

The weekend effect

How does it influence stock returns

Author: Peter Coenen

ANR: 967509

Supervisor: B. Düzce

Introduction

In 1929 there was a stock market crash on Wall Street. It started on Thursday 24th October with a loss of 11%. On Friday it looked like the market was stabilizing and that it was just a one day event. On Monday the 28th however, the market crashed again, losing almost 13% of the value. These events show that the non-trading days of the weekend can have a large influence on how the stocks market behaves on Mondays and even though this was just an extreme and exclusive event, there is some evidence that the weekend has a stable (though less extreme) effect on the behavior of the stock market, which is applicably called the weekend effect.

In a perfect world, all people are perfectly rational. When buying a product, people have perfect information and they are capable of flawlessly process all the information. With these abilities they make the undeniable optimal choice. In this case, people would be able to analyze all the options and would be able to foresee every benefit and problem that goes with any choice they make. We, however, don't live in such a world.

According to Simon (1982) there are two main factors that keep us from reaching this kind of perfect world. In the first place, the human brain would be incapable of processing all the information and translate it into rational behavior and secondly we don't have access to the complete set of choices and their consequences. In the perfect world, the value of a stock would be based on the discounted present value of all dividend payments expected in the future (Heaton and Lucas, 1999). But again, as we don't live in a perfect world, this function does not hold, as shown by Shiller (1981). He shows that the volatility of stock prices is five to thirteen times too high to be attributed to changes in expected dividend payments.

This implies that there are other factors that influence trading decisions, sometimes unconsciously. It is, according to Hirshleifer and Shumway (2003), for example, very unlikely that the weather would influence the stock market, but the relationship between the Wall Street weather and the stock prices (Saunders, 1993) as for the Korean weather and stock prices (Yoon; Kang, 2009) has been empirically demonstrated. Daniel, Hirshleifer and Subrahmanyam (1998) developed a theory that uses other anomalous patterns that seem to influence the stock market. This theory states that investors tend to be overconfident, they overestimate their ability to assess securities, and there is some biased self-attribution, investors tend to overestimate the extent to which they are liable for their own success.

Another irrationality where we have empirical evidence for is the weekend effect, which was first discovered by Cross in 1973. He shows that the average return on Fridays exceeded the average return on Mondays (+0.16% vs. -0.12%) and that there is a difference in the patterns of price changes between those days (Cross, 1973). French (1980) finds comparable results and he concluded that the most obvious reason this effect occurred was the unfavorable information

released during the weekend. At the time, economist thought the lower returns occurred between Friday close and Monday close, but Rogalski (1984) shows that the entire decline in returns occurred during the weekend, between Friday's close and Monday's open and that the returns on Mondays are in fact equal to other days.

There are, however, studies that oppose the findings of Cross and Rogalski. The conclusion of later research was that the existence of a weekend effect was clearly dependent on the method and the sample. In particular after the mid-70's the evidence for a weekend effect seems to disappear (Connolly, 1989). Lately most studies on weekend effect focus on the 'reverse' weekend effect, where Monday returns are actually higher than the returns on other days. This was first found by Brusa, Liu and Schulman (2000), who even found evidence for the existence of multiple 'weekend effects' depending on firm size; small companies have smaller returns on Mondays, large companies have higher returns on Mondays. In a more recent study, Brusa, Liu and Schulman (2003) found that the 'reverse' weekend effect only occurs in United States stock markets.

The main goal of this study is to examine whether the 'weekend effect' (still) exists and what factors cause these weekend effect(s). The first chapter will give a brief overview on stock pricing; we will discuss some basic theories about the value of stocks. The second chapter will evaluate irrationalities and the way they influence stock returns, with a focus on weekend effect. This study will be concluded with an empirical research. Here I will be testing the Amsterdam Euronext stock exchange on weekend effect and other effects that we come across during the literature survey. The procedure I will follow in testing this; is taking the growth/decline of the AEX-index on all Fridays and the successive Mondays from January 1st 2001 until December 31st 2011. When we subtract the Monday growth from the Friday growth we got the difference in return for each weekend. These numbers can be used to test whether Fridays have a significantly different return than the successive Monday.

Chapter 1: Basic stock pricing models

According to Heaton and Lucas (1999) the value of a stock in its most simple form, is based on the discounted present value of all (expected) future dividend. In this model 2 factors influence the stock price: (expected) future value of dividends and the rate these are discounted at. If we assume a constant rate of return, the standard formula for stock price is:

$$P_t = E_t[\sum_{j=1}^{\infty} (1+r)^{-j} D_{t+j}]$$

This formula denotes the stock price on time t (P_t) as a function of the expected value of the sum of the future dividends (D_{t+j}), which are discounted by the rate of return (Pagés, 1999). In the case where the dividends grow at a constant rate g , we can simplify this formula even further to what Heaton and Lucas (1999) name the probably simplified approach to predict stock prices:

$$P_t = D_t \frac{1+g}{r-g}$$

This model predicts the stock price on time t (P_t) as a function of the dividend payment on time t (D_t), the growth rate g and the discount rate r . This model is the Gordon (1962) growth model.

A nobel-prize winning (1990) theory for explaining the relation between risk and return is the Capital Asset Pricing Model (from now on used as CAPM). The CAPM has three main assumptions, the first of which is that investors can borrow and lend money at risk free interest rate and they can sell and buy securities at market price (there are no taxes or transaction costs). Secondly, investors will only invest in portfolios that have the maximum return for a certain volatility, these are called efficient portfolios. The third main assumption of CAPM states that all investors have the same (homogeneous) prediction for the volatilities and expected returns of securities as well as the correlation between the securities.

Combining the last two assumptions, we can derive the fact that all investors will invest in the same portfolio, as their expectations are equal, they all identify the same optimal portfolio, which they all invest in. This combined with the knowledge that every stock is owned there is, should be in this optimal portfolio, we can conclude that the optimal portfolio has the same proportions as the complete market, therefore the optimal portfolio is the market portfolio. By investing in the efficient portfolio as well as risk free investments, an investor can vary their volatility and return.

Using the CAPM we can calculate the expected return on a stock by using the amount of risk the stock has in common with the market portfolio, also known as the Beta (β) of the stock (Sharp, 1964):

$$E[R_i] = r_f + \beta_i^{Mkt}(E[R_{Mkt}] - r_f)$$

Fama and French (1992a) extend the CAPM further into their Three-Factor model. This model does not only use the Beta of the stock that the CAPM uses as a factor in explaining the expected return, but also the market capitalization (value of all outstanding stocks of a firm) and the book-to-market value. The formula they developed is:

$$r = R_f + \beta_3(K_m - R_f) + b_s * SMB + b_v * HML$$

In this formula the β_3 stands for the three-factor beta and is the equivalent of the beta in the CAPM, but they are not the same. SMB is short for Small Minus Big and stands for the market capitalization and HML stands for High minus Low which stands for the book-to-market value.

Another extension of CAPM is the Intertemporal CAPM (ICAPM). Merton (1973) says that preferences of investors can significantly change when they are faced with changing investment opportunities instead of constant ones. The CAPM has one constant investment and in the real market the investments changes, which shows one of the flaws of the CAPM. In his ICAPM Merton takes in account variables that lead to changes in the calculated investment opportunity, like changing costs.

Chapter 2: Other factors affecting stock prices

All aforementioned models are based on strong assumption and occur in perfect worlds, it can therefore be argued that there are other factors that are not included in these models.

Financial factors

In their research de Bondt and Thaler (1985) for example find that stocks that performed badly in the far past, do better in the future. They formed two portfolio's, one of stocks that were at the time losing and one out of stocks that were perform good. After 36 months they found that portfolio of prior losers were actually outperforming the prior winners by 25%. This shows that the long-term past return of a stock influences the current return. Jegadeesh and Titman (1993) find similar results about the long-term performance of stocks. They, however, also show in their research that the opposite holds when we look at short-term past returns. Their strategy

to buy stocks that had been winning and sell stocks that were losing while only paying attention to the past 6-months return, realized a return that was 12,01% higher than expected on average per year an effect that is also found by Carhart (1997). One of the possible explanations they give for both these effects is the under-reaction of investors on short-term prospect, but over-reaction to long-term prospects. Another interpretation of the long-term past result effect could be that the investors who buy winning stocks and sell losing stocks only because of the fact that they are winning or losing move the prices of these stocks, which causes overreaction. DeLong, Shleifer, Summers, and Waldman (1990) in their work find results that correspond with this possible explanation.

Another factor that is not explained by the simplified models is the fact that value stocks outperform glamour stocks, as shown by Lakonishok, Shleifer and Vishny (1994). Glamour stocks are stocks that are widely held by investors, they are considered to be very profitable due to past results, all these factors drive up the price, which makes these stocks overvalued. Value stocks are stocks that are considered to be undervalued mostly due to inferior returns, but which are still seen as good stocks. Lakonishok, Shleifer and Vishny have shown that due to their undervaluation the value stocks perform better than the glamour stocks, mostly because of the fact that the glamour stocks didn't perform as well as they did before and the value stock stocks didn't perform as bad as in the past. This shows the influence the value-price ratio can have on stock returns.

Fama and French (1992) conclude in their study that the book-to-market ratio influences the return. They find that a higher book-to-market ratio (which means that the accounting value of the firm (book value) is high compared the total value of all outstanding stocks (market value)) is associated with small returns where stocks that represent firms with a low book-to-market ratio of show high returns. In the same research Fama and French also show that size of the firm influences the return of the stock. They find that stocks with a smaller market capitalization have higher returns than stocks that have larger market capitalization.

Other behavioral phenomena in finance

One of the phenomena that affects stock prices is the weather effect, described by Saunders (1993) and Hirshleifer and Shumway (2003). There is a lot of research done in psychology on the correlation between weather and behavior. Rind (1996) noticed for example a relation between sunlight and the way people tend to tip and Tietjen and Kripke (1994) found a relationship between the weather and suicide rates in California.

Saunders was the first to study the effect of the weather on the stock prices. He did so by looking for a relation between the stock returns on the New York Stock Exchange and the percentage of cloud coverage in New York. He has shown that especially between the extreme

cases (0-20 and 100 percent coverage) there is a strong correlation. The days that had (almost) no clouds performed overall better and had less days with negative returns than the days with complete cloud coverage. He noted that between the partly covered days (30-90%) the same effect was present, though in a smaller character. He furthermore stated that if there was a relationship between weather and behavior, this would not affect a rational market. As we have shown it actually does, we can conclude the weather effect is indeed a bias.

In January the returns are higher in comparison to the other eleven months, that is the conclusion of Wachtel (1942). Keim (1983) was one of the first to find empirical evidence for this 'January effect'. He also found that this effect is negatively correlated with firm size, thus has less impact on larger firms. In 2009, Easterday, Sen and Stephan build a study on the findings of Keim and they concluded that the January effect was still present, which made them think that investors are not using this effect as an arbitrage opportunity, which would cause the effect to diminish. Keim gives a couple of possible causes of the January effect of which tax benefit is one, but there is no empirical evidence for any of these hypothesizes.

Ariel (1987) finds that all changes in the stock market are established in the first half of each month where the second half contributes much less to the average return. For the period 1963-1981, which Ariel used, the mean return of the first nine days of the month were 1.409% where the mean return of the last nine days of each month are - 0.021%. Lakonishok and Smidt (1988) find a similar movement where the returns tend to increase the last 2 and first 3 days of the month. A possible explanation of this could be the money available to pension funds and private investors due to income.

The disposition effect is the phenomena that investors tend to sell stocks that have been rising in value. The chance of them losing the gained value is more appealing to them than the possibility of an even higher profit. This effect was first shown by Shefrin and Statman (1985) and shows the loss aversion of investors.

Chapter 3: The weekend effect

Cross (1973) was (one of) the first to notice and report that there was a difference in return distribution of stocks on different days of the week, especially between Friday and Monday. He firstly found that the percentage of times the stock prices (of S&P composite) rose on 62.0% of Fridays versus 39.5% on Mondays. Furthermore the average return on Friday was +0.12%, where the average return on Mondays was -0.18%. When testing these numbers, Cross finds that the probability that all observed differences were due to chance, is less than 1 in 10^{20} .

Cross also tested the dependence of Monday's returns on Friday's returns. He found that at the times when the prices rose on Friday, there was a 48.8% chance that they would rise again on

the Monday following that Friday. If, however, the prices declines on a Friday, there was only a 24.0% chance that the prices would rise on the following Monday. When looking at the average returns on Mondays (separated for rising-Fridays and declining-Fridays) we again find better results for the Mondays following a rising-Friday: -0.001% versus -0.48%.

Lastly Cross checks whether these results were solely for Friday-Monday or whether more days where these effect could be noticed. He found that when on a certain day (other than Friday) the stock prices rose, the stock prices on the successive day (other than Monday) would on average increase by 63.9% (compared to 48.8% for Mondays). After a decrease of stock prices on the previous business day, the stocks increased in 49.0% of the following days (except for Mondays), this compared to the 24.0% chance on Mondays. The average return on stocks after a rising previous day (except for Mondays) is +0.16% and after a decline on the previous the stock prices decline with an average of -0.02% (respectively -0.001% and -0.48% on Mondays). This shows that the effect for the dependence between Mondays and Fridays is also valid for other days, though in a smaller magnitude. Where the differences in chance for previous increase/decline on Mondays is 24.8% (48.8% - 24.0%), this is only 14.9% for the other days (63.9% - 49%). Also the differences in average return between previous winning/losing days are larger for Mondays, namely 0.479% (-0.001% - - 0.48%) versus 0.18% (+0.16% -- 0.02%) on other days.

French (1980) in his research gets comparable results. He finds that buying the S&P composite portfolio and holding it, would (between 1953 and 1977) on average results in a 5.5% return, were a strategy where one buys the portfolio on Monday and sells it every Friday, would gain on average 13.5% return. He notes that this is without looking at transaction costs for each of these transactions as this strategy would gain less than the buy-and-hold method because of these transaction costs. This does not mean this effect has no influence on the market behavior as investors could change the sales they planned to make to a more preferable day (selling stocks on Fridays, buying them on Mondays).

French tried to find an explanation for the phenomena in the fact that the stock market is closed on the days before the Monday. By looking at the trading days after holidays, he however discovered that only for Tuesdays the after-holiday returns were lower than normal Tuesdays, which shows that the effect is an obvious “weekend-effect” and not a “closed-market-effect”.

A possible explanation for the weekend effect could, according to French, be that firms tend to announce bad news in the weekends. This way they could prevent immediate panic selling and give the investors some time to put the news in perspective before they can act.

Rogalski (1984) noticed that most research is done by using the close-rates of each date. The weekend effect therefore was based on the Friday-close to Monday-close returns. As there were little to no clues where the weekend effect came from he tried to narrow down the time span where the effect occurs. He therefore copied the previous research using the close and open rates of each day. Rogalski found that the complete decline in returns occurs between Friday-close and Monday-open and that the effect is indeed a 'weekend' effect and not a 'Monday' effect.

For the period 1979 to 1984 the Friday-close to Monday-close return was -0.1167% , the mean return of the 'weekend' (Friday-close to Monday-open) was -0.1315% and the average return on Mondays (Monday-open to Monday-close) was 0.0148% . So not only was the effect due to the weekend, the Monday return even decreased the extent of the effect (not by much though). Even with this new insight, Rogalski is not able to supply an explanation for this anomaly.

Conclusion

This study has shown that there are a lot of factors that influence the prices and returns on the stock market. Some of these are a clear and obvious factor, like for instance the Risk free interest rate, which is used to calculate the returns in even the most simple formulas. Some seem less obvious, but are still explainable. An example of this is the weather effect, which shows that returns of stocks are higher on sunny days. An explanation of the weather effect could be the proven correlation between the weather and people's mood. There are even phenomena influencing the stock market that aren't obvious and also hard to explain, like the weekend effect.

The weekend shows that the average returns on Mondays is lower than the return on Fridays. It has been shown that this is not due to the non-trading days between Friday and Monday, as the same effect does not hold for other holidays and non-trading days. Another explanation could be the tendency to release bad news over the weekend, to try to evade panic-selling. But if this would be the case, the investors would be discounting these expected losses during the whole week, neutralizing the more negative results on Monday. This however has not happened, leading to the belief that there should be another explanation to the weekend effect.

References:

- Ariel, Robert A. (1987): "A monthly effect in stock returns" *Journal of Financial Economics*, 18, pp. 161-174.
- Berk, Jonathan and Berk, DeMarzo, Peter (2007): "Corporate Finance", Pearson Addison Wesley, Boston, Mass.
- Brusa, J., P. Liu and C. Schulman (2000): "The Weekend Effect, 'Reverse' Weekend Effect, and Firm Size", *Journal of Business Finance & Accounting*, Vol. 27, Nos. 5&6, pp. 555-74.
- Brusa, J., P. Liu and C. Schulman (2003): "The 'reverse' weekend effect: the U.S. market versus international market", *International Review of Financial Analysis*, Vol. 12, Issue 3, pp. 267-286.
- Carhart, M. (1997). "On Persistence in Mutual Fund Performance". *Journal of Finance*, Vol. **52** (1): pp. 57-82
- Connolly, R. (1989): "An Examination of the Robustness of the Weekend Effect", *Journal of Financial and Quantitative Analysis*, Vol. 24, No. 2, pp.133 - 69.
- Cross, Frank, "The Behavior of Stock Prices on Fridays and Mondays" *Financial Analysts Journal*, Vol. 29, 67-69, (November/December 1973).
- Daniel, K., Hirshleifer, D., Subrahmanyam, A. (1998): "Investor psychology and security market under- and overreactions". *Journal of Finance*, 53 (6), p. 1839-1885.
- De Bondt, W. and Thaler, R. (1985): "Does the stock market overreact?" *Journal of finance*, Vol. 40, no. 3, pp. 793-805.
- De Long, B., Shleifer, A., Summers, L. and Waldman R, (1990): "Positive Feedback Investment Strategies and Destabilizing Rational Speculation", *Journal of Finance*, Vol. 45, pp. 379-395.
- Easterday, Kathryn E., Sen, Pradyot K., Stephan, Jens A. (2009): "The persistence of the small firm/January effect: Is it consistent with investors' learning and arbitrage efforts?" *The Quarterly review of Economics and Finance*, Vol. 49, Issue 3, pp 1172 – 1193
- Fama, E. and French K. (1992a): "The cross-section of expected stock returns." *Journal of Finance*, Vol. 47, pp. 427-465.
- Fama, E. and French K. (1994): "Size and book-to-market factors in earnings and returns." *Journal of Finance*, Vol. 50, No. 1, pp 131-155
- French, Kenneth R. (1980): "Stock returns and the weekend effect", *Journal of Financial Economics*, Vol. 8, Issue 1, March 1980, p. 55-69
- Gordon, M (1962): *The Investment, Financing, and Valuation of the Corporation*. Irwin, Homewood, IL

- Heaton, John and Lucas, Deborah (1999): "Stock Prices and Fundamentals". NBER macroeconomics annual (1999), p. 213 – 264
- Hirshleifer, David and Shumway, Tyler (2003): "Good Day Sunshine: Stock Returns and the Weather." Journal of Finance, Vol. 58, No. 3, pp 1009-32
- Jegadeesh, N and Titman, S (1993): "Returns to buying winners and selling losers: implications for stock market efficiency." Journal of Finance, Vol. 48, No. 1, pp 65-91
- Keim, Donald B. (1983): "SIZE-RELATED ANOMALIES AND STOCK RETURN SEASONALITY Further Empirical Evidence" Journal of Financial Economics, 12, pp 13-32
- Lakonishok, J., Shleifer, A. and Vishny R. (1994): "Contrarian investment, extrapolation, and risk", Journal of Finance, Vol. 49, No. 5, pp 1541-1578
- Lakonishok J, Smidt S, 1988. Are Seasonal Anomalies Real? A Ninety-Year Perspective. Review of Financial Studies, 1: 403–425
- Pagés, Henri (1999): "A note on the Gordon growth model with nonstationary dividend growth", BIS working paper
- Rind, Bruce (1996): "Effects of beliefs about weather conditions on tipping", Journal of Applied Social Psychology 26, pp 137-147.
- Rogalski, Richard. 1984. "New Findings Regarding Day of the Week Returns Over Trading and Non-Trading Periods." Journal of Finance, 39, pp. 1603–14
- Saunders, Edward M. (1993): "Stock prices and Wall Street weather", The American Economic Review, Vol. 83, No. 5 (Dec. 1993), pp. 1337-1345
- Sharpe, William F. (1964): "Capital asset prices: A theory of market equilibrium under conditions of risk", Journal of Finance, Vol. 19, No. 3, pp. 425-442
- SHEFRIN, H. and M. STATMAN, 1985. "The disposition to sell winners too early and ride losers too long: Theory and evidence". Journal of Finance, Vol. 40, No 3, pp 777 - 790
- Shiller, Robert J. (1981): "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?", The American Economic Review, Vol. 71, No. 3 (Jun. 1981), pp. 421-436
- Simon, H., (1982). "Models of Bounded Rationality", vol. 2. MIT Press, Cambridge, MA.
- Solomon, Micheal R. (2009): "Consumer behavior; buying, having and being", Eighth edition, Pearson Education International, Upper Saddle River, NJ
- Tietjen, Glenn H., and Daniel F. Kripke, (1994), Suicides in California (1968-1977)-Absence of season-ality in Los Angeles and Sacramento Counties, Psychiatric Research 53, pp 161-172.

Yoon, Seong-Min; Kang, Sang Hoon (2009): "Weather effects on returns: Evidence from the Korean stock market", *Physica A: Statistical Mechanics and its Applications* vol. 388 (2009) nr. 5 p.682-690