Seasonal Anomalies:

The Case of the Forex Market

By Joshua Savage

Introduction

According to the efficient markets hypothesis, market prices fully reflect all available information and prices are likely to be moving towards their equilibrium value in the long run. Schwert (2003) argues that if the market prices are in disequilibrium, then arbitrageurs will trade until prices become efficient. As a simple example, suppose a highly successful company, let’s say Apple, was priced below its market value. Investors would purchase the stock and bid up Apple’s shares given that they feel that the shares are undervalued. This would cause the price of Apple to start rising as more and more people started trying to buy the stock. In the long term this would cause the price of Apple to be in equilibrium and fully reflect the market information. That’s not to say that every day the price of Apple will be at its equilibrium price, but that people will arbitrage away the short term inefficiencies eventually causing the stock to be informationally efficient. The theory is simple enough to understand but leaves us with the question, does it hold up? One such curious example is the case of seasonal anomalies. In a paper written by Lakonishok and Smidt (1988), returns in the United States stock market are examined at the different time periods such as the end of the month, last day of the week and the first day of the week, holidays in which the stock market close and a few more. What they find is very contrary to what the efficient markets theory suggests. They find that over the time periods that they studied that returns exhibit distinct patterns. Again, this isn’t over a short period of time either as the authors study a period of ninety years. If the markets are efficient then this should never happen. Lakonishok and Smidt (1988) were not the only researchers to discover such anomalies. Keim (1984), Ariel (1985), and Cadsby (XXXX) show results that offer the same conclusion, that the returns in the stock markets were higher centered around certain and/or times of year. The data even suggested this is not an artifact in American markets but the anomalies exist in international markets as well. Since this is an international phenomenon it would be reasonable to think that it spills over into the currency exchange rate markets. Research in this area, however, is rather scarce as, to date, equity markets have received all the attention. To my knowledge, there isn’t any pre-existing research to rely on that examines these types of anomalies in the foreign exchange market. The objective of my study to provide some insight into anomalous or seasonal patterns in currency markets by as two research questions. First, and most important, do seasonal anomalies prevail across different currency pairs? Second, are stock markets and currency exchange rate markets as connected as they would seem to be? Admittedly, prior research does seem to provide some insight to the latter question. For instance, Dilrukshan and Simpson (2009) expound in their paper, “The interaction between exchange rates and stock prices: An Australian context”, that there only exists a loose relationship and that the stock market and exchange rates markets often are not in agreement. On the other hand, Granger, Huang and Yang (1998) wrote in there paper, A bivariate causality between stock prices and exchange rates: evidence from recent Asian flu (1998), that both markets are very correlated and that the exchange rate market leads the stock market. In my paper I hope to be able to resolve the disagreement and to see if seasonal anomalies prevail across different countries markets. This paper is going to be looking to replicate the research done by Lakonishok and Smidt (1988) except instead of using the stock market like they did use the currency exchange rate markets. I will examine the end of the week returns, end of the month returns, Christmas and Easter holidays, and the day before labor statistics are announced. Lakonishok and Smidt (1988) conducted their research on the end of the week and end of the month effects as well as different holidays but these same holidays will not be used because of the nature of currency exchange markets. Holidays are going to be different from one country to another with only a few exceptions therefore it wouldn’t make sense to use Presidents day while comparing the currency exchange rate of two countries that are not the United States. More reasoning will be discussed below in the paper.

The results of this paper will prove to be very interesting. I will show that the trends that prevail in the stock markets do not hold up in the currency exchange rate markets. Even more interesting in one of the few cases where it does show that is statistically significant for the same study it shows the returns are opposite of what is happening in the stock market.

The rest of this paper will have the following format, it will start by discussing the data, where I got it, what I did with it and how I got what I got. Next will come the tabular data. It will have my findings in tables explaining what you are looking at. I will have this for each study conducted. After that I will have a results section, discussing the results of for each study in depth. Lastly I will have a conclusion that will sum up what has been found.

The Data

Collecting correct data and manipulating it correctly is an important step in the process. If done incorrectly, the results would become non-consequential. The first step I took was to figure out the currency pairs I would use. Currently there are 118 actively traded currency pairs, far too many for this study. Of these pairs, the four most traded are the United States dollar, the Euro, the British pound and the Japanese yen. For this reason I chose three different pairs, the EURUSD (Euro to the United States dollar), the USDJPY (United States dollar to the Japanese yen) and the GBPJPY (British pound to the Japanese yen). These are three of the most commonly traded currency pairs in terms of volume. Collecting the data was simple. I went into Bloomberg and exported the historic daily prices. Because currency markets haven’t been traded on an open exchange for as long as the stock market my data only goes back to the 70’s, when these markets first opened. The total number of observations for each currency pair were the following, the GBPJPY and USDJPY had 11,531 observations each and the EURUSD had 10,380. Both the USDJPY and the GBPJPY opened for trading at the beginning of the year 1971, a few years earlier than the EURUSD, which opened beginning of the year 1975. Because of this, when manipulating the data, I set the position where the data wasn’t available to blank instead of just reading zero, otherwise it would have read the data as price of zero and returns of zero instead of omitting those dates and would have skewed the data. After exporting this information, I used sas to first organize the data by date and then creating a lag variable in order to calculate daily returns. Once that was set up I assigned dummy variables to signify certain dates that I wanted to isolate to then be able to compare returns of these dates to the returns of all other dates in the data. I did this for each different study. In order to do the analysis to compare the results the last thing I did was for each study I ran a proc t-test in sas to find the information needed. From there I had all I needed to make the tables in the next section.

Tabular Data

Table 1

Turn of the month

This table shows the daily returns for the currency pairs GBPJPY (pound to yen), EURUSD (euro to the dollar) and the USDJPY (dollar to the yen). The table shows the mean returns at the turn of the month to see if there exists an opportunity to arbitrage. The turn of the month is defined as the last day of the month and the first three days of the following month. I took the mean of those four days and the corresponding t-statistic (in parentheses) and compared returns to zero

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| Table 1 Turn of the Month | | | |
| Currency Pair | Mean | Standard Deviation | Standard Error |
| GBPJPY | -0.00012  (-0.68) | 0.00727 | 0.000173 |
| EURUSD | -0.00007  (-0.43) | 0.00628 | 0.000171 |
| USDJPY | -0.00009  (-0.61) | 0.00642 | 0.000151 |

Table 2

Turn of the week

This table shows the daily mean returns for the currency pairings GBPJPY (pound to yen), EURUSD (euro to the dollar) and the USDJPY (dollar to the yen). The table shows the mean returns during the turn of the week period. For this study Sunday and Friday are being analyzed separately. In the currency markets, the market is open from Sunday afternoon to Friday afternoon and do not have any closings in between, which is why Sunday to Friday has been selected. T-statistics are shown in parentheses. I also include both standard errors and standard deviations for the corresponding days.

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| Table 2 Turn of the Week | | | | | | |
| Currency Pair | Sunday Mean | Sunday Standard Deviation | Sunday Standard Error | Friday Mean | Friday Standard Deviation | Friday Standard Error |
| GBPJPY | 0.000241  (1.45) | 0.00727 | 0.000166 | 0.000054  (0.33) | 0.00727 | 0.000166 |
| EURUSD | 0.000271  (1.61) | 0.00628 | 0.000169 | 0.000186  (1.11) | 0.00628 | 0.000168 |
| USDJPY | 0.000144  (0.99) | 0.00642 | 0.000146 | -0.00051  (-3.47) | 0.00642 | 0.000146 |

Table 3

Christmas to New Year

This table shows the daily mean returns for the currency pairs GBPJPY (pound to yen), EURUSD (euro to the dollar) and the USDJPY (dollar to the yen). The table shows the mean returns during the Christmas holiday period. For this study the Christmas holiday was defined as December 25th to December 31st. T-statistics are again reported in parentheses. I have also included both standard deviations and standard errors relating to the mean returns.

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| Table 3 Christmas to New Year | | | |
| Currency Pair | Mean | Standard Deviation | Standard Error |
| GBPJPY | -0.00077  (-2.23) | 0.00726 | 0.000453 |
| EURUSD | -0.00043  (-0.95) | 0.00628 | 0.000452 |
| USDJPY | 0.000306  (0.76) | 0.00642 | 0.000400 |

Table 4

Day before United States Labor reports

This table shows the daily mean returns for the currency pairs GBPJPY (pound to yen), EURUSD (euro to the dollar) and the USDJPY (dollar to the yen). The table shows the mean returns on the day before the United States releases labor reports. For this study, the time period was the day before labor reports were released, so normally the day before the first Thursday of every month. I report both standard deviations and standard errors associated with the daily mean returns as well as t-statistics in parentheses.

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| Table 4 Day before United States Labor Reports | | | |
| Currency Pair | Mean | Standard Deviation | Standard Error |
| GBPJPY | -0.00034  (-1.07) | 0.00727 | 0.000317 |
| EURUSD | -0.00017  (-0.52) | 0.00628 | 0.000320 |
| USDJPY | -0.00088  (-3.14) | 0.00642 | 0.000280 |

Table 5

Easter Weekend

This table shows the daily mean returns for the currency pairs GBPJPY (pound to yen), EURUSD (euro to the dollar) and the USDJPY (dollar to the yen). The Table shows the mean surrounding Easter weekend. In this table, the time period was the Friday, Saturday and Sunday of Easter weekend. As before, I have included standard deviations and standard errors associated with the mean returns. I have also included t-statistics in parentheses.

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| Table 5 Easter Weekend | | | |
| Currency Pair | Mean | Standard Deviation | Standard Error |
| GBPJPY | -0.00038  (-0.35) | 0.00727 | 0.00107 |
| EURUSD | -0.00082  (-0.15) | 0.0286 | 0.00541 |
| USDJPY | -0.00034  (-0.36) | 0.00642 | 0.000948 |

Turn of the month results

Now that we have looked at the tables I am going to analyze the results. In order to do this, it is necessary to pull in and compare information from the Lakonishok and Smidt (1988) paper. First we are going to analyze the turn of the month statistics. In Lakonishok and Smidt’s (1988) paper, they report that the returns at the turn of the month, as described in the tables, were abnormally high. We should expect that pairings with the United States dollar to act the same. The null hypothesis then is that the returns will not be different at the turn of the month than during more normal time periods while the alternate hypothesis is the opposite. Let’s take a look at the results in the currency markets.

Table 1 shows that for the GBPJPY, EURUSD and the USDJPY they respectively have mean abnormal returns of -0.00012, -0.00007 and -0.00009. These returns are not statistically significant as they respectively have t-statistics of -0.68, -0.43 and -0.61. In order to be significantly different from zero at the .05 level, we would expect the t-statistics to have a value of 1.96 and higher or -1.96 and lower. Relative to the mean returns, both the standard deviation and the standard error are very high signaling that the estimated mean is not precise and different than zero.

The conclusion in this first set of tests then is we fail to reject the null hypothesis for all pairings. This is surprising given that in the stock market the opposite conclusion was reached. This may indicate that the currency markets and the stock market are not very correlated. Our results are, in fact, very interesting that this is the case.

Notably the standard deviation for the currency markets are all considerably lower than those for the stock market. This signifies that the currency markets experience less volatility in returns for this particular time period than the stock market.

Turn of the week results

Now we turn to the turn of the week effects. This particular study is very peculiar. According to Lakonishok and Smidt (1988), as well as studies done by others such as Donald B. Keim from the University of Pennsylvania and Charles Bram Cadsby of University of Guelth, returns statistically vary depending on the day of the week. The two days that were the most significant were Friday and Monday. Mondays had statistically low returns and Fridays had statistically high returns. Seeing that this trend prevailed throughout the United States stock market, we should expect that returns in currency pairs that are tied to the United States dollar to be affected in a similar way. Therefore, the null hypothesis is that for both Friday and Sunday that returns will not be different than for the rest of the days of the week. With that said, let’s take a look at the results in the currency markets.

Table 2 shows that the Sunday mean returns for the GBPJPY, EURUSD and USDJPY, respectively, are 0.000241, 0.000271 and 0.000144. The t-statistics of all three of these were in between -1.96 and 1.96 showing that none of these returns are statistically significant. The Friday means are respectively 0.000054, 0.000186 and -0.00051. For Friday, neither the GBPJPY nor the EURUSD are statistically significant but the USDJPY is statistically significant. This means that there might be an arbitrage opportunity by trading the USDJPY short every Friday. This return annualized would be 14.86% returns above market returns. This, of course, is not a strategy that could be taken every day and so instead of annualizing it, if you were to trade this every Friday, it would have returns of 2.65%.

These results are a little bit surprising in that not all United States dollar pairings are statistically significant and that the one pair that is significant is only significant on Friday and not on Sunday. We were able to reject the null for only Friday returns on the USDJPY pair. What is more surprising is that, according to Lakonishok and Smidt (1988), Friday returns in the stock market are positive the USDJPY returns are negative. In other words, it is profitable to go long on the United States stock market Friday while it is profitable to go short on the USDJPY. This is surprising because as the United States dollar strengthens, the spot price of the USDJPY increases as well because it is comparing it to the yen in that way.

Other notable statistics are that the standard deviation for Friday returns are generally similar but for the beginning of the week returns the standard deviation is smaller on average than for the currency markets than the stock market. That means that the returns have less volatility for the beginning of the week in the currency markets than the stock market and is about the same for the end of the week.

Christmas Holidays Results

Now let’s look at the Christmas holiday returns. According to Lakonishok and Smidt (1988) the inter-holiday returns, as denoted by Lakonishok and Smidt (1988), were very high. Higher than any other time of the year in fact. Christmas is a holiday that generally produces more spending than other times of the year. This explanation is one of the reasons that it is believed that the stock market does so well during this time of the year. Another potential reason the market does so well is because consumer optimism is believed to be high as well. That would lead us to believe that the currency markets would reflect this. For this part of the analysis the null is that the returns during the holidays are the same as during the year and the alternative is that they are different. Let’s look at the results.

The mean returns for the GBPJPY, EURUSD and the USDJPY respectively are -0.00077, -0.00043 and -0.000306. The EURUSD and USDJPY pairings returns are not statistically significant but the GBPJPY returns are significant with a t-statistic of -2.23. The mean return annualized would be 22.02%. This means that by shorting this position, the annualized return would be equal to 22.02% above market returns.

For the EURUSD and the USDJPY we fail to reject the null but in the case of the GBPJPY we do in fact reject the null. Although the stock market in the United States sees very high returns during this time of year it is not reflected at all in the currencies paired with the United States. The reason for this is unclear. The reason might have something to do with spending habits and consumer confidence in other countries as well, but that is all speculation and there are very possibly many variables in play.

Looking at the standard deviation for this particular study we see the same as in previous results. The standard deviation for the currency markets are lower than that of the stock market. This is telling us that the returns during the Christmas holidays are less volatile than the returns found in the stock market.

Day before labor market announcement results

The day before the labor reports are announced is an interesting test case. This particular study was not done by Lakonishok and Smidt (1988). It is included though because labor reports tend to make the currency markets move. Historically, the United States economy has had steady growth and one of the key indicators for this is the labor reports, this should indicate that currency pairs paired with the United States dollar to show the dollar strengthening. The null hypothesis is that the returns on the day before labor reports are announced are not different than any other day and the alternative is that they are different. Let’s take a look at the results.

The mean returns for the GBPJPY, EURUSD and the USDJPY respectively are -0.00034, -0.00017 and -0.00088. For this study, the GBPJPY and the EURUSD returns were not statistically significant with t-statistic not reaching 1.96. On the other hand for the USDJPY is statistically significant with a t-statistic of -3.14. The annualized cumulative abnormal returns for this strategy is 25.17% above market returns. The number of days where this strategy could be utilized is 12 because the labor report is announced once a month. If utilized, this strategy has averaged over a year cumulative returns of 1.06%.

For the GBPJPY and the EURUSD we fail to reject the null and for the USDJPY we can reject the null hypothesis. These results are very interesting. Historically, labor reports have on average been positive, yet the results tell us that the day before the dollar weakens and that going short for the USDJPY yields abnormally high returns. I suspect that the uncertainty surrounding the announcement is the reason for this but it is still unclear as to why.

For this particular study I do not have a standard deviation from the stock market to compare against the standard deviation in the currency markets. That being said the standard deviation in this study, for all the pairs, is below 1. This generally means that the returns are not very volatile.

Easter weekend results

Similar to the day before labor reports announcement study, this is a study that Lakonishok and Smidt did not do. This study though, is similar to the study done on the Christmas holidays. These two holidays are arguably the two biggest in the Christian world. The reasoning for conducting this study is that Easter is generally a solemn holiday for most of the Christian world and would suggest that if there exists abnormalities in the market returns then they should be lower than normal. The null hypothesis is that returns are not different than the rest of the year and the alternative hypothesis is that returns are different. Let’s look at the data.

The mean returns for the GBPJPY, EURUSD and the USDJPY respectively are -0.00038, -0.00082 and -0.00034. In this instance none of the returns were not statistically significant failing to reach a t-statistic of 1.96.

In all cases, we fail to reject the null hypothesis. It appears that Easter does not have a statistically significant effect on the currency markets. Similar to the study done on the day before labor reports are announced, I do not have comparable statistics in the stock market done by Lakonishok and Smidt (1988). The standard deviation for this study is also under 1 and has the lowest standard deviation of all the studies done in this paper signaling that this holiday has the least volatility in returns.

Conclusion

This paper examines whether or not seasonal anomalies, that have been shown to consistently show up in equity markets throughout the world, prevails in the currency exchange rate market and, in the process, determines whether the currency exchange rate markets and the stock market had a strong correlation or not. The results in this paper were, for the most part, conclusive. For most of the currency pairings, the seasonal patterns that prevailed so much in equity markets did not prevail in the exchange rate markets. That being said, there were some exceptions, and these exceptions did provide some very interesting information. In total I examined three different currencies pairs in five different studies and only three were statistically significant, the USDJPY Friday returns, the GBPJPY Christmas holidays returns and the USDJPY day before labor force announcements. The most interesting of the three was the USDJPY Friday returns. As discussed in the results portion of the weekend effect, the USDJPY returns were negative as compared to the mean returns signaling an opportunity to short sell the pair. This is very interesting because the dollar seems to be weakened on this day. According to Lakonishok and Smidt (1988), the United States stock market strengthens on Friday yet the United States dollar weakens on this pair on Friday. This signals that there is disequilibrium between the stock market and the currency exchange rate market. The evidence says that not only do only three of fifteen cases hold up when examining exchange rates but that one of those cases is actually the opposite of what happen in the equity market.

As stated in the introduction of this paper, in the long term, the efficient markets theory says that prices will reflect all available since short term inefficiencies will be arbitraged away. It appears that this is more the case in the foreign exchange markets than in the equity markets. It also seems that the currency markets and the equity markets of the same country whose pairs are being traded are not directly tied together and do stray from one another. This accounts for long term trends as well given that this study looked back into the seventies when the exchange rate markets opened. Looking at the results from a logical point of view, my findings suggest that, perhaps, markets have become more efficient over time. Given that there are certain seasonal anomalies that would exist in equity markets but not in currency markets indicates that the two markets are not tightly correlated, which is consistent with the findings in Dilrukshan and Simpson (2009).