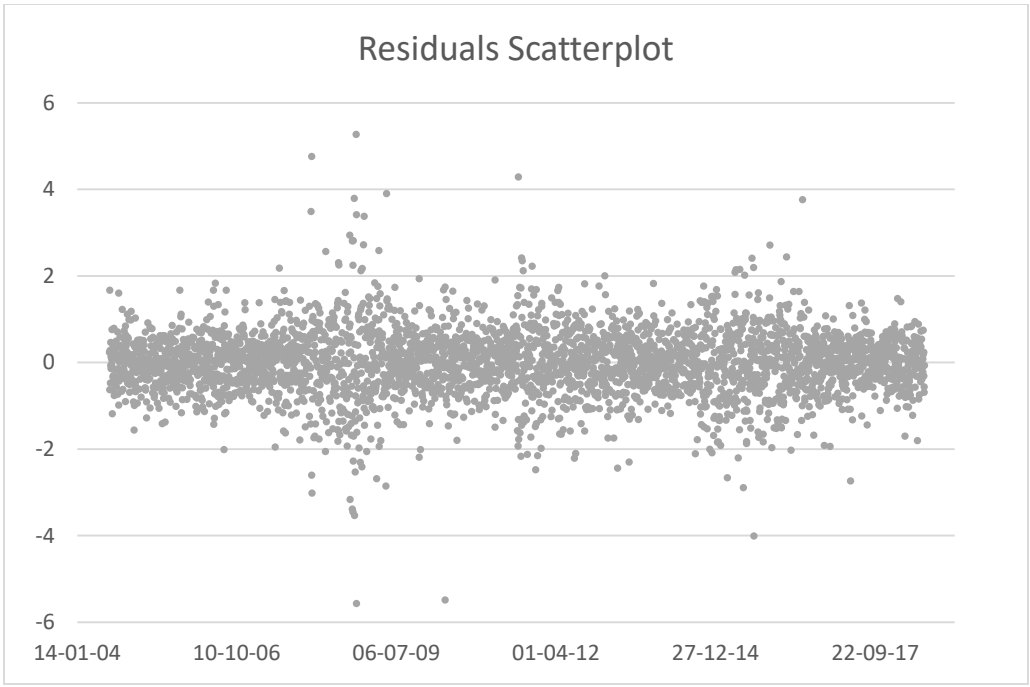


Figure 2: regression of "Market" on "World Average" and "UP"

```
. regress market worldaverage up
```

Source	SS	df	MS		
Model	13.1089988	2	6.55449942	Number of obs	= 40
Residual	33.2169371	37	.897755057	F(2, 37)	= 7.30
				Prob > F	= 0.0021
Total	46.325936	39	1.18784451	R-squared	= 0.2830
				Adj R-squared	= 0.2442
				Root MSE	= .9475

market	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
worldaverage	.6946543	.1823445	3.81	0.001	.3251892	1.064119
up	.0428107	.306069	0.14	0.890	-.5773439	.6629653
_cons	.0311767	.1935672	0.16	0.873	-.3610277	.4233811

Figure 3: Dickey-Fuller test for the variable "Difference"

```
. dfuller difference, lags(0)

Dickey-Fuller test for unit root                   Number of obs   =      2834

                         ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)           -67.399          -3.430            -2.860           -2.570
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

Figure 4: regression of "Difference" on all match outcomes

```
. regress difference won drew lost
```

Source	SS	df	MS		
Model	3.56670292	3	1.18890097	Number of obs	= 3576
Residual	2027.21857	3572	.567530395	F(3, 3572)	= 2.09
				Prob > F	= 0.0988
Total	2030.78528	3575	.568051825	R-squared	= 0.0018
				Adj R-squared	= 0.0009
				Root MSE	= .75335

difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
won	-.0526511	.0726667	-0.72	0.469	-.1951234	.0898213
drew	.1891672	.1143065	1.65	0.098	-.0349454	.4132798
lost	-.2230654	.1298446	-1.72	0.086	-.4776425	.0315117
_cons	-.0042679	.0129446	-0.33	0.742	-.0296473	.0211116