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Merger Paradox In Europe: An Empirical Research

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Abstract: Merger Paradox is the realization that the insider firms in a Cournot market need to command a large share of pre-merger market for a merger to be profitable, otherwise the insider firm will fail to obtain post-merger profits. Unprofitable mergers are not expected in the database. However, the Agency Problem provides a counter example. This research will analyze the occurrence of the Merger Paradox in Europe between 1990 and 2000 using the difference in stock prices before and after the merger. After regressing on the Cournot characteristics and industries, no significant relation between the characteristics and the industry could be found. The distribution of the differences in stock prices between the different Cournot characteristics does not differ in the data. The Merger Paradox does not seem apparent in the data.

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INTRODUCTION

Horizontal mergers in Cournot oligopolies have long been recognized to suffer from the Merger Paradox. The Merger Paradox is the realization that the merged firm (insider firm) needs to command more than 80% of the market in order to profit after the merger (Salant, 1983). There has been little to none empirical research on the existence of the Merger Paradox in reality. Andrade et al, (2001) has tested the merger paradox using a three day time frame round the merger announcement. It received significant positive returns on stocks for the insiders firm. When a longer time frame of a several days had been applied, abnormal returns are still positive but it ceases to be significant.

It can be argued that the Merger Paradox will never be observed in Merger Data. If rational firms expect that merging will be unprofitable, they will not merge. There will be a selection effect among the data which leads to a dominant amount of expected profitable mergers. The occurrence of the Merger Paradox will not be found in this situation. By employing the Agency Problem, this paper will provide incentives for companies to engage in unprofitable merger activity even if the companies are well aware of the unprofitable future of the merger. Besides that, this paper seeks to employ an empirical research on the occurrence of the Merger Paradox in Europe using stock prices of several years before and after the announcement date of the Merger.

Horizontal mergers occur when two or more competitors decide merge. This will allow a firm to increase market power unilaterally because when firms are merging, consumers will have less substitution possibilities. This allows the merged firms to impose their dominance on the market. Besides that, mergers between firms can result in increases efficiency through synergies, economies of scale, economies of scope and replacement of less efficient labor. For more than a decade, these have been the main reasons for companies to engage in to horizontal mergers (Motta, 2004).

Since the industrial revolution, horizontal mergers have occurred in five waves. These are:

The First Wave: 1898–1902: resulted in many U.S. industrial groups;
The Second Wave: 1926–1939: involved many public utilities;
The Third Wave: 1969–1973: had as its driving force diversification;
The Fourth Wave: 1983–1986: had as its goal efficiency;
The Fifth Wave: 1997 until the early 21st century: globalization (Kusstatscher, 2005)

There are two main forces which deters horizontal mergers. Various competition and industry regulation authorities are working to prevent horizontal mergers which will decrease social welfare through regulations and court orders. Besides that, there is another effect on the market side which makes horizontal mergers less attractive; the Merger Paradox.

This paper will provide theoretical concepts around the Merger Paradox. Stock data will be gathered, processed and analyzed. Then a clear conclusion will be drawn on the occurrence of the Merger Paradox in Europe.

MERGER PARADOX

This section explains the theory and intuition behind the necessary concepts in this research regarding the Merger Paradox.

Merger Paradox is the realization that the insider firms in a Cournot industry need to command a large share of pre-merger market for a merger to be profitable. No two firm merger will be profitable for private Cournot-Nash competitors as long the merger does not result in a market share of 80% or higher for the insider firms (Salant et al, 1983). The intuition behind this starts with the fact that the insider firms possess a more dominant position after the merger. This triggers the insider firms to abuse their dominance with an attempt to increase their profit by employing an anti-competitive strategy. In other words, the insider firms will lower their output and increase their prices. The output of these firms would be smaller than the combined output of the firms before the merger. This will drive the market price up and the insider firms profit will increase given that competitors will not alter their output. But the competitors in the market will react by increasing their output to capture the residual demand left behind by the insider firms. This move by the outsider firms will decrease the market price, resulting in a decrease in profitability for the insider firms (Salant et al, 1983). The insider firms cannot react by increasing their output because all of the residual output left behind has been captured by the outsider firms already (Salant et al, 1983).

One of the main conditions of the Merger Paradox is the horizontal nature of the merger. Vertically merged companies tend to act more competitively due to the elimination of the Double Marginalization problem and the improved coordination between the upstream and the downstream firms (Motta, 2004). This means that the Merger Paradox is very unlikely to occur when firms decide to merge vertically.

Another necessary condition for the Merger Paradox is a Cournot market or a market with strong Cournot characteristics. Assumptions for a Cournot market are the following: Capacity bound production, limited to no entry possibilities and homogenous products (Cournot 1838). The merger paradox does not occur in a Bertrand market. In a Bertrand price setting market, insider firms will increase their price after the merger due to their new dominant position. Competitor firms will also increase their prices due to their positively sloped response functions according to the Bertrand setting. Mergers in this setting are always beneficial for the insider companies. Therefore the insider firms are not likely to lose profitability (Deneckere, 1985). How horizontal mergers behave in a Stackelberg setting will be elaborated in the next section.

EXPECTED UNPROFITABLE MERGERS

The data on mergers might be biased in the sense that unprofitable mergers will never happen due to a selection effect. It is very unlikely for a rational firm to engage in unprofitable merger activities, especially when the unprofitability post-merger have been expected by the decision makers. However, it is possible for a firm to merge when it is expected that the merger is going to be unprofitable. This behavior can be caused by Agency Problems. Agency Problems arises when goals between a principal and its agent conflict in a setting of incomplete information (Basanko, 2010). In case of horizontal mergers, the principal can be seen as the owners or stockholder of the acquiring company who prioritizes the profitability and well-being of their company. The agents are the decision makers such as the managers and executives in the acquiring company who prioritize salaries and self-esteem. Information asymmetry is present as the agents have more information than the principals regarding the company and the market. The agents have more incentive to engage in an unprofitable merger as it will link their name to a more dominant firm in the market and thereby increase the agent’s self-esteem. Due to the information asymmetry, the principal may not perceive the merger as harmful for the profitability of the company and will be reluctant to prevent it. Moral hazard plays a role in Agency theory as well (Eisenhardt, 1989). The agent will expect the principal to bail him out when things go south. Therefore the agent can act more risk loving, which will impact the merger profitability adversely. In this research, it is assumed that unprofitable mergers occur in the data due to the difference motivations of the principals and agents.

INCENTIVES TO MERGE UNDER MERGER PARADOX

This section analyzes the incentives and the reasons for companies to merge despite the presence of the Merger Paradox. These incentives differ from the Agency Problem in a sense that they will increase merger profits or omit the Merger Paradox completely. In other words these, incentives will provide benefits to merging.

Synergy Effects

Horizontal mergers can provide the insider firms with the necessary efficiency increases. The efficiencies can counteract the profit loss of a merger paradox by prompting the insider company to act more competitively due to the increased expected profits when increasing output and decreasing price (Motta, 2004). These efficiencies can come in two ways. Firstly, combining the insider firm's joint capital will result in scale economy benefits (Shapiro, 1990). This is always desirable for the insider firms, given the capital possesses a certain degree of mobility. Secondly, a merger may increase efficiency at the merging facilities when facilities can learn from each other's patents, intellectual properties and human resources (Shapiro, 1990). If the efficiencies gained due to a horizontal merger are substantial enough for the insider firm to behave more competitively enough, it might just be enough to omit the trigger of the Merger Paradox.

Monopoly Mergers

No two firm merger will be profitable for private Cournot-Nash competitors as long the merger does not result in a market share of 80% or higher for the insider firms (Salant, 1983). However, when a merger has the potential to give the insider firms a market share above 80%, the insider firm will become so dominant that it can influence the market price and output sufficiently to get away with anticompetitive behavior. Besides that, the reaction of outsider firms to the anticompetitive behavior will not have a significant effect due to the sheer size of the insider firm (Salant, 1983). These mergers will have a high probability of being blocked by antitrust commissions due to the fact that a monopoly will generally be bad for social welfare (Motta, 2004). Therefore, monopoly mergers are a very rare sight.

Stackelberg after the Merger

In a market where the firms are symmetric, Huck 2004 modeled the situation of a horizontal merger where the pre-merger firms participate in Cournot competition and the post-merger firms participate in a Stackelberg setting. The insider firms only differ in their increased ease of internal information transfer from outsider firms. One party in the insider firm acts like the headquarter which controls the timing of the outputs. The other party acts like the subsidiary which follows the timing of the outputs. All of the headquarters and subsidiary's outputs are observable by the insider firm. Instead of a simultaneous Cournot game, this game turns into a sequential Partial Stackelberg game with the headquarter as the leader and the subsidiary as the follower. The Stackelberg game offers a commitment advantage (Huck, 2004). This commitment advantage allows the insider firm to supply more and increase its post-merger profits when there are four or more symmetric firms in the market. This is all without cost advantages for the insider firms after the merger (Huck, 2004).

UNPROFITABLE MERGERS IN ABSENCE OF MERGER PARADOX

In absence of the Merger Paradox, the following literature still suggests that insider firms still may lose profitability.

<u>Prospect Theory</u>

Devised by Kahneman & Tverski, the Prospect Theory states that risk taking depends on the reference levels of the participants. If a participant is below that threshold, he will act risk seeking. If a participant is above the reference level, he will risk adverse (Kahneman, 1979). Prospect Theory can be applied to the case of horizontal mergers. When two merging firms expect to have high merger profits before the merger, they will set a high reference points for themselves. When this reference point is not reached by their post-merger performance, they are likely to behave more risk seeking. Some risky choices will be preferred to some less risky choices, even when the risky choices have a lower expected value than the less risky choices. This can result in a decrease in post-merger profitability (Huck 2007). A problem with this theory is that the reference points can be hard to define.

<u>Dire Pre-Merger Situations</u>

Another reason for the decreasing stock prices in this case has something to do with the pre-merger situation of the insider companies. Troubled firms pre-merger can decide to merge in order to recover from their dire situation. However they are more likely to be more risk seeking and engage in more risky mergers, desperately attempting to recover from their dire straits. This risk seeking behavior leads to a decrease in post-merger profitability because some risky choices will be preferred to some less risky choices, even when the risky choices have a lower expected value than the less risky choices (Samila, 2003).

These theories for unprofitable mergers in absence of the Merger Paradox can be omitted by testing the data against Cournot characteristics. If the profits decrease for a Cournot industry or an industry with strong Cournot characteristics, the occurrence of the Merger Paradox can be confirmed. If the profits decrease in a Non Cournot industry, the decrease in profits can be contributed to the two theories described above.

RESEARCH SETUP

This empirical research will test the Merger Paradox theory on in the European market using historical stock prices. The data on merging companies in the European market will be collected from the Kiel Institute of world economics' 'Database on mergers in Europe (DOME)'. Subsequently the data will be filtered and cross referenced with Bloomberg stock data on the acquiring company. Finally, the stock data will be adjusted to industry shocks by using the SPX 500 historical industry prices. Data regarding industry and company stock prices are available on the Bloomberg Terminal. Stock prices before and after the merger of the acquiring companies will be adjusted for changes in the industry stock prices. Afterwards they will be graphically displayed, regressed and analyzed on three levels. The first level is the general level, which includes all the data points. The second level is the Cournot level which divides mergers in industries groups according to their Cournot characteristics. The third level is the industry level where mergers are divided on their respective industry level. After this analysis, the phenomenon of Merger Paradox in the European Industry can be confirmed or rejected.

The analysis will give us a clear view on the occurrence of the Merger Paradox in the European market on the three different levels

DATA COLLECTION AND PROCESSING

Data collecting and processing is done in six stages.

First stage:

Data on merging companies in Europe ought to be found. The DOME composed by the Kiel Institute of World Economics is created with the purpose to improve free data availability in Europe (Hammermann, 2004). The DOME database contains 1506 merger cases which have been examined and approved by the European Commission's Competition Authority between 1991 and 2000. It contains information such as but not limited to: announcement date, acquiring company, targeted company, country, industry, and the form of merger. Besides that, the mergers listed in the DOME database will have a community dimension. This means that an European merger between companies needs to comply with the following characteristics in order to be included in the DOME database (Hammermann, 2004):

- Combined aggregate world turnover of all companies involved has to be larger than 5000 million Euros
- The community-wide turnover of each of at least two of the companies concerned is over 250 million Euros unless
- the companies concerned achieve more than two-thirds of their community-wide turnover within the same member state.

For the research, this indicates that the mergers provided by the DOME database have sufficient economic significance and relevance as the all of the mergers will impact the European economy and its industries in a noticeable way. Besides that, due to the significant presence of the DOME listed companies on the European and Global markets, data on individual companies stocks will be relatively easier to find.

Second Stage

The mergers in the DOME database ought to be filtered. Non-horizontal mergers in DOME are displayed as a merger between companies in different industries and ought to be taken out. 461 of the total 1516 mergers are non-horizontal.

Third Stage

This stage involves cross referencing the remaining 1055 horizontal mergers in the DOME with historical last stock prices pre- and post-merger of the acquiring firm in each merger. Stock prices will be taken on a quarterly basis. Two time frames will be employed in our analysis. The first timeframe of Tmerger + 3 years and Tmerger -3 years has been chosen as the first option. T represents the time of the merger announcement displayed in quarters. The timeframe of +/-3 years is taken because the insider companies will need time in order to adjust themselves to the new merged situation. However, it can be argued that this timeframe is too long. This can affect the validity and the relevance of the research.

The second timeframe displays a timeframe of Tmerger + 1 year and Tmerger -1 year. The shorter timeframe will provide more validity and relevance. However, horizontal mergers do not take place in an instant. Usually it will take a substantial amount of time for the merger to get approved and for insider companies to operate in the merged setting. The shorter time frame might not capture the full effect of the merger on its stock prices. This research will employ the two time frames in the analysis.

The historical stock prices are taken from Bloomberg at the Bloomberg Terminal. During this stage, a substantial amount of data points are lost due to various reasons which will be displayed on table 1 on the next page.

Total Data Points	1506
Non horizontal mergers	(461)
Horizontal mergers	1055
Companies that are merged at the time but are acquired later by other firms	(64)
Delisted (bankruptcy,collapse,delist or divestment)	(23)
JC or Consortium as the acquiring company, impossible to determine pre-merger stock prices	(11)
Company is unlisted at the moment of merger	(344)
Government owned company	(8)
Total Useful Data Points	498

Tabel 1

Fourth Stage

Historical industry prices need to be found in order to adjust the remaining 498 data points for external industry related shocks. This is found using the SPX 500 historical stock prices database at the Bloomberg Terminal.

To adjust the stock prices for the industry changes, the following two formulas are employed for each of the 498 acquiring companies in the reworked dataset.

Formula 1: $P_{new}/P_{old} - PI_{new}/PI_{old}$

Formula 2: $(P_{new}/P_{old})/(PI_{new}/PI_{old})$

where:

P equals the quarterly last stock prices of an acquiring company inside a horizontal merger

PI represents the quarterly last stock prices of the SPX 500 industry where the above mentioned acquiring company is operating in.

New displays the time frame of +3 years or +1 year

Old displays the time frame of -3 years or -1 year

Formula 1 measures the relative change in stock prices which are adjusted in an absolute way. It assumes linear costs and profits.

Formula 2 measures the relative change in stock prices which are adjusted in a relative way. Judging stock prices in a relative way will enable the research to deal non-linear costs and profits in a more representative way.

Combining the formula's and timeframes with the relevant historical stock price data of the acquiring firm and the industry will give us four different variables. These are displayed as followed: F1Y1[1], F1Y3, F2Y1 and F2Y3.

[1] F1Y1 = Variable which is a result of formula 1, taken over 1 year difference and it retains it outliers. The same description applies for the other three variables

Fifth Stage

In order to analyze the results, outliers ought to be identified and dealt with. In this research, two scenarios will be considered. In the first one, the outliers are kept. In the second one, the outliers are removed according to the Interquartile Range (IQR) method (Moore, 2009). General view on outliers in a statistic research is very ambiguous and situation dependent. On the one hand, outliers can disrupt data analysis due to its big difference - most likely to be caused by an interfering exegetic factor - with the other variables. On the other hand, it can be said that outliers that are observed and recorded in the same way as all other variables are representative just like the non-outlier variables (Moore, 2009). The two scenario approach will allow for comparisons which will determine whether if the outliers play a significant role in the research.

The IQR method calculates the IQR according to the following formula:

$IQR = Q3 – Q1$

Where Q3 and Q1 are the third and the first interquartile range respectively.
Afterwards, the range of non-outlier data points will be established as a function of the IQR. The range is as follows

Range non-outliers $= [Q1 – 1.5IQR , Q3 + 1.5IQR]$

Appendix 2 will provide a more detailed computation of the non-outlier range for our four variables.

After dealing with the outliers, the tag NO (no outliers) will be applied to the variables without their outliers. Removal the outliers results in another four variables; F1Y1NO[2] , F1Y3NO, F2Y1NO and F2Y3NO. Table 2 below displays this graphically.

[2] F2Y1 NO = Variable which is a result of formula 2, taken over 1 year difference and had its outliers removed by the IQR method.

	F1Y3	F2Y3	F1Y1	F2Y1
Total data points before removing the outliers	498	498	498	498
Cournot Industry	(14)	(17)	(6)	(4)
Partial Cournot Industry	(21)	(19)	(14)	((3)
Slight Cournot Industry	(2)	(0)	(1)	(0)
Non Cournot Industry	(15)	(11)	(6)	(2)
Total data points left after removing the outliers	446	451	471	489

Table 2

Sixth Stage

The fifth and final stage requires a classification of each of the 498 merger cases. Firstly, they will be classified according to the above mentioned Cournot characteristics. These are

C = Capacity bound

E = no entry possibilities

H = Homogeneous products

Industries are treated as Cournot industries if they possess all three characteristics. Partial Cournot industries are found when they possess C and another characteristic. Slight Cournot Industries' only receive one of the Cournot characteristics. Non-Cournot industries do not have any of these characteristics. Tabel 3 provides an overview of this classification process. Appendix 1 provides a more detailed of the classification process.

Cournot Classifications	Number of datapoints
Cournot industry	174
Partial Cournot industry	158
Slight Cournot industry	31
Not Cournot industry	141

Tabel 3

TESTS, RESULTS AND ANALYSIS

Descriptive Statistics

The descriptive statistics of each of the eight variables are shown in table 4.
Looking at the standard deviations of the variables with a time lag of +/- 1 year, it can be seen that their standard deviations are substantially lower than the standard deviation the variables with a time lag of +/- 3 years. This means that the stocks of the acquiring companies and the industry index are more volatile over a longer period.

By looking at the means it can be seen that the stock prices have been decreasing on average after the merger in some of the variables. This is true especially for the variables with a three year time frame. However, conclusions about the merger paradox cannot be made since the exact spread of the data points is unknown.

Test on normality

The eight variables have been tested on their distribution using the Jarque-Bera test (Hill, 2012). Test results are displayed in table 4. Only F1Y1 NO tested positive for a normal distribution. The other seven variables are not normally distributed.

	Mean	Std. Div.	Distribution
F1Y1	0,0301	0,817	Not normal
F1Y3	-0,134	1,81	Not normal
F2Y1	1,082	0,732	Not normal
F2Y3	0,999	1,147	Not normal
F1Y1NO	-0,025	0,435	Normal
F1Y3NO	-0,532	1,052	Not normal
F2Y1NO	1,016	0,407	Not normal
F2Y3NO	0,712	0,585	Not normal

Tabel 4 (Appendix 3a-h)

T-test

Consequently, a t-test has been deployed. The t-test will provide the confidence intervals for each of the eight variables. It will enable us to see the data points which are significantly different (Moore, 2009). Appendix 4a shows the t-test statistics for the four variables with outliers. Appendix 4b shows the t-test statistics for the four variables without outliers. Similarly, the t-test results are displayed graphically in Appendix 5a for the variables with outliers. In Appendix 5b, the same t-test results are shown graphically for variables without the outliers. It has to be mentioned that F1Y1 and F1Y1NO received a T score higher than 5% which make these two confidence intervals not significant.

As we can see from Appendix 5a-b, all of the variables indicate that there are numerous individual cases where the stock prices after the merger are significantly lower than the situation before. However, it is very hard to draw a valid conclusion from individual cases alone.

Test with Cournot Characteristics as dependent variable

To get a more conclusive picture the eight variables ought to be divided according to the Cournot characteristics and be plotted again. This will provide a picture on the Cournot characteristics level as opposed to the individual firm level. Appendix 6a shows the results for the variables including the outliers graphically. Appendix 6b shows the same results, but for the variables excluding the outliers.

As it can be seen in Appendix 6a-b, the shape of the graph under each of the Cournot classifications is very similar. It has to be noted that the Slightly Cournot markets are very few in numbers to make a conclusion. However the other three Cournot classifications show substantial quantity of data points with similar distribution. Both the F1 and F2 series show that the stock prices of the acquiring company act in similar ways, despite the difference in Cournot classifications. In other words, there are acquiring companies who saw an increased in their stock prices after the merger and there are acquiring companies which saw decreases in their stock prices after the merger. The pattern of distribution of the increases and decreases under each of the Cournot characteristics are very similar in every variable. Taken the fact that the Merger Paradox is a mechanism that only holds in the Cournot industry, the preliminary judgment is one that denies the occurrence of the Merger Paradox in the data.

Kurskal-Wallis test

In order to test the distribution and the similarity of the shapes in Appendix 6a-b, Kruskal-Wallis test ought to be applied to formally test the similarity of the shapes. The reason for applying the Kurskal-Wallis test is the fact that most of the variables are not normally distributed. Only F1Y1NO is normally distributed. Besides that, this research is using two or more groups. On top of that, outliers have no effect under the Kruskal-Wallis test since the test is based on ranks (Moore, 2009).

Results are found in Appendix 9a for the variables with outliers and the results for variables without outliers are found in Appendix 9b. Please keep in mind that F1Y1NO is normally distributed. Therefore one way ANOVA is used for F1Y1NO.
All of the p-values are above 5%. This means that there are no significant and systematic differences between the shapes in the variables displayed in Appendix 7a-b. The results from the Kruskal-Wallis test reinforce the preliminary judgment presented in the last subchapter.

Regressions with Cournot characteristics dummies

To determine the relationship between the industry characteristics and the stock price change, this research resorts to regression. All of the eight variables have been regressed against Cournot characteristics dummies using Ordinary Least Squared regression (OLS), resulting in eight regressions. The group Slight Cournot Industries was used as the reference variable. Besides regressing, several assumptions of OLS have been tested in order to determine the usefulness of the regression. These assumptions are: errors have a mean of zero, normally distributed errors, homoskedacity and no autocorrelation. However, the assumption of normality of errors is not necessary for the validity of the regression (Hill, 2012). For testing the mean errors, distribution graphs of the residuals were made. The Jarque-Berra test was employed in order to test for the distribution of the errors. The Breusch-Pagan test was used to test for homoskedacity. For the detection of autocorrelation, the Breusch-Godfrey serial correlation LM test was utilized (Hill, 2012). The results are displayed in table 5.

The results indicate that all of the variables do not have normally distributed errors except for F1Y1NO. The errors all do have a mean of zero. Furthermore, the results show that the variables with outliers do comply with the assumptions of no autocorrelation and no homoskedacity. These are the variables with the best predictive regressors in the data. Of the variables without outliers, only F1Y1NO and F1Y3NO comply with homoskedacity. None of the variables without outliers comply with the assumption of no autocorrelation. The most striking result is the fact that none of the dummies showed a significant effect as the independent variable as all of their P-values are above 5%. Moreover, the dummy regressions all showed a R value which is very low. This means that the dummy regression have a low explanatory power. Resulting from this set of regressions, it can be seen that the Cournot classifications do not play a significant role in the stock prices. Under Merger Paradox, the stock prices of Cournot Industries are expected to be lower than the stock prices in other industries as the merging Cournot firms are expected to be not profitable.

	Residual mean = 0	Normally distributed erros	Homoskedacity	No autocorrelation	Significant P value of regressors
F1Y1	yes	no	yes	yes	no
F1Y3	yes	no	yes	yes	no
F2Y1	yes	no	yes	yes	no
F2Y3	yes	no	yes	yes	no
F1Y1NO	yes	yes	yes	no	no
F1Y3NO	yes	no	yes	no	no
F2Y1NO	yes	no	no	no	no
F2Y3NO	yes	no	no	no	no

Tabel 5 (Appendix 8a-h)

Regressions with industry dummies

These eight regressions go one level deeper to the industry level. Two industry sectors with a substantial amount of data points and contrasting Cournot characteristics have been chosen to be dummies in order to conduct these regressions. These industries are the automobile industry with 36 data points and the telecommunications industry with 52 data points. The remaining industries are jointly forming the reference variable. The automobile industry is in classified as a Cournot Industry due to its capacity bound production, high difficulty to enter and homogeneity of goods. The telecommunications industry is the complete opposite. It has been classified in this research as a Non Cournot Industry due to its ability to produce a near infinite amount of products, relative ease to enter the market and its differentiated offers. The previous regressions have shown that the Cournot classifications do not show the Merger Paradox. These regressions on a deeper level might reveal something new. Just as the previous regressions, OLS assumptions are tested in the same way. The results can be viewed in table 6.

The results are not very different than the previous regressions. All of the variables have a residual mean of zero. Only F1Y1NO have normally distributed errors. Homoskedacity is violated by F1Y1NO only. There is no autocorrelation found in F1Y1 and F2Y3. The P-value of the dummies is higher than 5% on all of the regressions. Besides that, the explanatory power of the regressions displayed by the R is very low. Due to the violation of multiple assumptions, it can be concluded that the industry dummy regressors are not the best estimators. The only variables which complied most with the assumptions are F1Y1 and F2Y3. These variables have the best predictive regressors in these industry dummy regressions. The insignificant effect of the F1Y1 and F2Y3 industry dummies hints that the Merger Paradox is not present. The other regressions in this set of regressions do not comply with enough OLS assumptions to be useful.

	Residual mean = 0	Normally distributed erros	Homoskedacity	No autocorrelation	Significant P value of regressors
F1Y1	yes	no	yes	yes	no
F1Y3	yes	no	yes	no	no
F2Y1	yes	no	yes	no	no
F2Y3	yes	no	yes	yes	no
F1Y1NO	yes	yes	no	no	no
F1Y3NO	yes	no	yes	no	no
F2Y1NO	yes	no	yes	no	no
F2Y3NO	yes	no	yes	no	no

Tabel 6 (Appendix 9a-h)

CONCLUSION AND DISCUSSION

This paper has researched the occurrence of the Merger Paradox in Europe. The research setup uses the stock prices one and three years before and after the merger as an indicator of profitability. However, a selection effect is present in the data due to the fact that no rational firm will merge if it expects to be unprofitable after the merger. Therefore the mergers with Merger Paradox present will not take place. The Agency Problem provides a counterargument to this selection effect. Different motivations between the principal and the agent will allow unprofitable mergers to take place. The increases and decreases in stock prices seem not to be related on Counot characteristics of the industry or the industry itself. Taken the fact that the Merger Paradox is a mechanism that expects a decrease of profitability in the Cournot market, it is clear that the Merger Paradox is not present in the dataset.

This research cannot deny the existence of the Merger Paradox in Europe between 1990 and 2000 completely because of two reasons. Firstly, this research used stock prices as a proxy for pre and post-merger profitability. Ratios such as the Capita Profitability Ratio or the growth of Earnings Before Income and Tax would have been a more accurate proxy for profitability. However, data on these proxies are difficult to obtain. Some of these data are considered private information. Secondly, merger profitability is not only caused by the Merger Paradox. Several factors had been named in the paragraph above. If merger profitability of the insider firms is taken to detect the Merger Paradox, all the other effects which affect the profitability should be adjusted. Thirdly, setting prices is in reality more of a natural strategic than setting quantities. Several Counot industries would have all of the Counot characteristics, but will still set prices as their strategic variable because it is easier to set up a complex pricing strategy than a complex quantity strategy.

Following the fact that the Merger Paradox has not been found in the data, further research could touch upon the Agency Problems and its role in preventing mergers. It can also research the distribution of decisive power within a company at the announcement of its merger plans. Combining these results will provide a clear and robust view of the Merger Paradox situation in Europe.

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Appendix 1: Industry classifications and their data points according to the classifications made by DOME

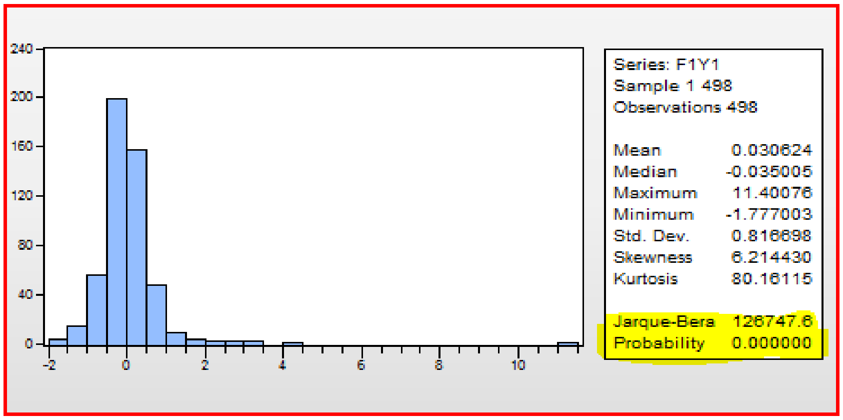
Cournot Characteristics	**Industry Sector**	**Number of Datapoints**
Cournot Industries	Agriculture	3
	Airline	10
	Automobile	36
	Automobile Conglomerate	1
	Conglomerate	2
	Defence	2
	Distribution Non-Durables	3
	Distribution Durables	5
	Food	26
	Mining	7
	Oil	21
	Packaging	5
	Paper	14
	Plastics	3
	Primary Metal Industries	16
	Tobacco	1
	Stone, Clay, Glass and Concrete Products	9
	Utilities	7
	Wood	2
Total Cournot Industries		**173**
Partial Cournot Industries	Aviation	5
	Chemicals	41
	Computers	12
	Conglomerate	3

	Construction	11
	Consumables	1
	Electronics	29
	Entertainment	11
	Health	2
	Industrial Machinery	17
	Pharmaceuticals	15
	Transport Equipment	3
	Transportation	6
Total Partial Cournot Industries		**156**
Slight Cournot Industries	Cosmetics	1
	Non-Food Retail	4
	Retail	20
	Travel	5
Total Slight Cournot Industries		**30**
Non Cournot Industries	Banking	36
	Business Services	7
	Conglomerate	1
	Electronic and IT Hardware	1
	Finance	3
	Insurance	34
	Telecommunication	52
	Software	1
	Service	4
Total Non Cournot Industries		**139**
Total Useful Data Points		**498**

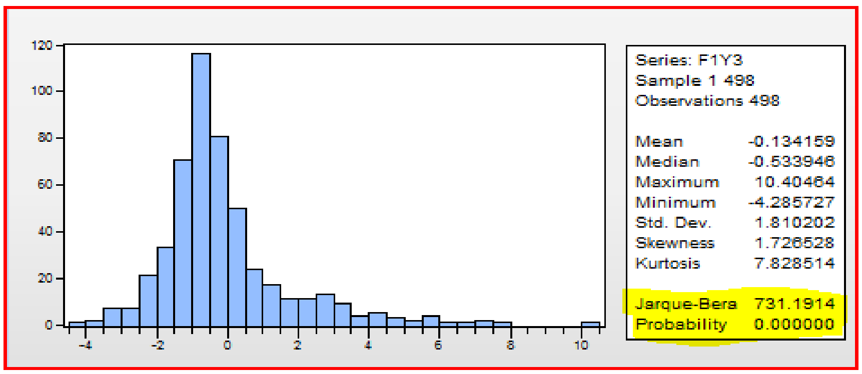
Appendix 2: Determining outlier values using the 1.5IQR method

		F1Y3	F2Y3	F1Y1	F2Y1
Observations		498	498	498	498
Mean		-0,1341585	0,9988731	0,0306243	1,0816128
Std. Deviation		1,8102022	1,1473997	0,8166977	0,7328089
Variance		3,2768322	1,3165261	0,6669951	0,5370089
Percentiles	25,0%	-1,1040382	0,3252754	-0,3096717	0,7655151
	50,0%	-0,5339455	0,6063162	-0,0350051	0,9653521
	75,0%	0,3498891	1,2179712	0,2950310	1,2650922
1,5 IQR		2,1808910	1,3390436	0,9070540	0,7493657
Minimum for non-outlier value		-3,2849292	-1,0137682	-1,2167256	0,0161493
Maximum for non-outlier value		2,5307801	2,5570148	1,2020850	2,0144580

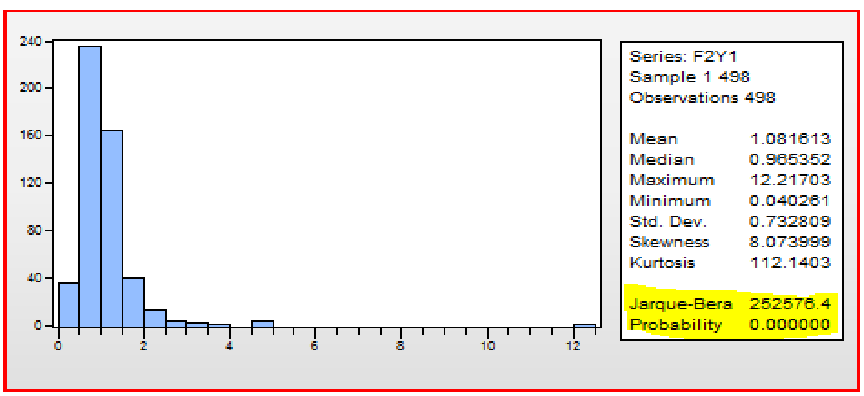
Appendix 3a: Jarque Bera test on F1Y1 with outliers at a significance level of 5%



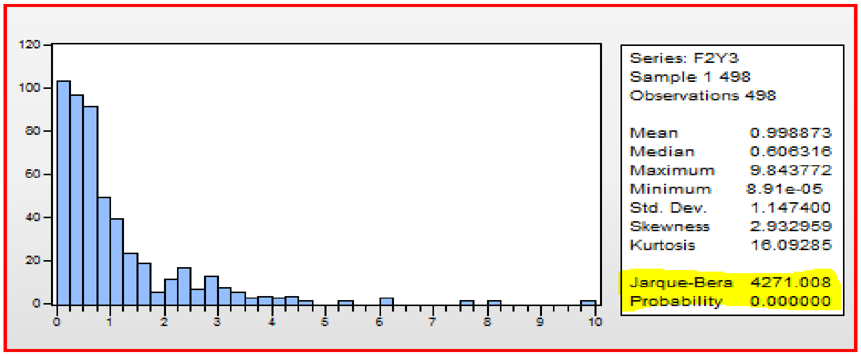
Appendix 3b: Jarque Bera test on F1Y3 with outliers at a significance level of 5%



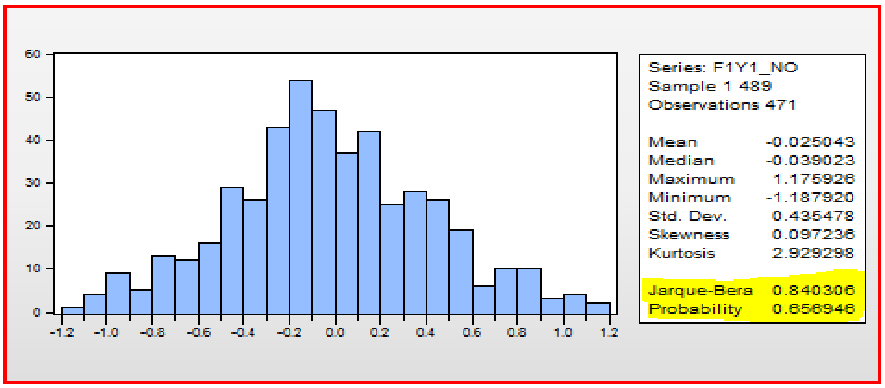
Appendix 3c: Jarque Bera test on F2Y1 with outliers at a significance level of 5%



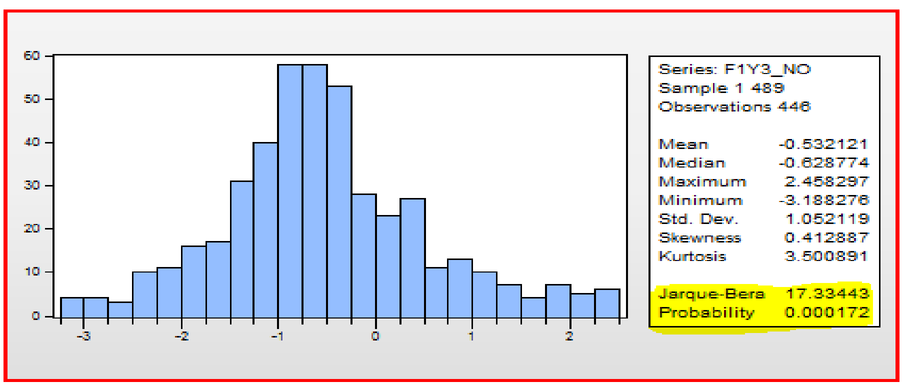
Appendix 3d: Jarque Bera test on F2Y3 with outliers at a significance level of 5%



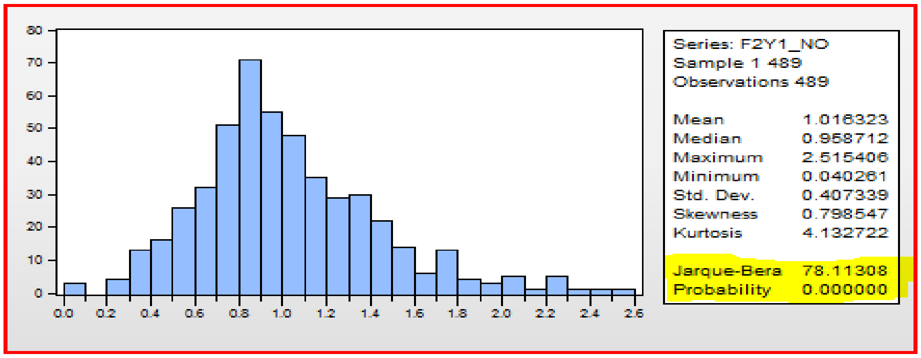
Appendix 3e: Jarque Bera test on F1Y1 NO at a significance level of 5%



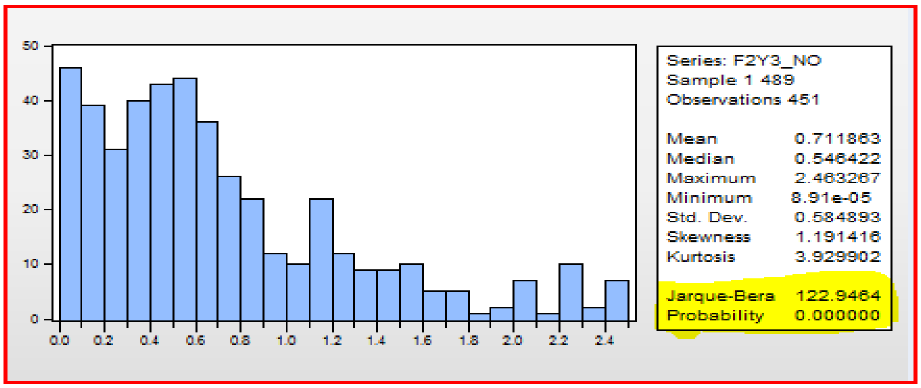
Appendix 3f: Jarque Bera test on F1Y3NO at a significance level of 5%



Appendix 3g: Jarque Bera test on F2Y1NO at a significance level of 5%



Appendix 3h: Jarque Bera test on F2Y3NO at a significance level of 5%



Appendix 4a: t -test using F1Y3, F2Y3, F1Y1 and F2Y1 with a significance level of 5%

	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Lower**	**Upper**
F1Y3	-1,654	497	,099	-0,134158540	-0,293533254	0,025216174
F2Y3	19,427	497	,000	0,998873100	0,897853172	1,099893029
F1Y1	,837	497	,403	0,030624305	-0,041279794	0,102528404
F2Y1	32,938	497	,000	1,081612765	1,017094446	1,146131085

Appendix 4b: t -test using F1Y3NO, F2Y3NO, F1Y1NO and F2Y1NO with a significance level of 5%

	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
F1Y3NO	-10,681	445	,000	-0,532121471	-0,630031764	-0,434211178
F2Y3NO	25,847	450	,000	0,711862844	0,657736857	0,765988832
F1Y1NO	-1.248	488	.213	-0.02504260575	-0.06447231951	0.014387108
F2Y1NO	55,173	488	,000	1,016323174	0,980129847	1,052516501

Appendix 5a: t-test results using F1Y3, F2Y3, F1Y1 and F2Y1 on the Y axis and the dates of the mergers on the X axis with a significance level of 5%.

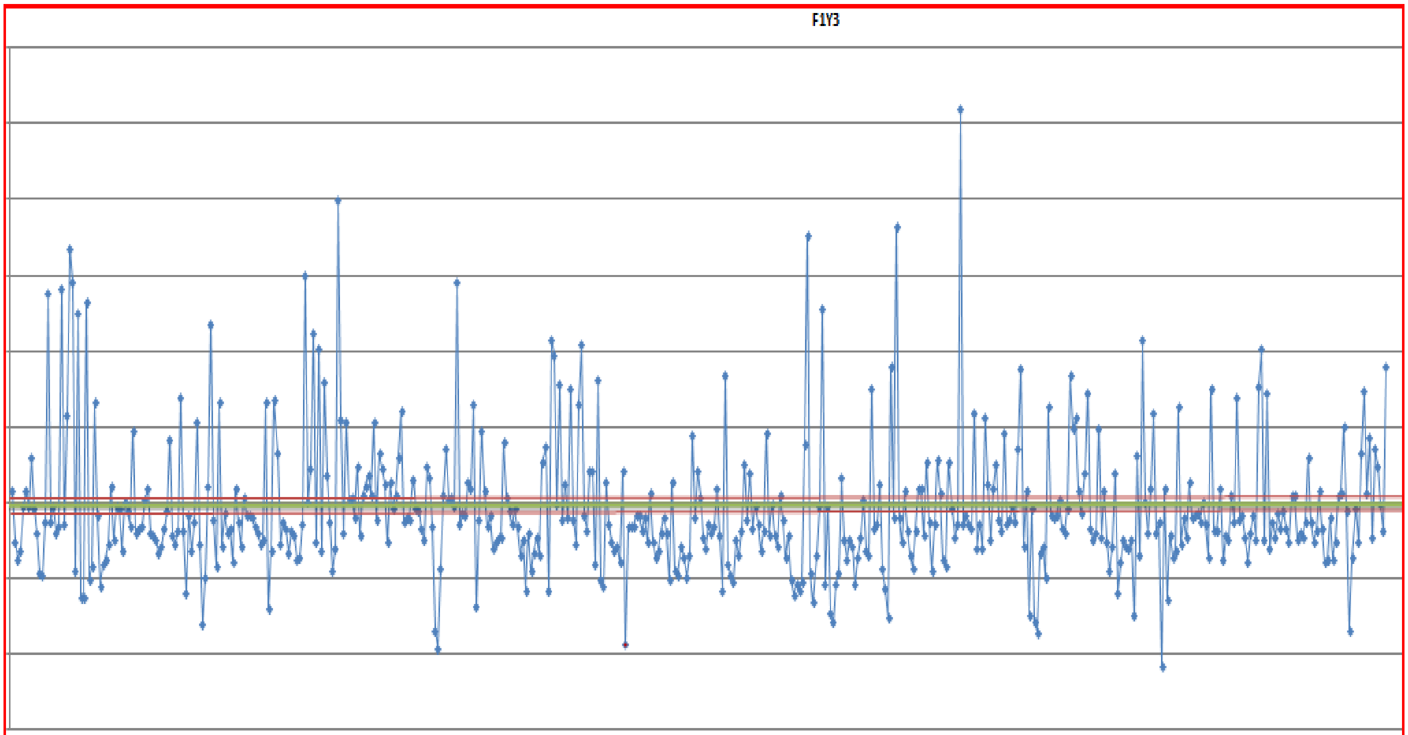
The purple lines shows Y = 1

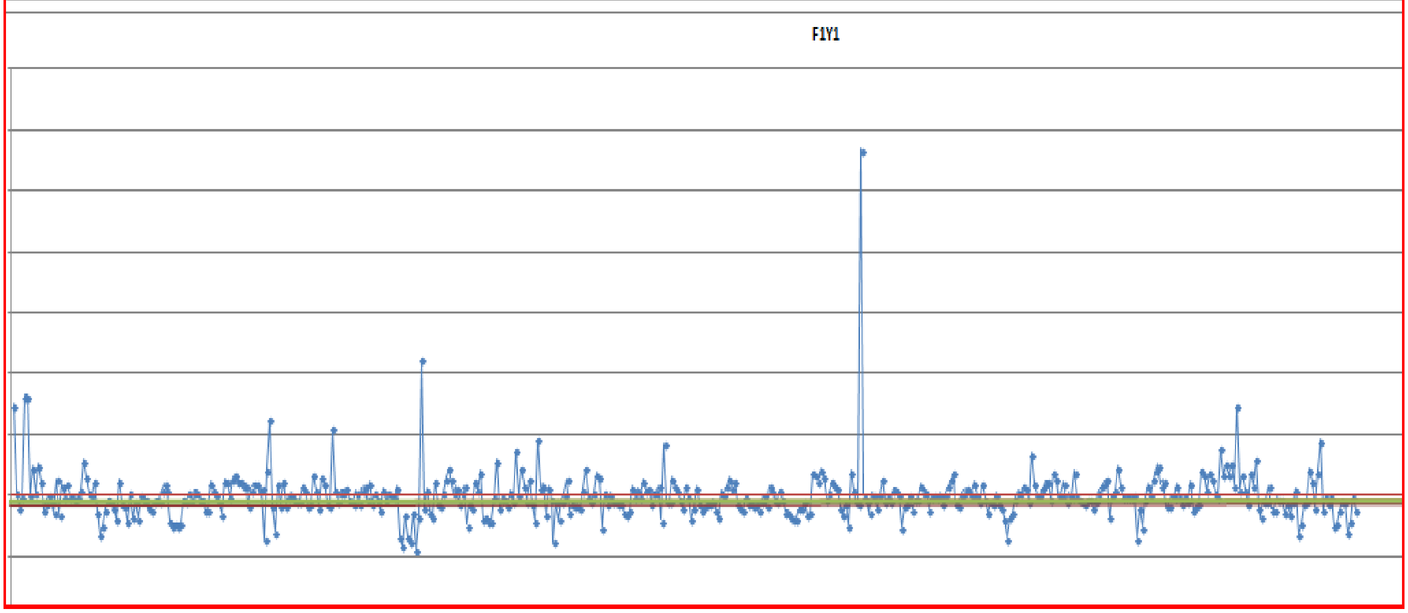
The red lines display the upper and lower boundaries of the confidence intervals.

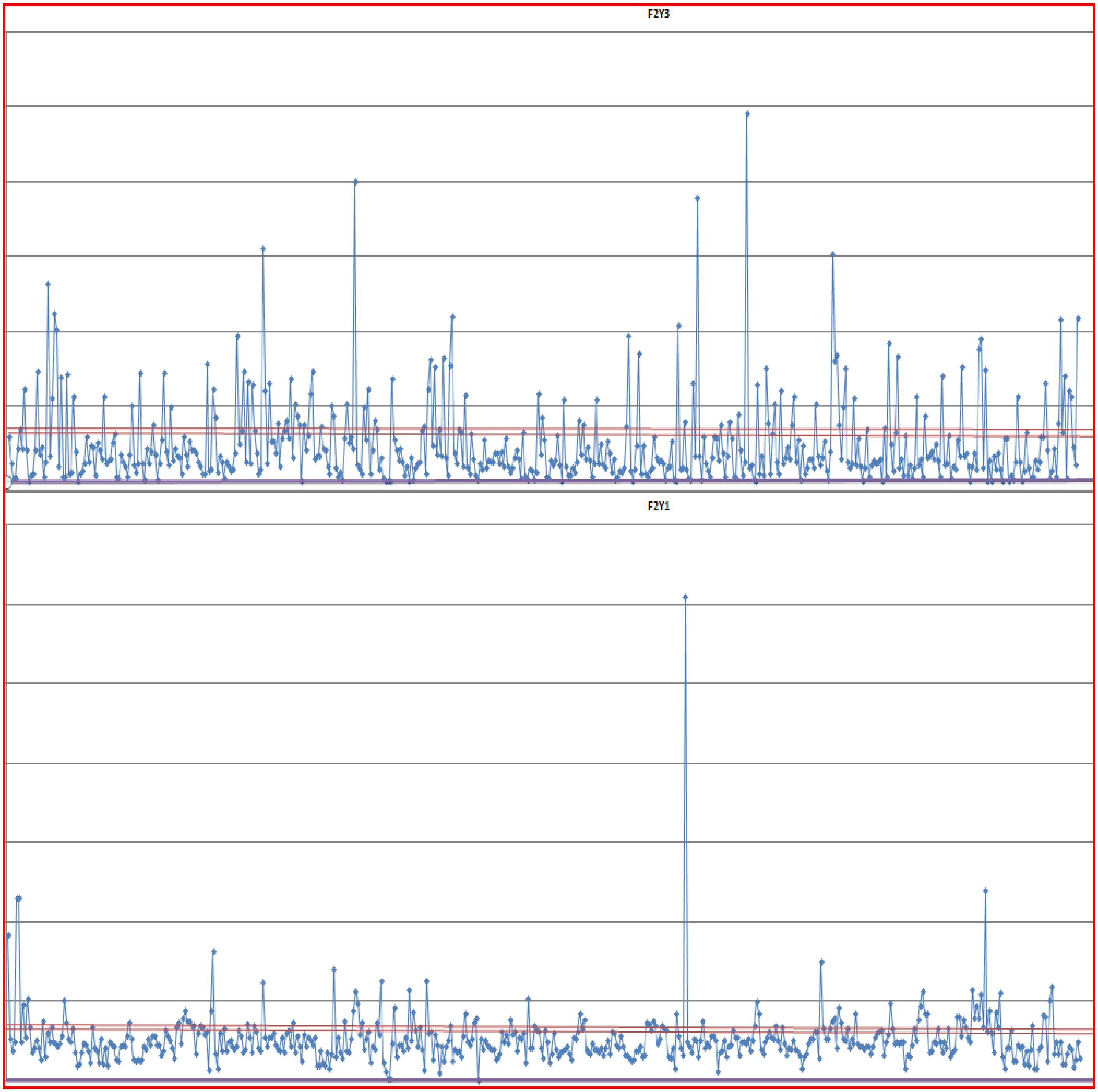
The green line displays Y = 0

Y-axis has a scale of 2 per grey line

X axis starts with 01-01-1991 and ends with 12-12-2000

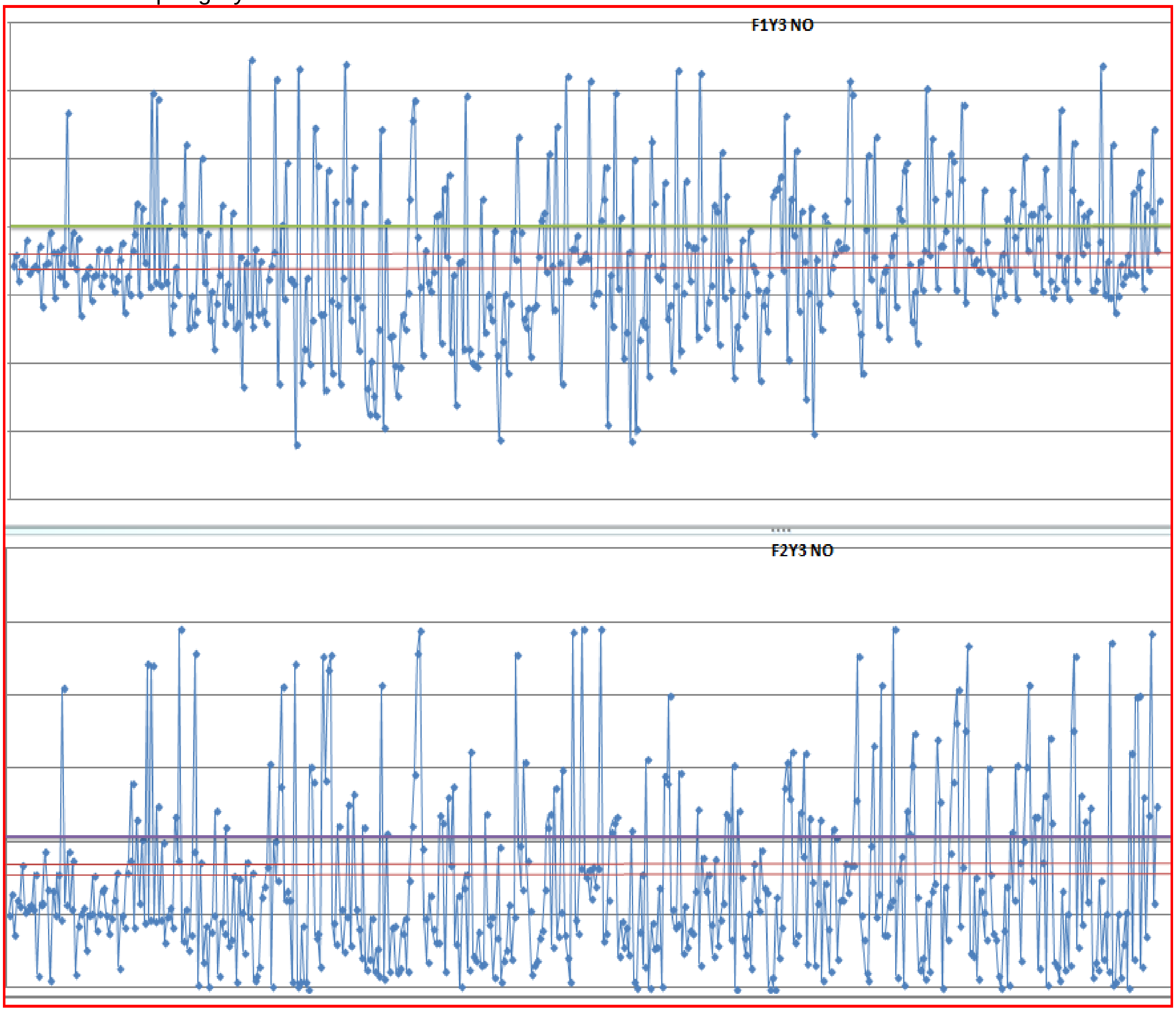


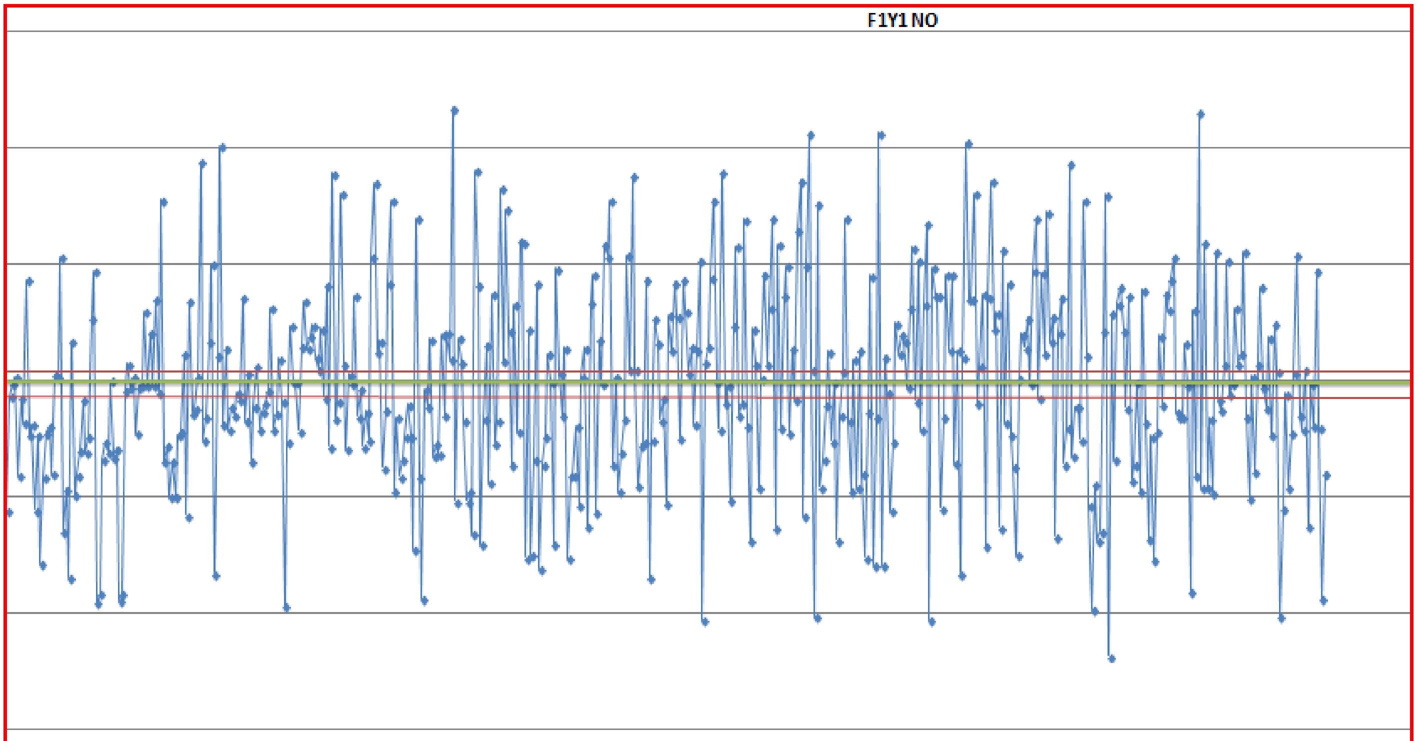


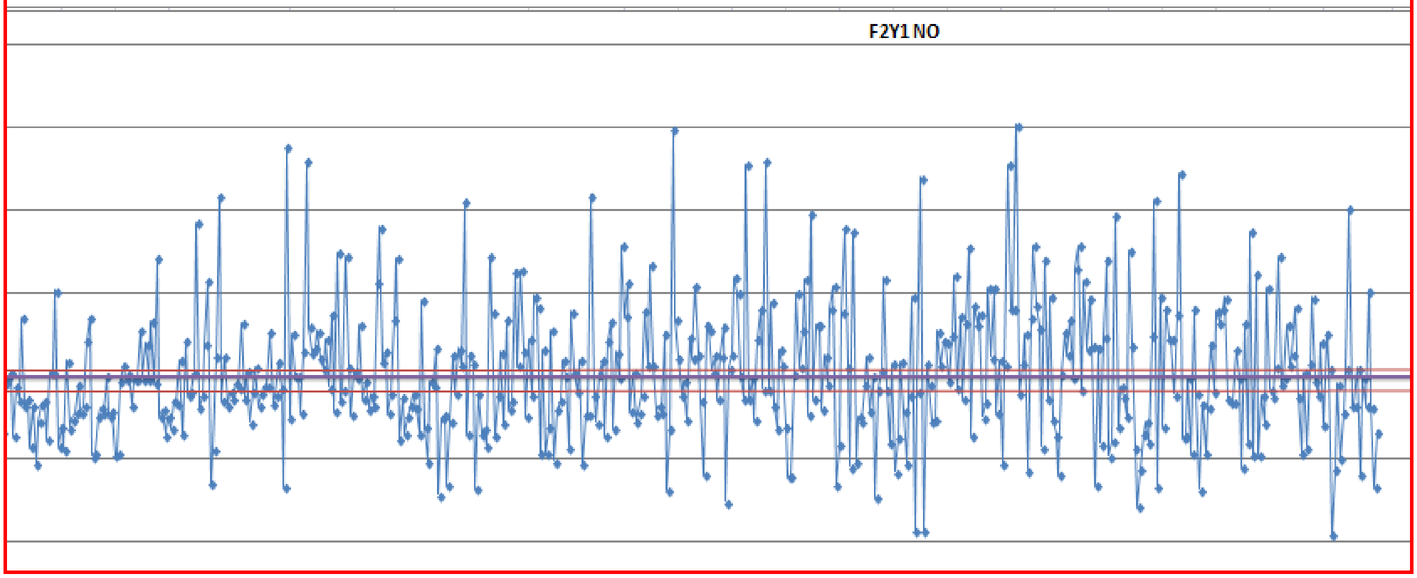

F2Y3
F2Y1

Appendix 5b: t-test results using F1Y3NO, F2Y3NO, F1Y1NO and F2Y1NO on the Y axis and the dates of the mergers on the X axis with a significance level of 5%. The red lines display the upper and lower boundaries of the confidence intervals.

The red lines display the upper and lower boundaries of the confidence intervals.
The purple lines shows Y = 1
The green line displays Y = 0
X axis starts with 01-01-1991 and ends with 12-12-2000
F1Y3NO has a scale of 1 per grey line on the Y axis. F2Y3NO, F1Y1NO and F2Y1NO all have a scale of 0.5 per grey line on the Y axis.

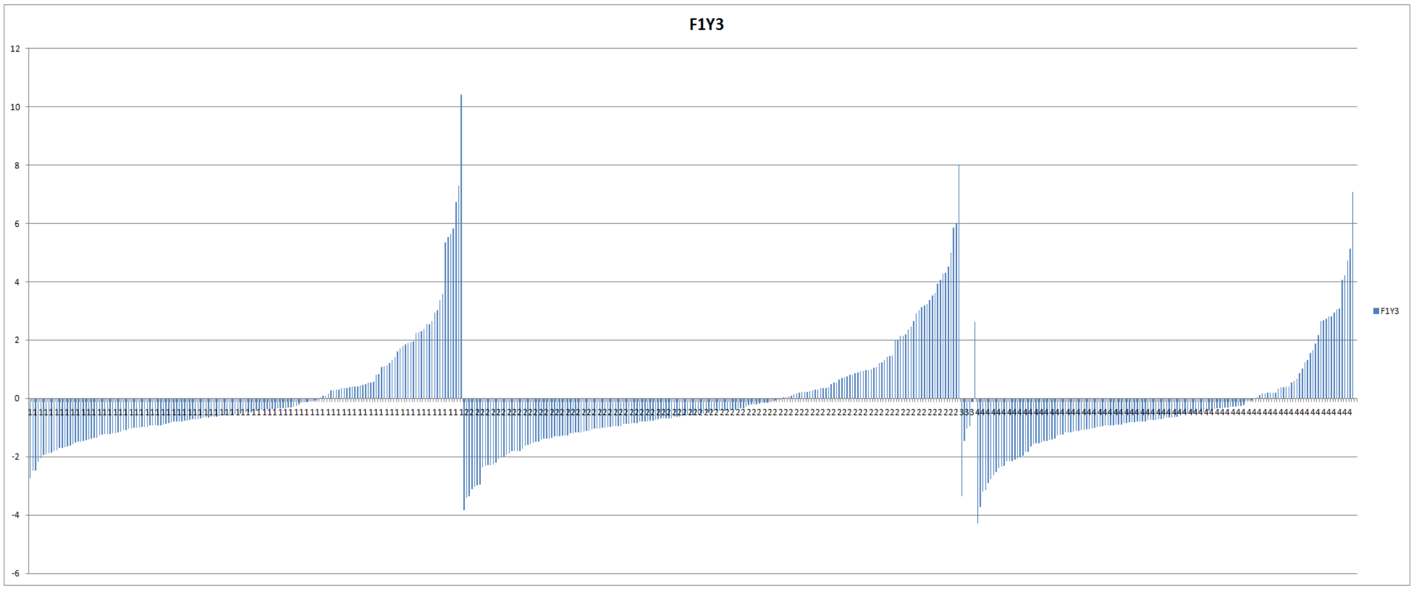


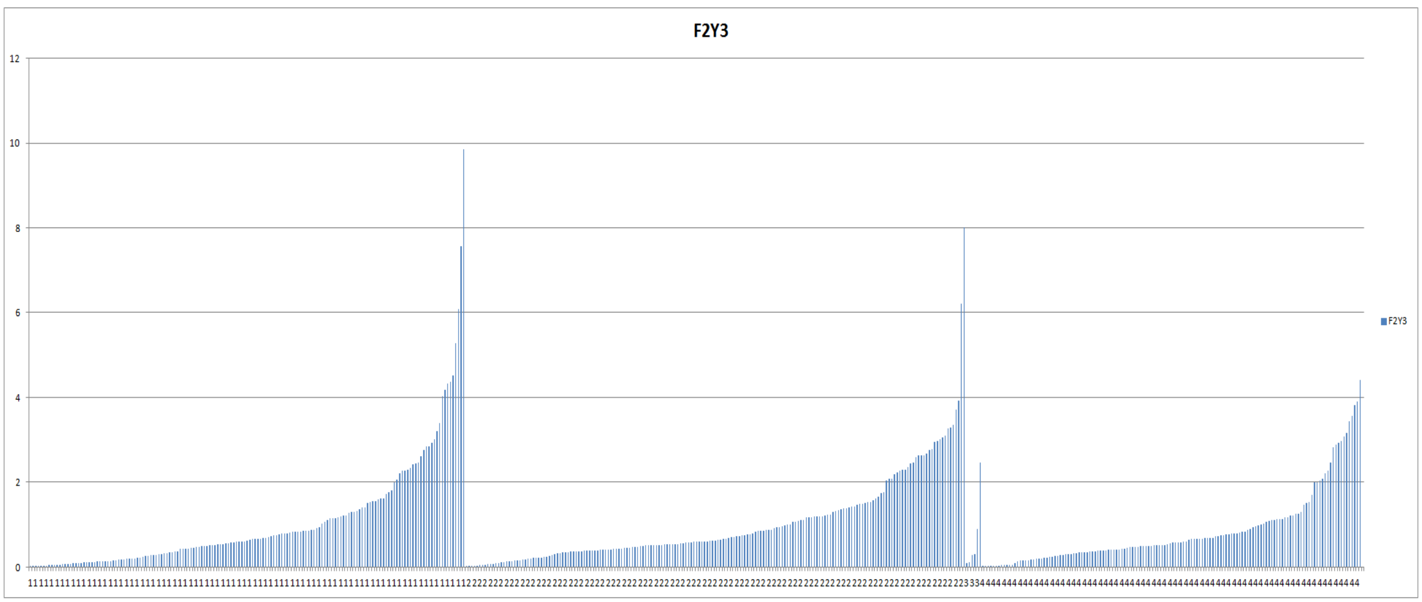

F1Y1 NO

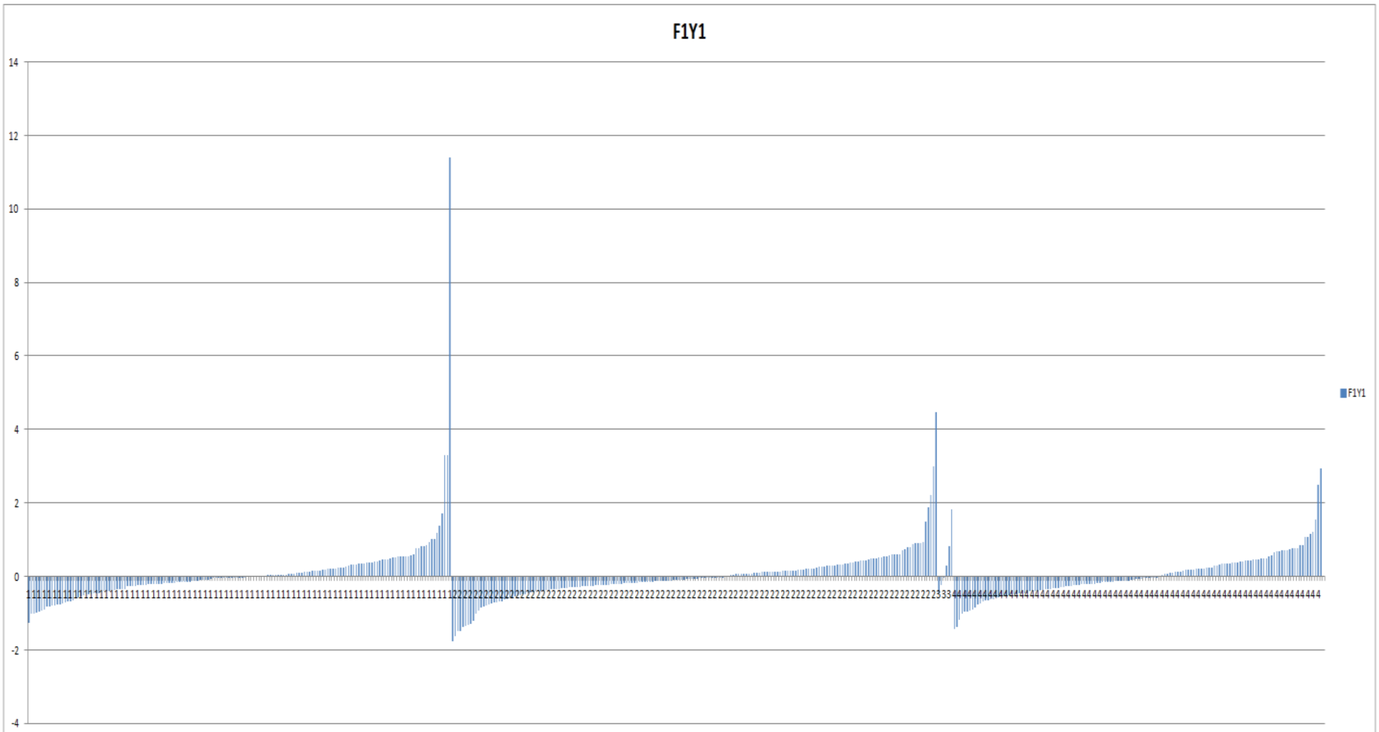

F2Y1 NO

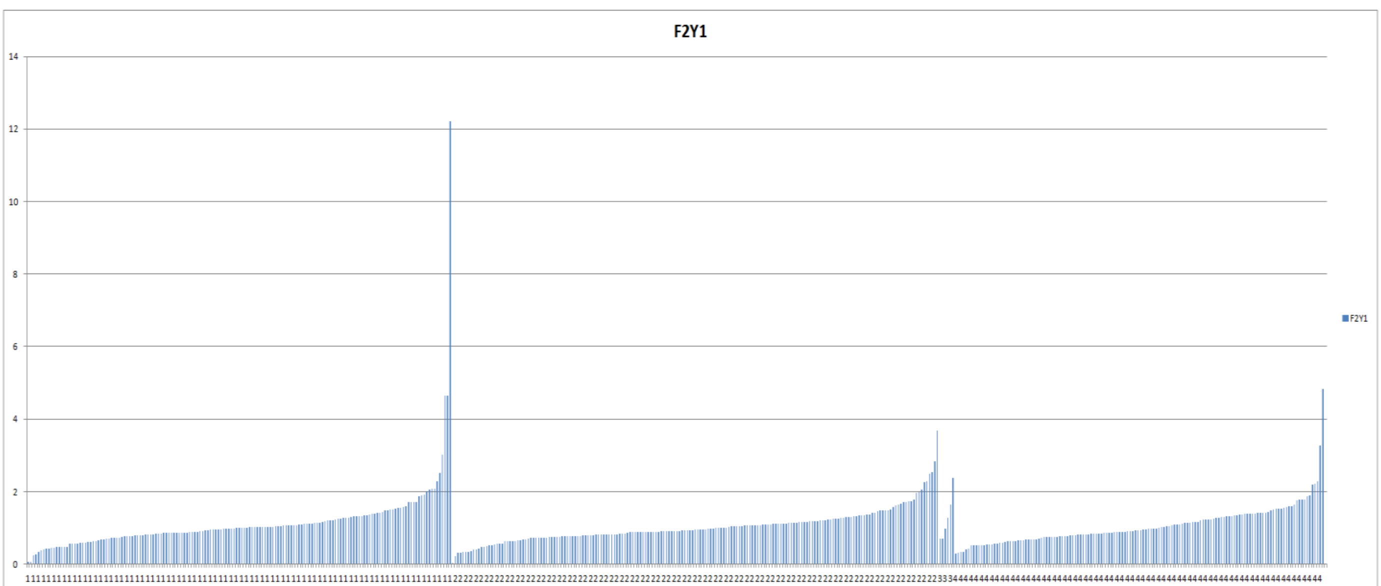
Appendix 6a: Graphing F1Y3, F2Y3, F1Y1 and F2Y1on the Y-axis and Cournot characteristics on the X-axis.

Cournot Industry - Most left figure
Partial Cournot Industry - Middle figure
No Cournot Industry - Most right figure



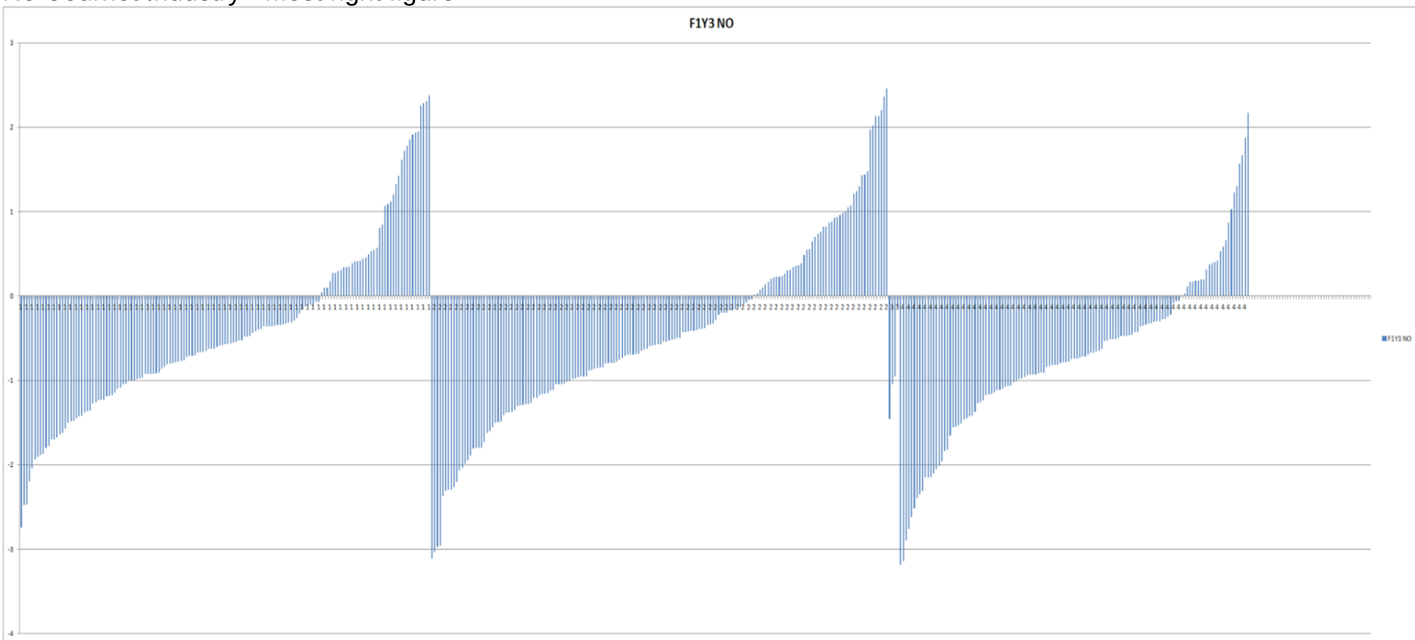


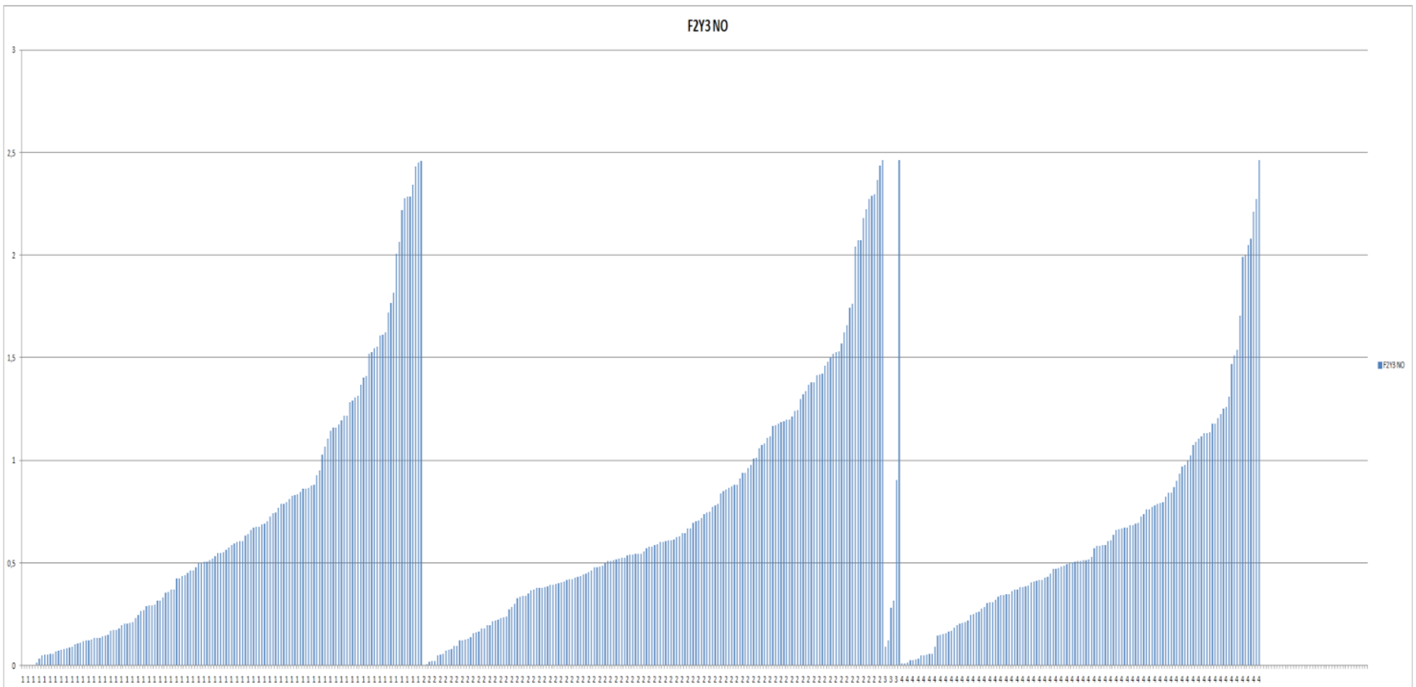

F1Y1
14
12
10
8
6
4
2
0
-2
-4
F1Y1

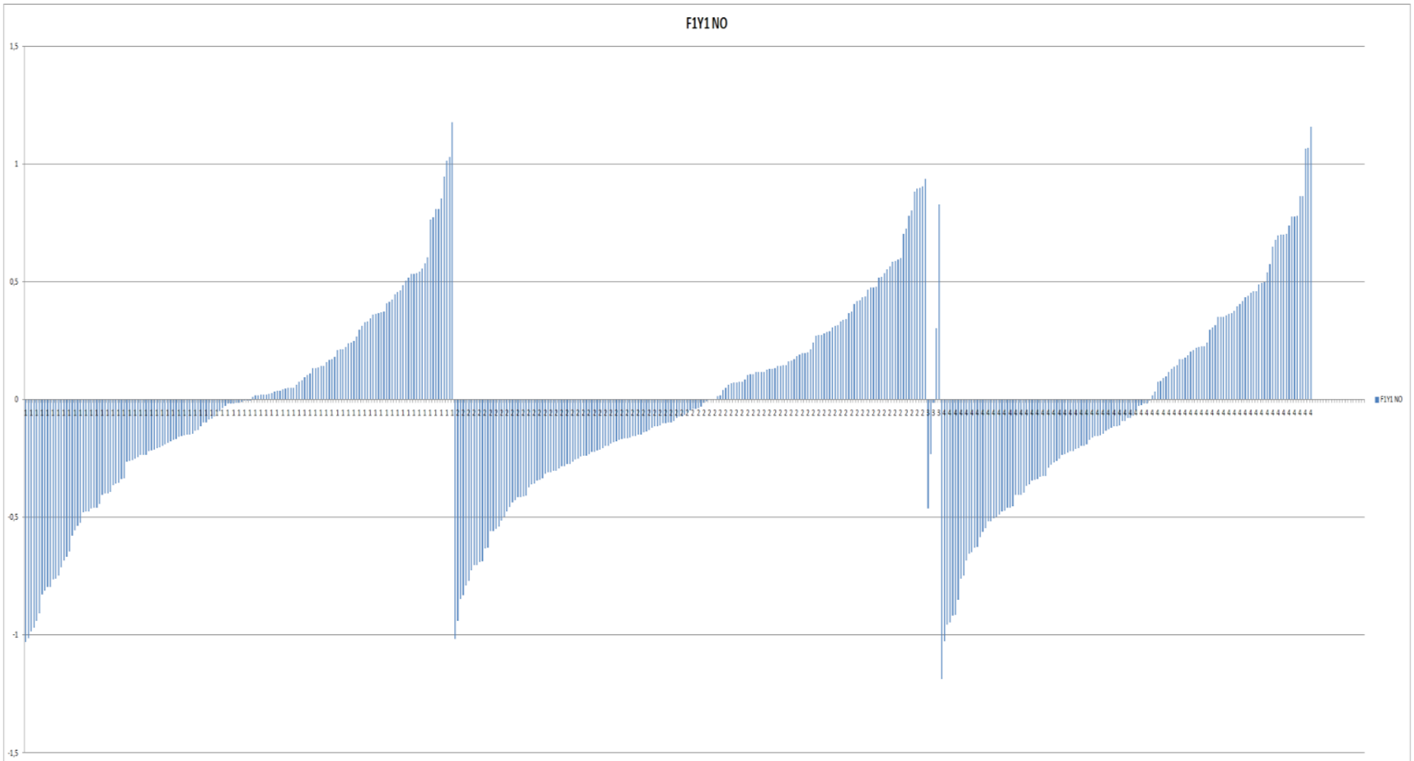

F2Y1
14
12
10
8
6
4
2
0
F2Y1

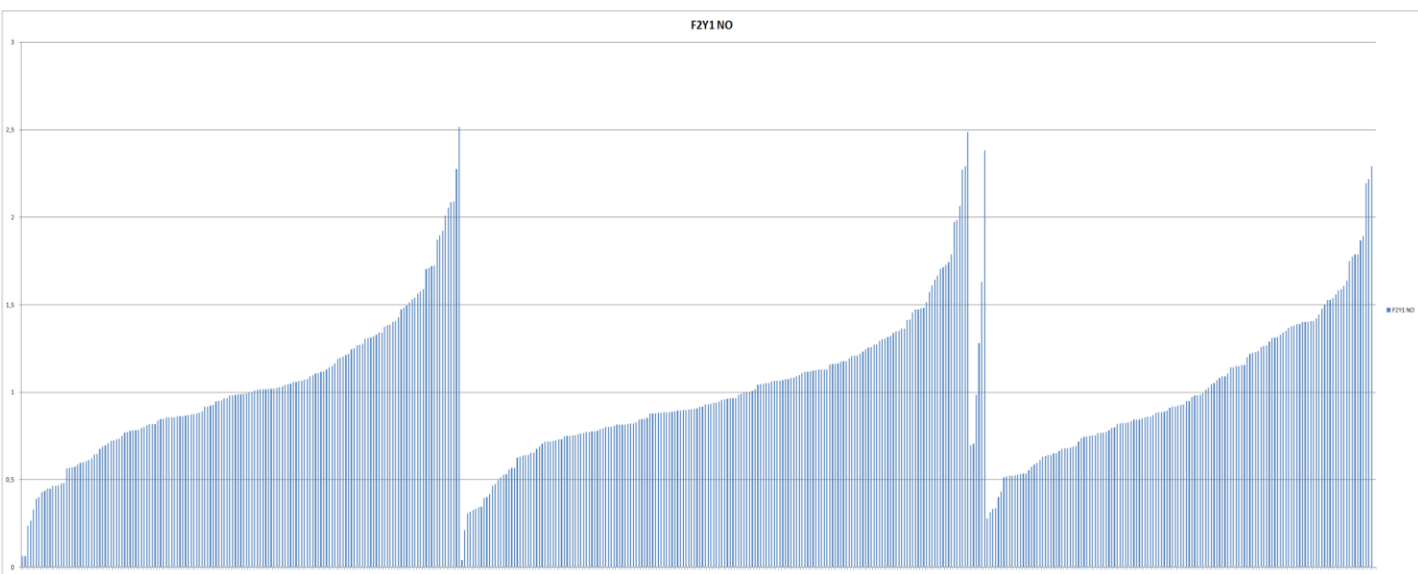
Appendix 6b: Graphing F1Y3NO, F2Y3NO, F1Y1NO and F2Y1NO on the Y-axis and Cournot characteristics on the X-axis.

Cournot Industry - Most left figure
Partial Cournot Industry - Middle figure
No Cournot Industry - Most right figure






F1Y1 NO
1,5
1
0,5
0
-0,5
-1
-1,5
F1Y1 NO


F2Y1 NO
3
2,5
2
1,5
1
0,5
0
F2Y1 NO

Appendix 7a: Kruskal-Wallis test between the four groups of Cournot characteristics of the variables with outliers.

Test Statistics[a,b]

	F1Y1
Chi-Square	1,317
df	3
Asymp. Sig.	,725

a. Kruskal Wallis Test

b. Grouping Variable: CC

Test Statistics[a,b]

	F2Y1
Chi-Square	,893
df	3
Asymp. Sig.	,827

a. Kruskal Wallis Test

b. Grouping Variable: CC

Test Statistics[a,b]

	F1Y3
Chi-Square	4,973
df	3
Asymp. Sig.	,174

a. Kruskal Wallis Test

b. Grouping Variable: CC

Test Statistics[a,b]

	F2Y3
Chi-Square	4,263
df	3
Asymp. Sig.	,234

a. Kruskal Wallis Test

Appendix 7b: Kruskal-Wallis test between the four groups of Cournot characteristics of the variables without outliers. One way ANOVA is applied for F1Y1NO due to its normally distributed datapoints.

ANOVA

F1Y1NO

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,073	3	,024	,128	,944
Within Groups	89,058	467	,191		
Total	89,131	470			

Test Statistics[a,b]

	F1Y3NO
Chi-Square	5,614
df	3
Asymp. Sig.	,132

a. Kruskal Wallis Test

b. Grouping Variable: VAR1

Test Statistics[a,b]

	F2Y1NO
Chi-Square	,910
df	3
Asymp. Sig.	,823

a. Kruskal Wallis Test

b. Grouping Variable: VAR4

Test Statistics[a,b]

	F2Y3NO
Chi-Square	3,695
df	3
Asymp. Sig.	,296

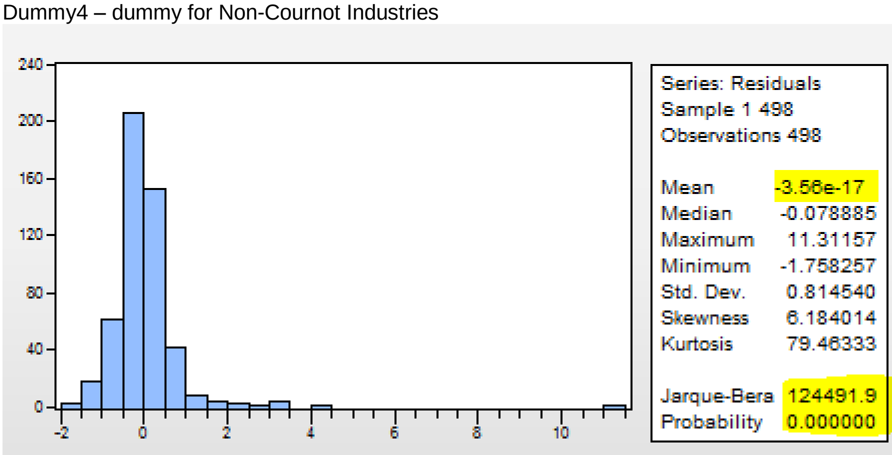
a. Kruskal Wallis Test

b. Grouping Variable: VAR2

Appendix 8a Regressing

F1Y1 = c + b1Dummy1 +b2Dummy2 +b3Dummy3 + error and testing on OLS assumptions for it.

Dummy1 - dummy for Cournot Industries
Dummy2 - dummy for Partial Cournot Industries
Dummy3 – dummy for Slight Cournot Industries
Dummy4 – dummy for Non-Cournot Industries



Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.561996	Prob. F(3,494)	0.6403
Obs*R-squared	1.693859	Prob. Chi-Square(3)	0.6383
Scaled explained SS	65.38966	Prob. Chi-Square(3)	0.0000

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.241244	Prob. F(2,492)	0.1074
Obs*R-squared	4.496190	Prob. Chi-Square(2)	0.1056

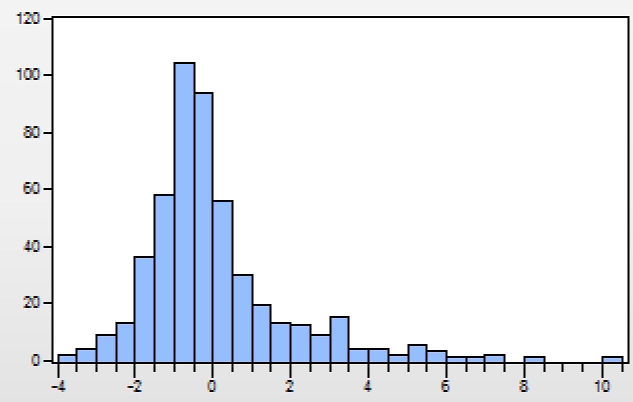
Dependent Variable: F1Y1
Method: Least Squares
Date: 07/10/13 Time: 09:27
Sample: 1 498
Included observations: 498

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.371095	0.333543	1.112588	0.2664
DUMMY_1	-0.281901	0.339626	-0.830035	0.4069
DUMMY_2	-0.389842	0.338851	-1.150481	0.2505
DUMMY_4	-0.357072	0.340516	-1.048620	0.2949

R-squared	0.005278	Mean dependent var	0.030624
Adjusted R-squared	-0.000763	S.D. dependent var	0.816698
S.E. of regression	0.817009	Akaike info criterion	2.441667
Sum squared resid	329.7470	Schwarz criterion	2.475487
Log likelihood	-603.9750	Hannan-Quinn criter.	2.454940
F-statistic	0.873713	Durbin-Watson stat	1.824323
Prob(F-statistic)	0.454543		

Appendix 8b Regressing

F1Y3 = c + b1Dummy1 +b2Dummy2 +b3Dummy3 + error and testing on OLS assumptions for it.



Series: Residuals
Sample 1 498
Observations 498

Mean	3.92e-17
Median	-0.388230
Maximum	10.37775
Minimum	-3.912202
Std. Dev.	1.801785
Skewness	1.727253
Kurtosis	7.718724
Jarque-Bera	709.6494
Probability	0.000000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.203191	Prob. F(3,494)	0.8942
Obs*R-squared	0.613752	Prob. Chi-Square(3)	0.8933
Scaled explained SS	2.028827	Prob. Chi-Square(3)	0.5664

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.037985	Prob. F(2,492)	0.3549
Obs*R-squared	2.092457	Prob. Chi-Square(2)	0.3513

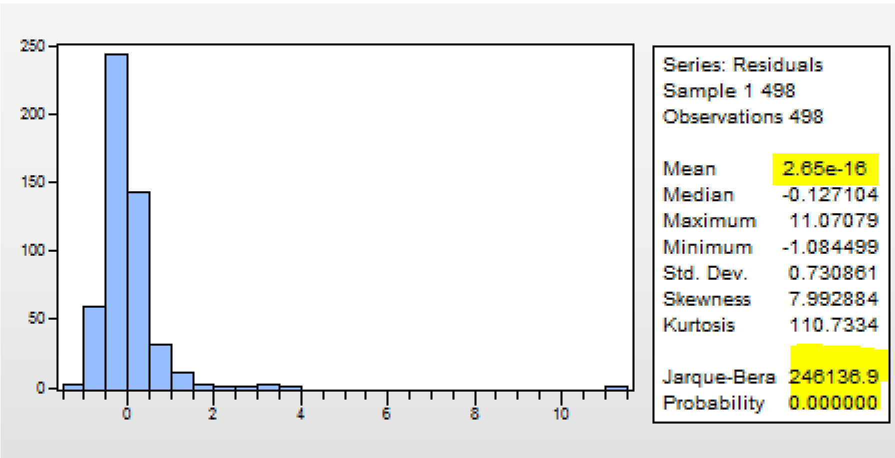
Dependent Variable: F1Y3
Method: Least Squares
Date: 07/10/13 Time: 09:28
Sample: 1 498
Included observations: 498

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.721241	0.737806	-0.977548	0.3288
DUMMY_1	0.748129	0.751262	0.995830	0.3198
DUMMY_2	0.647306	0.749549	0.863594	0.3882
DUMMY_4	0.347716	0.753232	0.461632	0.6445

R-squared	0.009278	Mean dependent var	-0.134159
Adjusted R-squared	0.003261	S.D. dependent var	1.810202
S.E. of regression	1.807248	Akaike info criterion	4.029487
Sum squared resid	1613.476	Schwarz criterion	4.063307
Log likelihood	-999.3423	Hannan-Quinn criter.	4.042760
F-statistic	1.542068	Durbin-Watson stat	1.966418
Prob(F-statistic)	0.202743		

Appendix 8c Regressing

F2Y1 = c + b1Dummy1 +b2Dummy2 +b3Dummy3 + error and testing on OLS assumptions for it.



Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.868734	Prob. F(3,494)	0.4571
Obs*R-squared	2.613516	Prob. Chi-Square(3)	0.4551
Scaled explained SS	141.1006	Prob. Chi-Square(3)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.868734	Prob. F(3,494)	0.4571
Obs*R-squared	2.613516	Prob. Chi-Square(3)	0.4551
Scaled explained SS	141.1006	Prob. Chi-Square(3)	0.0000

Dependent Variable: F2Y1
Method: Least Squares
Date: 07/10/13 Time: 09:43
Sample: 1 498
Included observations: 498

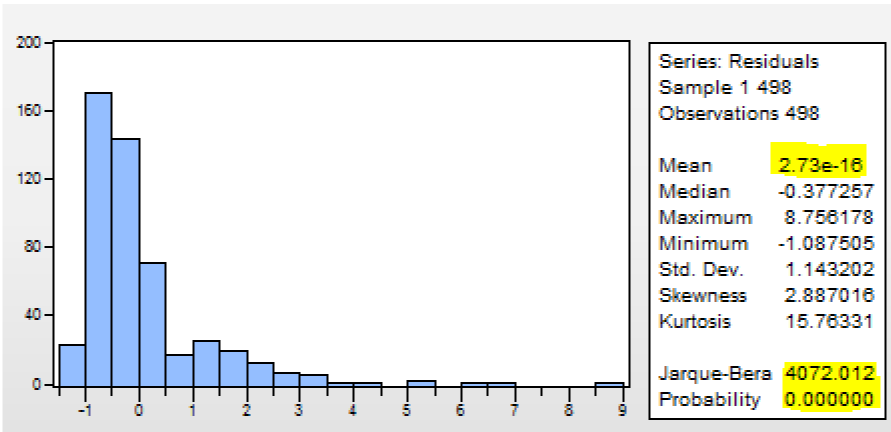
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.279118	0.299277	4.274023	0.0000
DUMMY_1	-0.132879	0.304736	-0.436048	0.6630
DUMMY_2	-0.247123	0.304041	-0.812795	0.4167
DUMMY_4	-0.214692	0.305535	-0.702677	0.4826

R-squared	0.005310	Mean dependent var	1.081613
Adjusted R-squared	-0.000731	S.D. dependent var	0.732809
S.E. of regression	0.733077	Akaike info criterion	2.224867
Sum squared resid	265.4763	Schwarz criterion	2.258687
Log likelihood	-549.9918	Hannan-Quinn criter.	2.238140
F-statistic	0.879008	Durbin-Watson stat	1.748218
Prob(F-statistic)	0.451791		

Appendix 8d

Regressing

F2Y3 = c + b1Dummy1 +b2Dummy2 +b3Dummy3 + error and testing on OLS assumptions for it.



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.008334	Prob. F(2,492)	0.9917
Obs*R-squared	0.016870	Prob. Chi-Square(2)	0.9916

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.514671	Prob. F(3,494)	0.2098
Obs*R-squared	4.539055	Prob. Chi-Square(3)	0.2088
Scaled explained SS	32.96965	Prob. Chi-Square(3)	0.0000

Dependent Variable: F2Y3
Method: Least Squares
Date: 07/10/13 Time: 09:40
Sample: 1 498
Included observations: 498

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.696053	0.468125	1.486896	0.1377
DUMMY_1	0.391540	0.476663	0.821420	0.4118
DUMMY_2	0.339738	0.475576	0.714371	0.4753
DUMMY_4	0.165156	0.477913	0.345578	0.7298

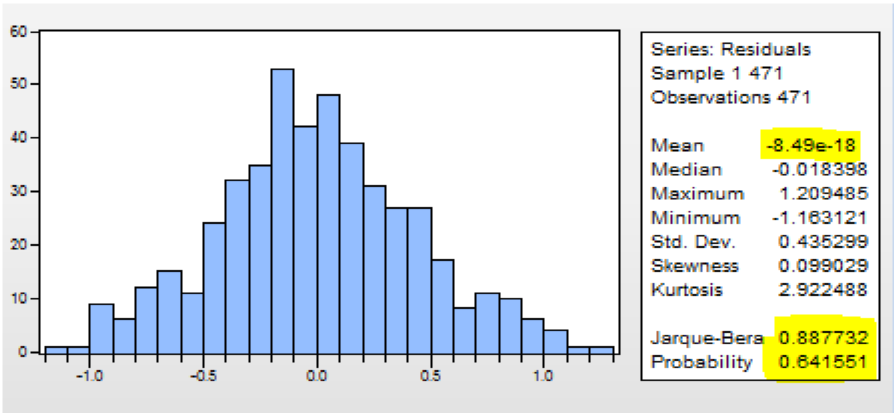
R-squared	0.007304	Mean dependent var	0.998873
Adjusted R-squared	0.001276	S.D. dependent var	1.147400
S.E. of regression	1.146668	Akaike info criterion	3.119597
Sum squared resid	649.5343	Schwarz criterion	3.153417
Log likelihood	-772.7796	Hannan-Quinn criter.	3.132870
F-statistic	1.211596	Durbin-Watson stat	1.987701
Prob(F-statistic)	0.304891		

Appendix 8e

Regressing

F1Y1NO = c + b1F1Y1NOD1 +b2F1Y1NOD2 +b4F1Y1NO3D + error and testing on OLS assumptions for it.

F1Y1NOD1 stands for the dummy1 (Cournot Market) of the variable F1Y1NO. The four variables without outliers all had different quantities of outliers due to the fact that they used a different formula and different data. Therefore variable specific dummies needed to be made.



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1491.812	Prob. F(2,465)	0.0000
Obs*R-squared	407.4921	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.898889	Prob. F(3,467)	0.1289
Obs*R-squared	5.676220	Prob. Chi-Square(3)	0.1285
Scaled explained SS	5.363952	Prob. Chi-Square(3)	0.1470

Dependent Variable: F1Y1_NO
Method: Least Squares
Date: 07/10/13 Time: 12:49
Sample (adjusted): 1 471
Included observations: 471 after adjustments

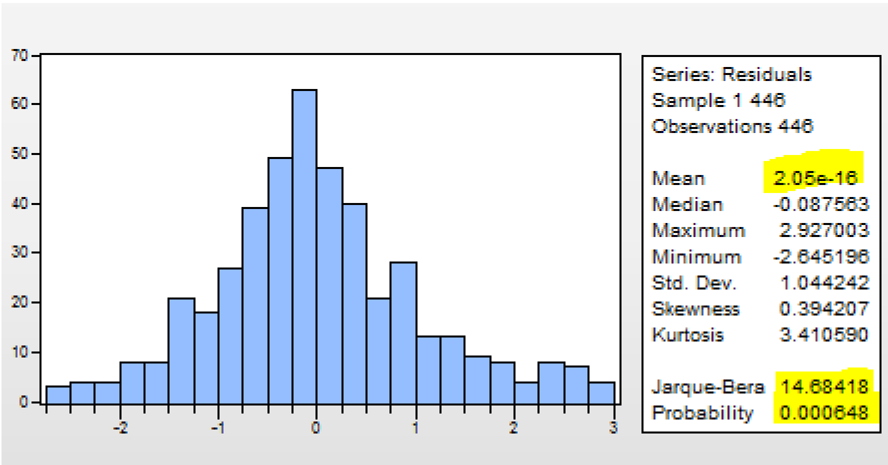
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.082909	0.195296	0.424530	0.6714
F1Y1NOD1	-0.116468	0.198382	-0.587091	0.5574
F1Y1NOD2	-0.103534	0.198098	-0.522641	0.6015
F1Y1NOD4	-0.107708	0.198854	-0.541647	0.5883

R-squared	0.000819	Mean dependent var	-0.025043
Adjusted R-squared	-0.005599	S.D. dependent var	0.435478
S.E. of regression	0.436695	Akaike info criterion	1.189295
Sum squared resid	89.05826	Schwarz criterion	1.224580
Log likelihood	-276.0789	Hannan-Quinn criter.	1.203176
F-statistic	0.127665	Durbin-Watson stat	0.129766
Prob(F-statistic)	0.943681		

Appendix 8f

Regressing

F1Y3NO = c + b1F1Y3NOD1 +b2 F1Y3NOD2 +b3F1Y3NOD4 + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1675.234	Prob. F(2,440)	0.0000
Obs*R-squared	394.2280	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.949958	Prob. F(3,442)	0.4163
Obs*R-squared	2.857242	Prob. Chi-Square(3)	0.4142
Scaled explained SS	3.382324	Prob. Chi-Square(3)	0.3363

Dependent Variable: F1Y3_NO
Method: Least Squares
Date: 07/10/13 Time: 13:14
Sample (adjusted): 1 446
Included observations: 446 after adjustments

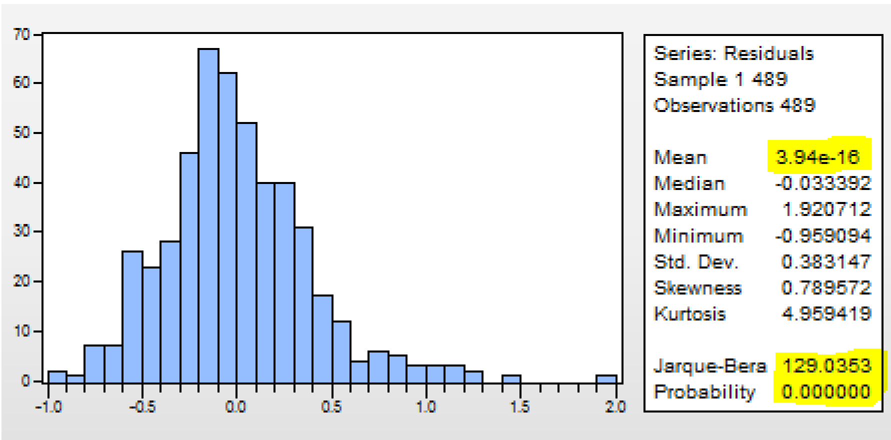
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.242644	0.468582	-0.517826	0.6048
F1Y3NOD1	-0.199187	0.476431	-0.418082	0.6761
F1Y3NOD2	-0.226062	0.475586	-0.475334	0.6348
F1Y3NOD4	-0.488984	0.477717	-1.023586	0.3066

R-squared	0.014917	Mean dependent var	-0.532121
Adjusted R-squared	0.008231	S.D. dependent var	1.052119
S.E. of regression	1.047780	Akaike info criterion	2.940153
Sum squared resid	485.2467	Schwarz criterion	2.976927
Log likelihood	-651.6541	Hannan-Quinn criter.	2.954652
F-statistic	2.231058	Durbin-Watson stat	0.112075
Prob(F-statistic)	0.083912		

Appendix 8g

Regressing

F2Y1NO = c + b1F2Y1NOD1 +b2F2Y1NO D1 +b3F2Y1NOD4 + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	902.2435	Prob. F(2,483)	0.0000
Obs*R-squared	385.7483	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	7.942853	Prob. F(3,485)	0.0000
Obs*R-squared	22.89998	Prob. Chi-Square(3)	0.0000
Scaled explained SS	44.59666	Prob. Chi-Square(3)	0.0000

Dependent Variable: F2Y1_NO
Method: Least Squares
Date: 07/10/13 Time: 13:24
Sample: 1 489
Included observations: 489

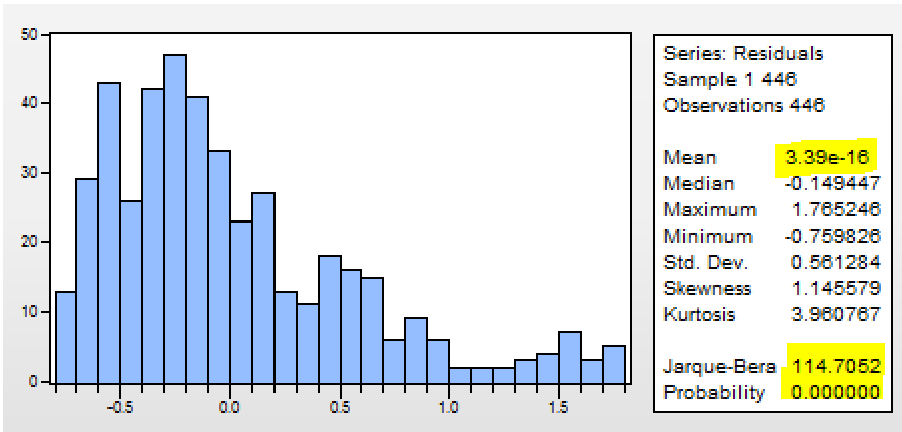
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.459383	0.079120	5.806124	0.0000
F2Y1NOD1	0.561451	0.084788	6.621812	0.0000
F2Y1NOD2	0.465603	0.076051	6.122289	0.0000
F2Y1NOD4	0.597559	0.075550	7.909430	0.0000

R-squared	0.115256	Mean dependent var	1.016323
Adjusted R-squared	0.109783	S.D. dependent var	0.407339
S.E. of regression	0.384330	Akaike info criterion	0.933516
Sum squared resid	71.63914	Schwarz criterion	0.967809
Log likelihood	-224.2447	Hannan-Quinn criter.	0.946985
F-statistic	21.06033	Durbin-Watson stat	0.211780
Prob(F-statistic)	0.000000		

Appendix 8f

Regressing

F2Y3NO = c + b1F2Y3NOD1 +b2F2Y3NOD2 +b3F2Y3NOD4 + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1319.045	Prob. F(2,440)	0.0000
Obs*R-squared	382.2462	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	5.066805	Prob. F(3,442)	0.0018
Obs*R-squared	14.82804	Prob. Chi-Square(3)	0.0020
Scaled explained SS	21.55921	Prob. Chi-Square(3)	0.0001

Dependent Variable: F2Y3_NO
Method: Least Squares
Date: 07/10/13 Time: 13:21
Sample (adjusted): 1 446
Included observations: 446 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.696053	0.229919	3.027379	0.0026
F2Y3NOD1	0.012568	0.234596	0.053571	0.9573
F2Y3NOD2	0.066622	0.233989	0.284721	0.7760
F2Y3NOD4	-0.107093	0.235330	-0.455076	0.6493

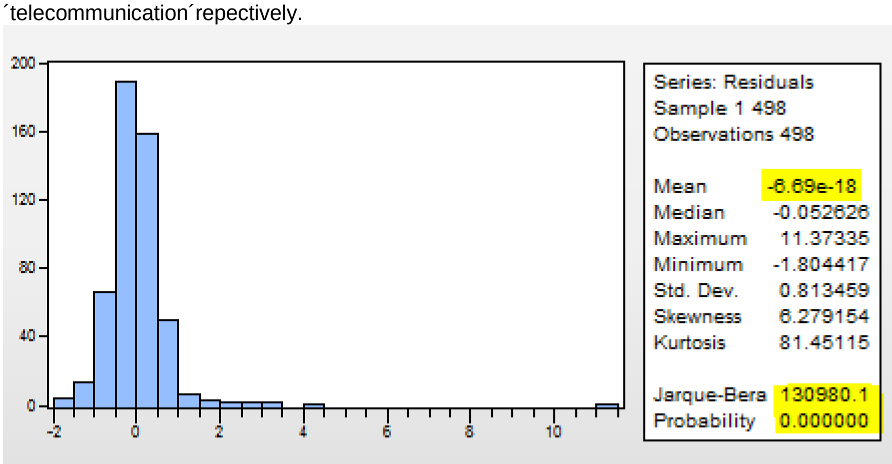
R-squared	0.015542	Mean dependent var	0.695008
Adjusted R-squared	0.008860	S.D. dependent var	0.565697
S.E. of regression	0.563185	Akaike info criterion	1.698512
Sum squared resid	140.1926	Schwarz criterion	1.735286
Log likelihood	-374.7682	Hannan-Quinn criter.	1.713012
F-statistic	2.326048	Durbin-Watson stat	0.145409
Prob(F-statistic)	0.074115		

Appendix 9a

Regressing

F1Y1 = c + b1automobile + b2telecommunication + error and testing on OLS assumptions for it.

The dummies for the automobile industry and the telecommunication industry are displayed as ´automobile´ and ´telecommunication´repectively.



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.186645	Prob. F(2,493)	0.0157
Obs*R-squared	8.316953	Prob. Chi-Square(2)	0.0156

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.149328	Prob. F(2,495)	0.8613
Obs*R-squared	0.300285	Prob. Chi-Square(2)	0.8606
Scaled explained SS	11.93404	Prob. Chi-Square(2)	0.0026

Dependent Variable: F1Y1
Method: Least Squares
Date: 07/10/13 Time: 13:51
Sample: 1 498
Included observations: 498

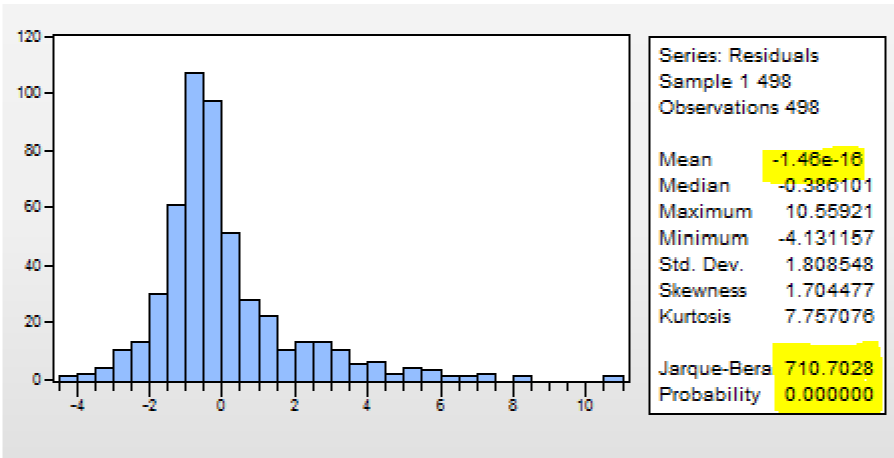
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.027414	0.040012	0.685147	0.4936
AUTOMOBILE	-0.187943	0.143469	-1.309988	0.1908
TELECOMMUNICATION	0.170350	0.124267	1.370835	0.1710

R-squared	0.007916	Mean dependent var	0.030624
Adjusted R-squared	0.003907	S.D. dependent var	0.816698
S.E. of regression	0.815101	Akaike info criterion	2.434995
Sum squared resid	328.8725	Schwarz criterion	2.460360
Log likelihood	-603.3138	Hannan-Quinn criter.	2.444950
F-statistic	1.974807	Durbin-Watson stat	1.716534
Prob(F-statistic)	0.139880		

Appendix 9b

Regressing

F1Y3 = c + b1automobile + b2telecommunication + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	20.39693	Prob. F(2,493)	0.0000
Obs*R-squared	38.05841	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.360511	Prob. F(2,495)	0.0954
Obs*R-squared	4.704762	Prob. Chi-Square(2)	0.0951
Scaled explained SS	15.70429	Prob. Chi-Square(2)	0.0004

Dependent Variable: F1Y3
Method: Least Squares
Date: 07/10/13 Time: 13:41
Sample: 1 498
Included observations: 498

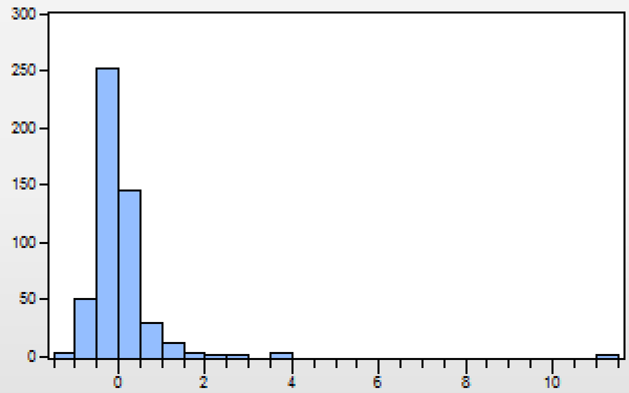
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.154569	0.088957	-1.737568	0.0829
AUTOMOBILE	0.301406	0.318973	0.944926	0.3452
TELECOMMUNICATION	-0.008013	0.276281	-0.029002	0.9769

R-squared	0.001827	Mean dependent var	-0.134159
Adjusted R-squared	-0.002206	S.D. dependent var	1.810202
S.E. of regression	1.812198	Akaike info criterion	4.032964
Sum squared resid	1625.610	Schwarz criterion	4.058329
Log likelihood	-1001.208	Hannan-Quinn criter.	4.042919
F-statistic	0.452976	Durbin-Watson stat	1.468382
Prob(F-statistic)	0.635996		

Appendix 9c

Regressing

F2Y1 =c + b1automobile + b2telecommunication + error and testing on OLS assumptions for it



Series: Residuals
Sample 1 498
Observations 498

Mean	-2.66e-16
Median	-0.101174
Maximum	11.13412
Minimum	-1.042646
Std. Dev.	0.730388
Skewness	8.117723
Kurtosis	113.4036
Jarque-Bera	258390.4
Probability	0.000000

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.638094	Prob. F(2,493)	0.0270
Obs*R-squared	7.243082	Prob. Chi-Square(2)	0.0267

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.100923	Prob. F(2,495)	0.9040
Obs*R-squared	0.202987	Prob. Chi-Square(2)	0.9035
Scaled explained SS	11.27119	Prob. Chi-Square(2)	0.0036

Dependent Variable: F2Y1
Method: Least Squares
Date: 07/10/13 Time: 13:44
Sample: 1 498
Included observations: 498

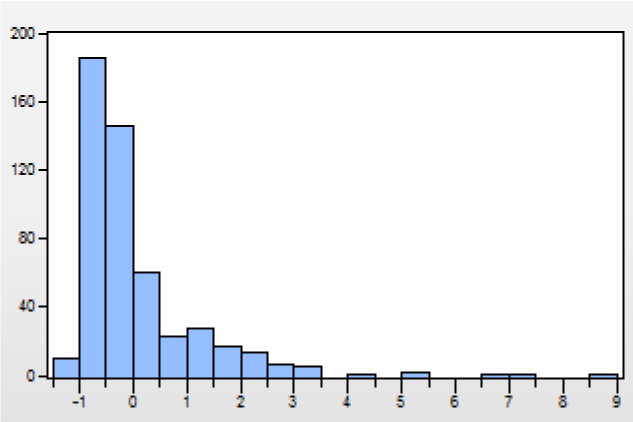
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.082907	0.035926	30.14296	0.0000
AUTOMOBILE	-0.178118	0.128818	-1.382705	0.1674
TELECOMMUNICATION	0.116452	0.111577	1.043689	0.2971

R-squared	0.006596	Mean dependent var	1.081613
Adjusted R-squared	0.002583	S.D. dependent var	0.732809
S.E. of regression	0.731862	Akaike info criterion	2.219556
Sum squared resid	265.1329	Schwarz criterion	2.244921
Log likelihood	-549.6695	Hannan-Quinn criter.	2.229511
F-statistic	1.643418	Durbin-Watson stat	1.742090
Prob(F-statistic)	0.194371		

Appendix 9d

Regressing

F2Y3 = c + b1automobile + b2telecommunication + error and testing on OLS assumptions for it



Series: Residuals	
Sample 1 498	
Observations 498	
Mean	2.67e-16
Median	-0.383020
Maximum	8.840506
Minimum	-1.154748
Std. Dev.	1.145374
Skewness	2.925397
Kurtosis	16.09740
Jarque-Bera	4269.802
Probability	0.000000

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.801769	Prob. F(2,493)	0.4491
Obs*R-squared	1.614549	Prob. Chi-Square(2)	0.4461

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.279784	Prob. F(2,495)	0.7561
Obs*R-squared	0.562323	Prob. Chi-Square(2)	0.7549
Scaled explained SS	4.193819	Prob. Chi-Square(2)	0.1228

Dependent Variable: F2Y3
Method: Least Squares
Date: 07/10/13 Time: 13:47
Sample: 1 498
Included observations: 498

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.003266	0.056338	17.80808	0.0000
AUTOMOBILE	0.166912	0.202009	0.826262	0.4091
TELECOMMUNICATION	-0.167280	0.174972	-0.956039	0.3395

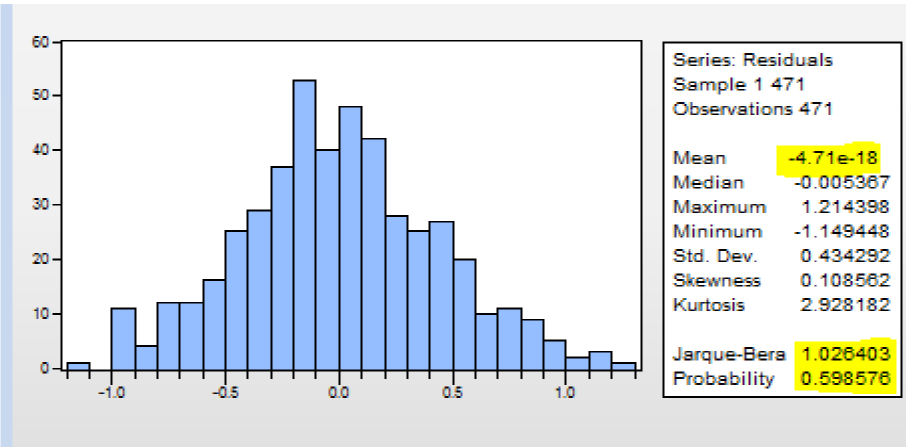
R-squared	0.003528	Mean dependent var	0.998873
Adjusted R-squared	-0.000498	S.D. dependent var	1.147400
S.E. of regression	1.147685	Akaike info criterion	3.119377
Sum squared resid	652.0048	Schwarz criterion	3.144742
Log likelihood	-773.7249	Hannan-Quinn criter.	3.129332
F-statistic	0.876359	Durbin-Watson stat	1.885986
Prob(F-statistic)	0.416941		

Appendix 9e

Regressing

F1Y1NO = c + b1autoF1Y1NO + b2teleF1Y1NO + error and testing on OLS assumptions for it

AutoF1Y1NO is the dummy for the automobile industry. . The four variables without outliers all had different quantities of outliers due to the fact that they used a different formula and different data. Therefore variable specific dummies needed to be made.



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1399.678	Prob. F(2,466)	0.0000
Obs*R-squared	403.7834	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.269741	Prob. F(2,468)	0.0389
Obs*R-squared	6.490705	Prob. Chi-Square(2)	0.0390
Scaled explained SS	6.178168	Prob. Chi-Square(2)	0.0455

Dependent Variable: F1Y1_NO
Method: Least Squares
Date: 07/10/13 Time: 14:54
Sample (adjusted): 1 471
Included observations: 471 after adjustments

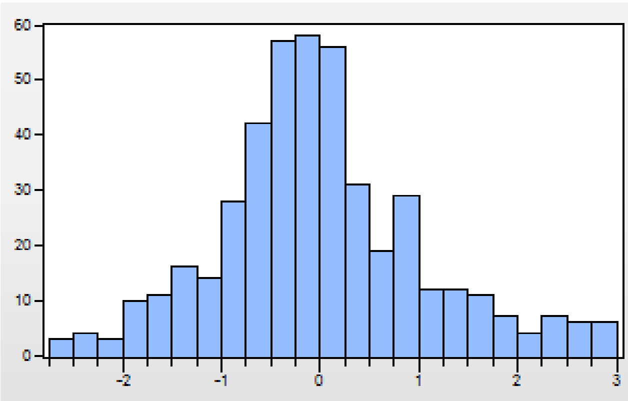
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.038472	0.021982	-1.750173	0.0807
AUTOF1Y1NO	0.047450	0.077809	0.609825	0.5423
TELEF1Y1NO	0.104711	0.068501	1.528592	0.1270

R-squared	0.005441	Mean dependent var	-0.025043
Adjusted R-squared	0.001191	S.D. dependent var	0.435478
S.E. of regression	0.435219	Akaike info criterion	1.180412
Sum squared resid	88.64630	Schwarz criterion	1.206876
Log likelihood	-274.9870	Hannan-Quinn criter.	1.190823
F-statistic	1.280254	Durbin-Watson stat	0.141740
Prob(F-statistic)	0.278938		

Appendix 9f

Regressing

F1Y3NO = c + b1autoF1Y3NO + b2teleF1Y3NO + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1578.036	Prob. F(2,441)	0.0000
Obs*R-squared	391.3205	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.097604	Prob. F(2,443)	0.1240
Obs*R-squared	4.183995	Prob. Chi-Square(2)	0.1234
Scaled explained SS	5.185387	Prob. Chi-Square(2)	0.0748

Dependent Variable: F1Y3_NO
Method: Least Squares
Date: 07/10/13 Time: 14:58
Sample (adjusted): 1 446
Included observations: 446 after adjustments

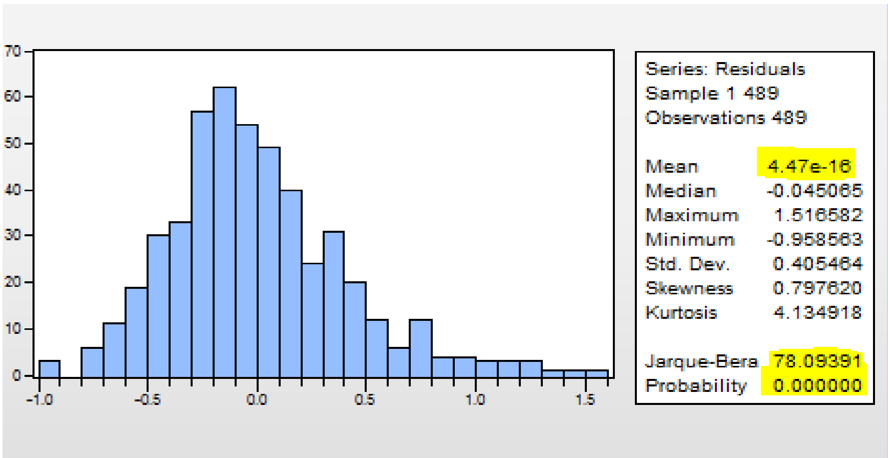
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.539071	0.054520	-9.887532	0.0000
AUTOF1Y3NO	0.043884	0.203241	0.215922	0.8291
TELEF1Y3NO	0.042483	0.169782	0.250219	0.8025

R-squared	0.000227	Mean dependent var	-0.532121
Adjusted R-squared	-0.004286	S.D. dependent var	1.052119
S.E. of regression	1.054372	Akaike info criterion	2.950471
Sum squared resid	492.4828	Schwarz criterion	2.978051
Log likelihood	-654.9550	Hannan-Quinn criter.	2.961345
F-statistic	0.050335	Durbin-Watson stat	0.117956
Prob(F-statistic)	0.950916		

Appendix 9f

Regressing

F2Y1NO = c + b1autoF2Y1NO + b2teleF2Y1NO + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	973.4781	Prob. F(2,484)	0.0000
Obs*R-squared	391.6408	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.255646	Prob. F(2,486)	0.1059
Obs*R-squared	4.497392	Prob. Chi-Square(2)	0.1055
Scaled explained SS	6.963245	Prob. Chi-Square(2)	0.0308

Dependent Variable: F2Y1_NO
Method: Least Squares
Date: 07/10/13 Time: 15:01
Sample: 1 489
Included observations: 489

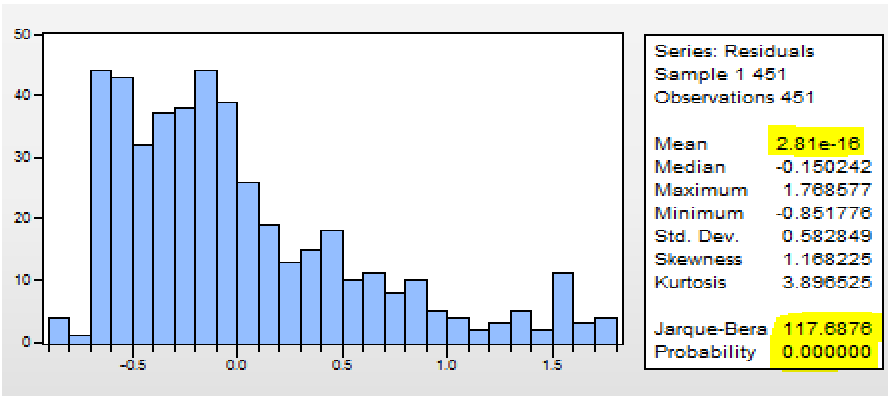
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.998824	0.020139	49.59542	0.0000
AUTOF2Y1NO	0.107022	0.071569	1.495366	0.1355
TELEF2Y1NO	0.102370	0.062593	1.635488	0.1026

R-squared	0.009184	Mean dependent var	1.016323
Adjusted R-squared	0.005107	S.D. dependent var	0.407339
S.E. of regression	0.406298	Akaike info criterion	1.042656
Sum squared resid	80.22790	Schwarz criterion	1.068376
Log likelihood	-251.9294	Hannan-Quinn criter.	1.052758
F-statistic	2.252504	Durbin-Watson stat	0.207174
Prob(F-statistic)	0.106232		

Appendix 9g

Regressing

F2Y3NO = c + b1autoF2Y3NO + b2teleF2Y3NO + error and testing on OLS assumptions for it



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1423.181	Prob. F(2,446)	0.0000
Obs*R-squared	389.9053	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.046032	Prob. F(2,448)	0.1305
Obs*R-squared	4.082180	Prob. Chi-Square(2)	0.1299
Scaled explained SS	5.833676	Prob. Chi-Square(2)	0.0541

Dependent Variable: F2Y3_NO
Method: Least Squares
Date: 07/10/13 Time: 15:05
Sample (adjusted): 1 451
Included observations: 451 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.692801	0.030045	23.05853	0.0000
AUTOF2Y3NO	0.184332	0.110802	1.663620	0.0969
TELEF2Y3NO	0.071319	0.094012	0.758613	0.4485

R-squared	0.006978	Mean dependent var	0.711863
Adjusted R-squared	0.002545	S.D. dependent var	0.584893
S.E. of regression	0.584148	Akaike info criterion	1.769306
Sum squared resid	152.8707	Schwarz criterion	1.796655
Log likelihood	-395.9785	Hannan-Quinn criter.	1.780084
F-statistic	1.574013	Durbin-Watson stat	0.143200
Prob(F-statistic)	0.208356		