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Do country characteristics influence the momentum effect? A recent study
on the momentum effect around the globe.

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Where some researchers are convinced of the momentum effect, others are determent that it is the result of the January effect, data mining or driven by risk. This paper displays momentum returns in different countries and tests the impact of different macroeconomic variables on these returns. The three important variables that are tested are the financial system, legal system and the religion of a nation. The momentum effect is measured by 8 different momentum strategies and measured two times a year, in January and July. This study uses formation periods of 3 and 9 months and holding periods with an equal number of months. The momentum anomaly is most present in European countries but this study does not state a clear relationship between the macroeconomic variables and momentum. However, it does give some fresh insights into the anomaly.

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1. Introduction

In the history of finance, economists always assume that stocks are not predictable and follow a random walk. Higher profits should therefore always be linked to greater risks. The domain of behavioral finance broke through this frame of mind and found multiple anomalies in the equity markets. An example of this breakthrough is the discovery of De Bondt and Thaler (1985) who found that the stock market overreacts and that bad performing portfolios tend to outperform good performing portfolios in the long run. This finding can be explained by the overreaction of investors on news events. (Kahneman & Tversky, 1977) The momentum effect itself was first found by Jegadeesh and Titman (1993), who documented that poorly performing stock tend to keep on performing bad in the following 3 to 12 months and the good performing stock kept on doing well. Although the findings of De Bondt and Thaler are inconclusive and can be explained by systematic risks and the size effect (Zarowin, 1990), are the findings of Jegadeesh and Titman still unexplained by the three-factor model of Fama and French (1996). This makes the momentum effect an interesting research topic for further investigation. The interest on this topic is especially large because researchers keep on finding evidence on this anomaly¹. The study on the momentum effect is important because it helps the understanding of stock price movement. Better understanding could lead to a better allocation of capital. In this understanding, the use of recent data is essential to test the survival of the anomaly in other market states, crisis and the integration of financial markets.

This study consists of two important parts. The first part is the calculation of momentum returns in the different stock markets among 24 countries. This study uses the most prominent formation and holding periods that are discussed in the literature. A formation period of 3 and 9 months is used together with the same holding period. This study also makes the distinction between the immediate formation after the valuation period and the one month delay before the holding/investing period starts. Furthermore, this study uses stock market data from 1995-2017 and with this data the momentum returns are calculated two times a year for every country. So the aim of this first part is to test if the momentum effect still exists in stock markets in different countries.

¹ See Parsons, Sabbatucci and Titman (2016) for geographic momentum, Ly (2018) for momentum in crises, Bernard et al. (2015) for momentum in Indian markets, etc.

The second part of the study consists of the effect of macroeconomic variables in different countries on the momentum return that is calculated in the first part. This study tries to investigate if the momentum effect is more present in bank-based countries than in market based countries. Furthermore, it investigates if civil law countries contain more momentum than common law countries and if religion has an impact on momentum profits. Influences of these variables are tested with correlation matrixes, a Mann-Whitney U test, a permutation test and regressions. So the goal of the hypotheses of this study is to test for the existence of the momentum effect in our sample of countries and the influence of a country's financial system, legal system and religion on these profits.

Coming back on the first part, this study discovers that momentum strategies are still profitable in multiple countries. It is important to note that these profits² are very volatile and momentum returns drop in periods of financial crisis. The momentum effect is most present in northern European nations and is less present in Islamic countries. The effect of a country's financial system is hard to determine and further research is necessary to prove a significant relationship. Although significant evidence is absent, the tests imply that there is a minor negative relationship in a manner that market-based countries contain less momentum profits than bank-based countries. A comparable result is found in the legal system of a country which means that common law countries contain less momentum than civil law countries. This makes sense because whereas civil law countries tend to be more bank-based, common law countries are more market-based. A country's religion has a significant negative effect on momentum returns but this is mainly due to the January effect.

This paper starts with a literature review on the momentum effect, on a country's financial system, legal system and religion. After this review the hypotheses are formed and the research method explains how these hypotheses are tested. The results can be found in chapter 5 followed by an overall conclusion of the literature review and the results.

² The profits mentioned in this study are unrealized. Those are ex-post potential profits that could be realized by using the chosen momentum strategy

2. Literature review

2.1. Momentum

2.1.1 Origin

The task of the capital market is to distribute ownership of the capital stock. An efficient capital market is (according to the efficient market hypothesis) a market in which prices reflect all information. This market is called a strong form market. A market in which prices reflect all publicly available information is called a semi-strong form market and a weak form market is a market in which the information only exists of historical prices.

The study on the stock market price process has already received a lot of attention in the academic literature. One of the first ideas on this topic are given by Levy, who test in his paper the dependency of stock prices on past price trends and patterns (Levy, 1967). His significant results were found by data crashing and he came up with his trading rule after trying 68 variations of numerous trading rules (Jensen & Bennington, 1970). His results caused a lot of skepticism about his conclusions.

The findings of Bondt and Thaler (1985) are in line with the overreaction hypothesis and the predictability of stock returns. The overreaction hypothesis focuses on the effect that stocks tend to have low returns after a period of high returns. These high returns are due to the overreaction of investors on certain events like the announcement of a merger or the publication of quarterly results. The market corrects this overreaction and these stocks contain lower returns. This hypothesis implies a violation of weak-form market efficiency because stock returns can be predicted by historical returns. Bondt and Thaler (1985) test their hypothesis by creating two portfolios of stocks with good and bad past returns, called the winner and loser portfolio. The strategy Bondt and Thaler practice is a reversal trading strategy. They found that the loser portfolio outperforms the market by 19.6% and the winner portfolio underperforms the market by 5%. These returns occur after an evaluation period of 36 months.

The market anomaly found by Bondt and Thaler leads to the demand of a better understanding on stock price movement. For this reason, Fama and French extended the Capital Asset Pricing Model (CAPM) by adding a factor for company size and book-to-market value (Fama & French, 1993). An important finding was that a company with a smaller market capitalization tends to have

stronger momentum returns than companies with a larger market capitalization. Another finding is that companies with a low book-to-market equity earn higher returns than those with a high book-to-market equity. With this adjustment to the CAPM, the model is able to explain 90% of diversified portfolio returns (instead of 70%). Later it was found that the contrarian strategy of de Bondt and Thaler can almost completely be explained by the January effect (Yao, 2012). The January effect is the increase in stock prices in January because investors make up for the selling of their positions at the end of the previous financial year due to tax loss selling. Due to this effect, the long-term contrarian strategy became extraordinarily profitable in January but not outside this month.

After the anomaly was found by Bondt and Thaler, Jegadeesh founds evidence of generating abnormal returns by using the reversal strategy on a shorter-term (Jegadeesh, 1990). This paper found negative correlation between last month stock returns and the current stock return. After this finding Jegadeesh and Titman (1993) discovers the most acknowledged momentum strategies we know nowadays namely, the short term strategies. They test the momentum effect by using 16 different trading strategies. They use 4 different time frames for the observation of the past returns. These time frames were 1,2,3 or 4 quarters. For every timeframe they use 4 different holding periods which were also 1,2,3 or 4 months. The data Jegadeesh and Titman used is the daily return on the stock from NYSE and the AMEX. They formed an opposite division from Bondt and Thaler in which the winner portfolio consists of the bottom decile performing stocks of the last quarter(s). The loser portfolio consists of the top decile performing stocks. The findings from this research are that the winner portfolio also realizes higher returns than the loser portfolio in the multiple holding periods. When a momentum portfolio (as described by Jegadeesh and Titman) is created based on their past 6-month returns and is hold for 6 months the excess return will be 12.01%. The excess returns of this strategy tends to disappear after 12 months. Conrad and Kaul confirm the finding of Bondt & Thalers and Jegadeesh & Titman by showing that momentum profits are the highest for 3- to 12-month time periods and reversal strategies are more profitable over longer periods. (Conrad & Kaul, 1998) They also argue that the momentum profits are entirely due to the cross sectional variation (in the mean returns) between stocks, instead of patterns over time. So even when stocks follow a completely random walk, momentum strategies will always lead to positive

results. For the same reason they claim that contrarian (reversal) strategies are always unprofitable. But stock prices do not follow a random walk according to Lo and Mackinlay (1988).

The literature on momentum makes a distinction between two strategies. The most known and used by Jegadeesh and Titman is the cross sectional momentum strategy. In this strategy, the past returns of a stock are compared to their peers and a portfolio is formed based on this ranking. The other momentum strategy is time-series momentum. In time-series momentum the focus lies on the past return of the own stock. In this momentum form the winner stocks are the stocks that have the highest past returns compared to their own past returns (Moskowitz, Ooi, & Pedersen, 2012). This means that the amount of stocks that are bought and shorted depend on the state of the market. The consequence of this selection is that the cross sectional momentum strategy always selects winner and loser stocks for every time periods and time series momentum selects more winning stocks in strong markets and more losing stocks in weak markets (Bird, Gao, & Yeung, 2017). There is mixed evidence on the profitability of time series momentum. It outperforms the cross sectional momentum strategy in continuing markets but underperforms in market transitions (Cheema, Nartea, & Man, 2017).

The momentum effect is later adopted in the CAPM model from Fama and French to better describe stock returns because their three-factor model was not able to explain the momentum profits (Fama & French, 1996). Monthly momentum is calculated by subtracting the average of the lowest performing firm from the average of the highest performing firm. The adoption of the momentum effect resulted in the four-factor model of Carhart (Carhart, 1997). The new four-factor model of Carhart is better able to explain stock returns for investors and overcomes the inability of the three-factor model to explain cross-sectional variation in the momentum portfolios.

According to Barberis, Shleifer, and Visny (1998) the momentum effect is mainly the result of investors underreacting to new information. It takes securities between 1 and 12 months to incorporate this new information which is equal to the investment horizons of Jegadeesh and Titman (1993). Johnson (2002) suggests that momentum returns are simply just the payoff of taking risk and that it is not the result of irrational behavior of the investor.

To test if the findings by Jegadeesh and Titman (1993) are not a result of data snooping they repeated their test in the 90's. They document similar results in their tests (Jegadeesh & Titman, 2001). After their maximal holding period of 12 months they continue to observe the stock returns

and notice that the returns become negative in the next 13 to 60 months. This is in line with the findings of Bondt and Thaler (1985).

2.1.2 Momentum and contrarian profits around the globe

Based on the ideas of Jegadeesh and Titman, Rouwenhorst (1998) found that momentum strategies are also profitable on indices outside the U.S. He uses the same strategies as Jegadeesh and Titman (1993) and found that the effect was prevalent in 12 European countries. The diversified winner portfolio outperformed the loser portfolio by one percent a month. This conclusion of Rouwenhorst (1998) also revealed that the results of Jegadeesh and Titman (1993) are not country specific and not due to data mining or chance. In Germany, the momentum strategy as well as the contrarian strategy show positive results and these results are quite similar to the the U.S. (Schiereck, Bondt, & Weber, 1999). The finding of Rouwenhorst (1998) is backed up by Doukas and McKnight (2005) who find that the momentum effect is still present in European markets in the period of 1988-2001 and is not a result of data mining.

In a later study Chui, Titman and Wei (2000) too discovered the anomaly in Asian stock markets. An interesting finding in their study is that the momentum effect differs within Asia. Some countries show a strong effect and other countries show a weaker or even no momentum effect. This was especially the case for Japan, Korea and Indonesia in their study. Another finding is that higher foreign ownership leads to more momentum profits. This is explained by the fact that foreign investors tend to be momentum investors compared to domestic investors.

The contrarian strategies show weaker profits in Canada than the United States (Mun, Vasconcellos, & Kish, 2000). With regard to the contrarian strategy, da Costa (1994) found evidence in Brazil to support the overreaction hypothesis of De Bondt and Thaler (1985) which is even more present than in the U.S. Weaker evidence for this strategy has been found in Australia and the positive results are mainly due to the small firm effect (Gaunt, 2000).

In a more extensive study on momentum profits around the world, 50 countries are tested on their profitability of the momentum strategy. Except for Japan, Korea, Taiwan and Turkey, all countries contain positive momentum profits and in half of these cases the profits are significant. (Chui, Titman, & Wei, 2010).

The momentum anomaly is also discovered by the literature in emerging countries (Cakici, Fabozzi, & Tan, 2013). In their study they find momentum in all of their 18 emerging countries, except for Eastern Europe.

2.1.3 Drivers of the momentum effect

Since the introduction of the momentum anomaly, a lot of studies have been done on this strategy. Macroeconomic variables such as dividend yield, yield on treasure bills, and size of portfolio outflow, could have an impact on momentum profits (Chordia & Shivakumar, 2002) (Chelley-steeley & Siganos, 2004).

Industries are good indicators for the momentum effect (Moskowitz & Grinblatt, 1999). When momentum portfolios are created based on buying stock of industries with a good past performance and selling stocks of industries with bad past performance, the portfolio appears to be quite profitable. This is especially the case for medium sized horizons (9-12 months).

The momentum effect cannot be found in corporate bonds according to Gebhardt, Hvidkjaer and Swaminathan (2005). They even suggest that the reversals can be found in bonds, and the reversal effects is larger in more riskier (lower rated) bonds.

So risk is an important indicator for the profitability of momentum strategies. Avramov et al. (2007) show that the extreme winner and loser portfolios consist of stocks of firms that obtain the highest credit risk. This implies that momentum is just a compensation for risk. This explains the findings of Daniel and Moskowitz (2016), who display that momentum strategies can result in huge losses in panic states. This occurs because the losing stock embodies high premiums. In a poor market state the market tries to recover and the loser stocks will receive strong gains. Momentum strategies short these loser stocks, which will lead to high losses in the portfolio. In 1932 and 2009, these panic states lead to momentum losses of 91.59% and 73.42% (Barroso & Santa-Clara, 2015), which make the momentum strategy far less promising. Wang and Xu (2015) find that market volatility has a significant power to forecast momentum payoffs. A possible explanation they mention for their results is that investors act differently towards winning and losing stocks. Recent literature shows that the time series (momentum) strategy outperforms the cross sectional strategy when the market state doesn't change (Cheema, Nardea, & Man, 2017). When the market transits from a bull market state to a bear market state or the other way around, the cross sectional strategy will outperform the time series strategy.

Besides these risk-based explanations for the momentum effect, there also are more behavioral explanations that can clarify momentum. One of these explanations states that prices that overreact to new information, continue to overreact for a short period of time³ (Daniel, Hirshleifer, & Subrahmanyam, 1998) and momentum strategies exploits these continuations. This finding is backed up by Lee and Swaminathan (2000), who found that in the following 3-5 years the winner portfolio will significantly underperform with regard to the loser portfolio. On the other hand may under reaction explain the profitability of momentum strategies. Barberis, Shleifer and Vishny (1998) show that investors do not always correctly react on public information due to the conservatism bias. This enhances the momentum effect and makes these strategies, by trend chasing, more profitable. So the combination of both under- and overreaction of investors on firm-specific information can help explain momentum profits (Hur & Singh, 2016). Hong and Stein (1999) follow up on this under reaction by Barberis et al. (1998) by showing that this under reaction in the short term always lead to overreaction in the long term, due to arbitrage opportunities. They explain the under reaction by the gradually diffusion of information among investors. This means that momentum profits should increase when analyst coverage is lower because lower analyst coverage should lead to a slower diffusion of information. This claim is later supported Hong et al. (2000) who proves that momentum strategies are more profitable for stocks with low analyst coverage.

All the momentum strategies are based on the assumption that stocks are liquid and that there is an unlimited possibility of short selling without transaction costs. In practice this is not the case and this could explain why the momentum effect seems in theory more profitable than it actually is. Stocks that obtain the highest momentum returns are often the same stocks that have high trading costs, such as costs of short sale, taxes and bid-ask spreads. Due to these high transaction costs, the profitability of momentum strategies can fade away (Lesmond, Schill, & Zhou, 2004). This finding is support by Keim (2003) , who argues that the excess return of momentum strategies is not enough to cover the cost of implementing the strategy. These stocks do contain the highest momentum returns because acting on this information is more expensive and for this reason prices do not adjust to the rational level. In other words, the benefits of reacting on these high prices do not outweigh

³ Because investors tend to follow the positive feedback from other investors

the costs of it. The academic research on stock predictability also diminishes the effect of it (Mclean & Pontiff, 2016). Return predictability declines with 32% after the publication of academic articles on anomalies like momentum. While momentum strategies seem to look very ideally in theory, they are not so profitably in practice.

2.1.4. Other findings on the momentum effect

The anomaly can also be found in currency markets (Menkhoff, Sarno, Schmeling, & Schrimpf, 2012). These returns on momentum strategies in currency markets are rather unstable over a short period of time, but could result in an excess return of 10%. Just like in stock markets, the returns are sensitive to transaction costs.

There is also evidence on the profitability of momentum strategies in commodity markets (Erb & Harvey, 2006). Encouraged by Erb and Harvey, Miffre and Rallis (2007) found 13 momentum strategies that are profitable with horizons between 1 and 12 months. The usage of this strategy in commodity markets lead to an yearly average return of 9.38%.

This literature study shows that quite a lot of research has already been done on the momentum effect. Some of these studies observe a small tendency for the effect of a country's legal system⁴. This study will fill this academic gap in following up on their findings and find the existence of the momentum effect with recent data.

2.2. Financial systems

The most general division in financial system is between market-based and bank-based financial systems. The main difference between those two systems is that in a bank-based system the banking sector is highly developed and is the main party in distributing society's savings, allocating capital and overseeing corporate control. In market-based financial systems these tasks are up to security markets. Developing countries tends to shift from a bank-based system towards an market-based financial system (Chakraborty & Ray, 2006). It is unclear why this shift occurs, because countries

⁴ E.g. Chui et al. (2000) find in their study on momentum in Asian stock markets that common law/civil law is a perfect indicator for momentum.

with complete different financial systems could have a similar GDP per capita. Both of the system have advantages over each other; a market-based system is more efficient in allocating capital whereas a bank-based systems are bettering at solving agency problems and allowing businesses to borrow more.

Demirguc-Kunt and Levine (1999) made a clear ratio to make a division between market-based countries and bank-based countries. Factors they use to determine the financial system of a country are ratios of the sector development (bank or market) measured in size, activity and efficiency. The first factor Demirguc-Kunt and Levine use for their ranking is size. The size is calculated by dividing the total bank assets by the market capitalization. To test for activity, they made a ratio of the private credit by deposit money banks compared to the total value of stock transaction on domestic exchanges. Efficiency is tested by focusing on the value of the stock market, trading vs overhead cost and trading vs interest margin.

But the question arises why countries have different financial systems? Why are Germany and Japan more bank-based and have the U.S. and the U.K. more developed equity markets? La Porta et al. (1997) provides answers for these questions by showing that financial systems mainly depend on the legal system of a country. When a country has a better legal shareholder protection, the country tends to become more market-based than when this shareholder protection is less developed, but more on this in the next paragraph. Better shareholder protection leads to a more market-based systems, because investors have more confidence in lending out their capital without the intermediation of a financial institution.

So when a country is more market-based, it can be expected that stock markets are more developed and efficient. Due to this efficiency and according to the efficient market hypothesis, stock prices should reflect all available information and cannot be predicted by historical prices. This may lead to a lesser presence of the momentum anomaly.

2.3. Legal system

One of the main findings in the study of Demirguc-Kunt and Levine (1999) is that countries with a common law structure have a strong protection of shareholder rights compared to countries with a civil law tradition. La Porta et al. (1997) concluded that the financial system is dependent on the legal system of the country. The main distinction in legal systems is common law vs civil law. Civil law exists of three major families from where the modern laws are derived, namely French, German and Scandinavian law. The French and German laws are scattered around the globe because of the colonial history of these countries. In common law, the law is mainly made by judges and this jurisprudence is later adopted into legislature. Contrary to common law, the dominant source of law in civil law comes from core principles from scholars that creates the legislature. While common law has strong investor protection, the French civil law has the weakest investor protection. Regarding investor protection, German and Scandinavian civil law fall in between. Investors rights include e.g. the voting rights, laws to prevent selling shares around the shareholder meeting, cumulative voting for the board, shares needed to organize an extraordinary shareholder's meeting, etc.

But why do countries with a common law structure have better shareholder protection than countries with a civil law structure? The argument for the low level of investor protection is that courts in civil countries do not protect minority shareholders for abuses they have not witnessed yet (only long known abuses). These courts do not protect the minority shareholders, because the law is determined by the government instead of case law (jurisprudence) (Coffee, 1999). This lack of protection results in an environment in which the majority shareholders rule the market. This leaves the minority shareholders powerless, causing them to turn towards financial institutions such as banks. This results in more concentrated ownership in markets, which could have an effect on momentum strategies.

Chui, Titman and Wei (2000) find that the legal system of a country is a good indicator in their study for the profitability of momentum strategies in stock markets in Asia. So for this reason this study tries to confirm this finding with a more recent and broader dataset. Furthermore does the legal system of a country influence the shareholder protection which may influence the market efficiency and the momentum effect.

2.4. Religion

To extend the study of momentum, religion is added to explain momentum profits. A lot of academic research has been done on Islamic finance. Islamic countries display a growing global presence of banking and capital markets. For example, the banking sector is over US\$700 billion in assets and grows with a rate of 15% per annum (Khan, 2010). This growth started in the last decade of the last century. The demand from Muslims to partake in financial capital markets arises. This demand leads to the first Islamic index on the Dow Jones to help investors move funds on the capital markets. In 1997 the Kuala Lumpur Stock Exchange Shari'ah Index was set up in Malaysia. The purpose of this market was that Muslims could trade within the laws of their religion (Rahman, Yahya, & Nasir, 2010).

There is mixed evidence about the profitability of Islamic stocks compared to the more conventional stocks. Al-Khazali et al. (2014) find that Islamic indexes tends to outperform peers during crises. This finding is supported by Kassim (2010), who also observes a lower impact of the financial crisis on Islamic markets. But besides the more conventional stocks the Islamic stocks do have lower average returns and higher volatilities during crisis time.

Hayat and Kraeussl (2011) finds that stock performances of Islamic countries are weak, while Ashraf and Mohammad (2014) are convinced that Islamic stocks are profitable. Narayan and Phan find some evidence for momentum profits in Islamic stocks (Narayan & Phan, Momentum strategies for Islamic stocks, 2017) but this research is limited by the fact that these profits are just compensations for risks. They discover insignificant evidence on abnormal returns due to momentum.

Another finding of Narayan and Phan is that Islamic stocks are profitable regardless of financial crises. With regard to the efficiency of Islamic markets, Rizvi et al. (2014) found that when Islamic stock markets are compared to stock markets of other developed countries, these stock markets behave less efficient. This difference is especially noticeable in the short term. This finding contradicts the finding of El Khamlichi et al. (2014) who concluded that both Islamic as non-Islamic indices have the same tendency to be efficient or inefficient.

Islamic stock tends to react relatively stronger on financial news compared to conventional stock (Narayan & Bannigidadmath, 2017). This study discovered that Islamic portfolios are more profitable than other portfolios as well. On average the Islamic portfolios generate a return of 3-4

% per year more than the conventional stock. Another finding of this study is that momentum profits are lower in Islamic stock than in conventional markets (annual 3.90% compared to 8.32%).

The growing research on Islamic stock markets, the contradicting literature and the absence of a broad amount of studies on the momentum leads to a demand for more research on this topic

3. Hypotheses

3.1. Momentum effect

Before the effect of the different independent variables on momentum returns is researched, the momentum itself has to be investigated. Therefore, the first hypothesis of this study will be:

H0: There is no evidence of the momentum effect in stock markets in different countries.

H1: There is evidence of the momentum effect in stock markets in different countries.

3.2. Financial system

The ongoing debate about the profitability of momentum strategies results in a demand for more research on this matter. Therefore, this study tries to explain the effect of market efficiency on momentum strategies. The literature study shows that countries seem more efficient when they are market-based, although there is enough evidence of the momentum effect in these countries. This study will test the effect of the financial system on momentum strategies. Therefore, the second hypothesis will be as follows:

H0: Countries with a bank-based financial system do not obtain more momentum profits than countries with a market-based financial system.

H2: Countries with a bank-based financial system have more momentum profits.

3.3. Legal system

Besides the effect of the financial system, this research also focuses on the legal system of a country. The literature study shows that common law countries tend to have more accountancy rules and investor protection. Demirguc-Kunt and Levine (1999) also explain that countries with a civil law tradition tend to have underdeveloped markets. It can be expected that these underdeveloped stock markets contain more momentum, because they could be less efficient. When financial markets are less efficient, they take longer to adjust stock prices to all the available and important information. This adjustment could influence the momentum effect and therefore, the following hypothesis is formulated:

H0: Countries with a civil law tradition do not contain higher momentum returns than countries with a common law system

H3: Countries with a civil law tradition contain higher momentum returns.

3.4. Religion

The literary study describes differences between stock markets in non-Islamic countries and Islamic countries and how this could have an impact on efficiency and on momentum profits. During crisis periods momentum profits tend to fall (Daniel & Moskowitz, 2016), but literature shows that Islamic stock markets outperform other stock markets during these periods. It is therefore unclear if there are differences in the momentum effect between non-Islamic and Islamic countries, because the literature is divided over the efficiency of Islamic stock. Since it is unclear what effect the religion of a country has on momentum profits, a two-tailed test is used. Therefore, the following hypothesis is:

H0: There is no difference in momentum profits between Islamic and non-Islamic countries.

H4: There is a significant difference in momentum profits between Islamic and non-Islamic countries.

4. Research method

The methodological approach that is used in this study is a deductive/quantitative approach. In other words, the data is deductively derived from the existing knowledge and empirical methods are used to test the hypotheses.

First, the presence of the momentum effect needs to be measured to rank all the countries on their amount of momentum in their markets⁵. When these countries are measured, they have to be arranged based on their financial system. After the arrangement, the data is briefly discussed, and the correlation between the independent variables and momentum returns is described. This correlation can accept or reject the hypotheses.

4.1. Occurrence of momentum

To test for the presence of the momentum effect in different markets, the same method as Jegadeesh & Titman is used. They test for momentum by using a momentum strategy and check for the returns of this strategy. In their paper, they discuss different valuation and holding periods of stock but in this paper, the formation and the holding period are 3 and 9 months. By taking two momentum strategies the differences between short- and long-term momentum can be observed, see figure I. The valuation months are J and the holding months are K.

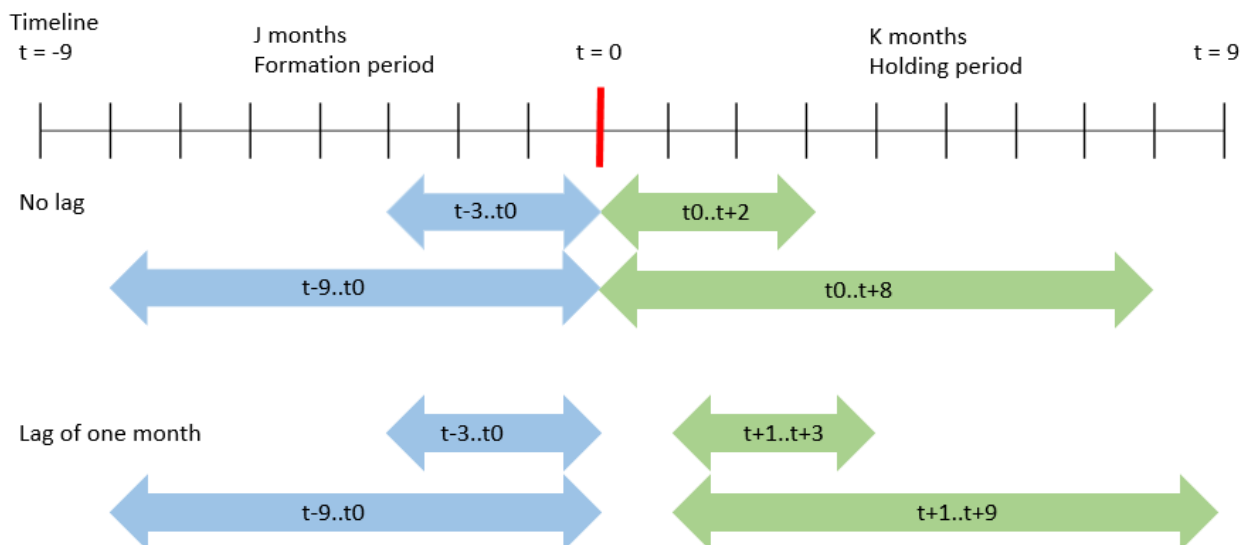


FIGURE I: MOMENTUM STRATEGIES

⁵ The same way Chui, Titman, and Wei (2010) did in their paper

The lognormal returns on the stock measure the performance. The following formula calculates these returns:

$$\text{Stock return} = \ln\left(\frac{\text{price}}{\text{price}-n}\right) \quad (1)$$

There are 24 countries chosen from different regions over the world to create a broad dataset. Every country should have the past performance of 3 and 9 months and the return (R) after the holding period for $t=0$ in January and in July. For these past and future performances the following formulas are used to calculate the Cumulative Past Return (CPR) and Cumulative Future Return (CFR):

$$CPR_{3 \text{ month}} = R_{t-1} + R_{t-2} + R_{t-3} \quad (2)$$

$$CPR_{9 \text{ month}} = R_{t-1} + R_{t-2} + R_{t-3} + R_{t-4} + R_{t-5} + R_{t-6} + R_{t-7} + R_{t-8} + R_{t-9} \quad (3)$$

$$CFR_{3 \text{ month}} = R_{t+1} + R_{t+2} + R_{t+3} \quad (4)$$

$$CFR_{9 \text{ month}} = R_{t+1} + R_{t+2} + R_{t+3} + R_{t+4} + R_{t+5} + R_{t+6} + R_{t+7} + R_{t+8} + R_{t+9} \quad (5)$$

By not including the $R_{t=0}$ a month lag is added between the past and the future returns. A one month lag is added because the literature is divided on skipping a month after the formation period⁶. To test if this makes a difference in momentum profits the returns without the lag are calculated too. Without the lag, the portfolio is immediately formed after the formation period and the future returns are calculated with the following formulas.

$$CFR_{3 \text{ month}} = R_{t=0} + R_{t+1} + R_{t+2} \quad (6)$$

$$CFR_{9 \text{ month}} = R_{t=0} + R_{t+1} + R_{t+2} + R_{t+3} + R_{t+4} + R_{t+5} + R_{t+6} + R_{t+7} + R_{t+8} \quad (7)$$

Two times a year (in January and July) the portfolio is created at $t=0$. At the beginning of each t all the stocks are ranked on the performance in the past J months. The top-performing decile of the

⁶ Some studies do skip a month (e.g. Griffin, Ji & Martin (2003)) and some studies do not (Chordia & Shivakumar, 2002) (Moskowitz, Ooi, & Pedersen, 2012)

total market is called the ‘‘winners’’ and the bottom performing decile is named the ‘‘losers’’. The strategy requires buying the winners and selling the losers. For every t this portfolio is created and the profits of this strategy are calculated after K months. The winner portfolio for every period and for every country is calculated by computing the mean of the future returns when the past return are in the 10% best-performing stock. The same method is used for the loser portfolio, but then the future returns are used when the past returns are in the 10% worst performing stock. The top and bottom deciles are used to create portfolios just like Jegadeesh and Titman (1993) did in their paper.

When the winner portfolio is bought and the losers portfolio is shorted, the profit is the difference between the return on the winner portfolio minus the return on the loser portfolio (WML). This return of the momentum strategy is calculated for January and July for every year. It is also interesting to observe the winners and the loser’s portfolio separately. Momentum profits could arise from the outperformance of winner stocks or underperformance of loser stocks. But if the profits are mainly due to the underperformance of loser stocks in less liquid markets, the profits are still not practically reachable.

The reason that January and July are chosen for the dataset is to test the influence of the January effect. The historical stock prices are obtained by Thomas Reuters Eikon and this gives in total 3,943,754 observations over 24 countries.

This study implies that there is unlimited arbitrage, short-selling is always possible and that there are no transaction costs⁷.

4.2. Country’s financial system

To test if the financial system of a country has an impact on the momentum returns in the stock market, countries are first ranked based on their financial system. To create the independent variable of the financial system of a country the method of Demirguc-Kunt and Levine (1999) is used. The financial system depends on the ratio of the banking sector development in a country relative to the market. This ratio is called the structure index. The structure index is measured in terms of size (s), activity (a) and efficiency (e) and the data is obtained from the Financial development and Structure Dataset from The World Bank (Beck, Demirguc-Kunt, Levine, Cihak,

⁷ These facts are ignored to make a reliable comparison between markets around the world

& Feyen, 2015). To measure the size the ratio bank versus capitalization is calculated by dividing the stock market capitalization (*stmktcapt*) by the deposited money bank assets as a percentage of the GDP (*dbagdp*). Activity is calculated by dividing the total value of all trading on the stock market in a percentage of GDP (*stvaltraded*), by the private credit at deposit money banks as a percentage of the GDP (*pcrdbofgdp*). Finally, the efficiency is calculated by multiplying the total value of all trading on the stock market as a percentage of GDP, by the bank overhead costs in a percentage of the total assets. To develop a structure index that is negative when a country is bank-based and positive when a country is market-based, the mean of each ratio (size, activity, and efficiency) for each year of all countries is subtracted from the country's own ratio. The structure index is then calculated by taking the mean of the three ratios. The following formulas display this calculation:

$$s = \frac{stmktcap}{dbagdp} \quad a = \frac{stvaltraded}{pcrdbofgdp} \quad e = stvaltraded * overhead \quad (7)$$

$$FS_{t,c} = \frac{(s-\bar{s})+(a-\bar{a})+(e-\bar{e})}{3} \quad (8)$$

The countries in the database are selected based on their financial system ratio as described in the paper of Demirguc-Kunt and Levine (1999). The country's ratios are very different from each other to compare the effect of differences in momentum profits between them. In this study countries with a widely dispersed financial system ratio according to Demirguc-Kunt and Levine are used. The countries are Australia, Austria, Belgium, Brazil, Canada, Chile, Egypt, Germany, Iraq, Japan, Jordan, Malaysia, Morocco, Netherlands, Norway, Pakistan, Portugal, Saudi Arabia, Singapore, South Korea, Switzerland, Tunisia, United Kingdom, and the United States.

These countries with a very wide distribution of the financial system ratio can help to explain the differences in momentum profits. To test the effect of the financial system on momentum profits in time, an own structure index is created for each year based on 213 countries worldwide. By including all these countries instead of only the 24 countries from the dataset for momentum profits, the structure index will show a clear ratio to determine if a country is bank- or market-based. If only the 24 countries from the dataset are used, the index can identify countries as market-based when they are bank-based or the other way around. This wrong identification occurs because this

structure index compares the financial system's characteristics (size, activity, and efficiency) to other countries.

4.3. Legal system

The legal system of a country is determined by the World FactBook of the Central Intelligence Agency (Central Intelligence Agency, 2018). This index gives an overview of the legal system of each country. This independent variable is a static variable in the regression because it can be assumed that the legal system in a country doesn't change over the 20 years in this dataset.

4.4. Religion

To capture the effect of religion on momentum profits, religion in this study is divided into Islamic and non-Islamic countries. Islamic countries are countries where the Islam is the state religion.⁸ To determine the religion of a country, data from the World Atlas is used (WorldAtlas, 2018). The Islamic countries in this study are Egypt, Iraq, Jordan, Malaysia, Morocco, Pakistan, and Saudi Arabia. These countries are selected on their availability of stock data.

4.5. Control variables

Finally, two macroeconomic control variables are added to the equation to remove their effect on momentum profits. This study uses the same control variables as Dou et al. (2016), who studies the impact of cultural dimensions on momentum strategies. By adding these control variables, this study can test if the explanatory power of the independent variables is affected by macroeconomic variables. The control variables that are included in the regression are the percentage change in the nominal Gross Domestic Product (GDP) and the percentage change of inflation. The data on these variables is obtained from the International Monetary Fund (2018) database. The percentage change in the nominal GDP is calculated by using the current prices in U.S. dollars.

⁸ Countries with a separation between religion and state are labeled as Muslim countries

4.6. Testing hypotheses

The first hypothesis is accepted when countries show the presence of the momentum effect. This effect is present when momentum strategies show positive results. The strategies that this study follows are derived from the momentum strategies of Jegadeesh and Titman (1993). The significance of these results are later tested by a t-test. By using this method, this study is able to observe the momentum profits for each country.

To reject the other zero hypotheses and accept the other alternative hypotheses given in chapter three, a series of tests are done. To get an idea of the total data a correlation matrix is created to get an insight on the correlation between the variables. This matrix will not be able to reject or accept hypotheses so a Mann-Whitney U test and permutation tests are used to test for differences between two categories like a market- bank-based or civil law system or common law system. These tests are able to give significant results on the relationship between momentum profits and the independent variables.

The aim of the Mann-Whitney U test is to reject the zero hypothesis: “There are no significant differences in the dependent variable between two groups of the independent variable”. If the p-value shows a significant number, the zero hypothesis can be rejected. The test is extended by giving an extra command to calculate the probability that random draws from the first group are larger than that of the second group. This is done when the test shows a significant result to reject the zero hypotheses.

The permutation test calculates the mean of two different categories within an independent variable and observes the difference between the two means. After calculating this difference, the test divides the data into the dependent variable randomly and calculates the means of the divided groups and the differences between the two means. The test repeats this action 10,000 times and it calculates in how many times of the cases the difference in the means of the randomly divided groups are equal to or greater than the difference between the first calculated means. By doing this, the test shows if these differences occur due to chance or that there are differences between the groups on the dependent variable.

After these two tests, this study will elaborate on the results by running a regression. This study uses a random effect model because the panel data contains a high number of economic entities on a relatively short period. The high number of economic entities and a relatively short period of time

is also the reason a Seemingly Unrelated Regression is unsuitable. A fixed effects model is not suitable for this study because some variables do not change over time so these cannot be measured.

To test if our independent variables have an influence on momentum a similar regression as Chordea and Lakshmanan (2002)⁹ and Griffin et al. (2003) is done:

$$WML_{cJK} = \alpha + \beta_{FS} * FS_c + \beta_{LS} * LS_c + \beta_R * R_c + [\beta_{MC} * MC] + (\varepsilon + \mu) \quad (9)$$

WML_{cJK} is the return of the momentum portfolio for country c with a formation period of J months with a holding period of K months. The first independent variable is the financial system (FS) in country c . This variable is a ratio based on all countries in the dataset. The second independent variable is the legal system (LS) of country c which is a dummy variable. This variable is 0 for a common law country and 1 for a civil law country. The last independent variable is the religion (R) in country c , and again a dummy variable. A non-Islamic country has a value of 0 and an Islamic country has a value of 1. The macroeconomic control variables (MC) control for macroeconomic effects on the momentum return. Finally, the regression contains two errors terms to allow for individual deviations too.

The following outcome of the regression should lead to acceptance of the hypotheses:

<i>Financial system</i>	H0: $\beta_{FS} \geq 0$
	H2: $\beta_{FS} < 0$
<i>Legal system</i>	H0: $\beta_{LS} \leq 0$
	H3: $\beta_{LS} < 0$
<i>Religion</i>	H0: $\beta_R = 0$
	H4: $\beta_R \neq 0$

⁹ Table V: Momentum Strategy Payoffs Regressed On Macroeconomic Predictors Variables: Five –year Sub period Results

5. Results

5.1. Momentum

The momentum profits are calculated for every January and July between 1995-2017¹⁰. This study focuses on eight momentum strategies (J=3,9 and K=3,9) so the dataset contains for every half-year and every country eight data points. Table I shows the mean momentum profits for every country over the total time series (with and without lag). The momentum profits adjusted to the January effect can be found in Appendix I.

¹⁰ When data is available

TABLE I: MOMENTUM PROFITS PER COUNTRY

Momentum returns									
Country	No. Stocks	One month lag				No month lag			
		<i>J3,K3</i>	<i>J3,K9</i>	<i>J9,K3</i>	<i>J9,K9</i>	<i>J3,K3</i>	<i>J3,K9</i>	<i>J9,K3</i>	<i>J9,K9</i>
Norway	209	0.089**	0.189***	0.067	0.270***	0.114***	0.204***	0.054	0.324***
Switzerland	242	0.077***	0.208***	0.089***	0.261***	0.053**	0.195***	0.106***	0.278***
Germany	595	0.098***	0.119**	0.080**	0.196***	0.068**	0.142***	0.105***	0.239***
United Kingdom	1283	0.072***	0.172***	0.087***	0.166***	0.061***	0.186***	0.098***	0.191***
Austria	71	0.011	0.138***	0.073	0.170**	-0.055**	0.092*	0.055	0.236**
Belgium	153	0.069**	0.163***	0.026	0.127***	0.014	0.148***	0.039	0.119*
Tunesia	79	0.071***	0.124*	0.072**	0.088	0.006	0.066	0.055	0.106
Morocco	74	0.065***	0.122**	0.064**	0.119**	0.019	0.069	-0.024	0.090
Netherlands	103	0.012	0.122	0.039	0.092	0.007	0.076	0.071	0.096
Canada	807	0.023	0.100**	0.029	0.080**	-0.015	0.054	0.006	0.074**
United States	1694	0.017	0.058*	0.026	0.039	0.011	0.051**	0.049	0.078**
Signapore	530	0.025	0.132***	0.024	-0.022	-0.024	0.063	0.040*	0.028
Chile	192	0.059***	0.045	0.002	-0.011	0.057**	0.061	0.001	-0.008
Egypt	175	0.035	0.070	0.006	-0.039	0.038	0.095	-0.006	-0.040
Japan	2906	0.014	0.015	0.030	0.032	0.019	0.012	0.011	0.024
Malysia	798	0.015	0.020	0.000	0.004	-0.016	0.007	-0.022	-0.037
Brasil	415	-0.005	0.018	-0.007	-0.055	-0.039	-0.003	0.039	-0.015
Iraq	85	-0.058	-0.068	0.023	-0.045	0.026	-0.127	0.094	0.029
Pakistan	280	0.014	0.088	-0.024	-0.176	-0.051*	0.016	0.058	-0.063
Jordan	192	0.002	-0.049	-0.022	-0.009	-0.012	-0.043	-0.031	-0.013
Australia	1920	-0.013	-0.019	-0.002	-0.019	-0.041*	-0.060	-0.019	-0.011
Saudi Arabia	185	-0.030	-0.201**	0.017	0.001	-0.036	-0.151	0.034	-0.008
Portugal	54	-0.079	0.017	-0.013	-0.045	-0.097	-0.043	-0.103	-0.113
South Korea	1251	-0.050	-0.084*	-0.020**	-0.108	-0.082***	-0.131***	-0.056*	-0.128***

Notes: The profits are the mean of the momentum profits in January and July for every year. J is the evaluation period and K is the holding period. The results are sorted on their mean return. The asterisks show the significance level from zero for every value. *** is significant at 0.01, ** is significant at 0.05 and * is significant at 0.1 *Source:* Author calculations.

Table I shows the momentum returns¹¹ in different countries with the different momentum strategies. A t-test is done to test if the findings are significantly different from zero. The table displays mainly significant results for northern European countries together with Morocco, Tunisia, and Canada. These findings are similar to the findings of Rouwenhorst (1998) and Griffin et al. (2003) in such a way that the momentum profits are especially large in Europe compared to other countries. The findings differ from their studies in the exact average monthly momentum profit. This study finds higher momentum returns than other studies. A possible explanation for these higher returns could be that this study uses for every country the winner and loser decile instead to simplify calculations. Rouwenhorst (1998) and Griffin et al. (2003) switch between a decile and quintile selection of stocks because of the difference in sizes in stock markets.

To get an idea of the distribution of the momentum profits some eyeballing figures are generated. The violin plot below shows the dispersion of the mean momentum profits from the different strategies. This graph shows that (as expected) the profits become more disperse when the holding period (K) increases. The median average value is the highest for the strategy of J=3, K=9. The momentum returns are the highest for the following European countries: Germany, United Kingdom, Norway, Switzerland, Austria and Belgium¹².

¹¹ The returns in the table are the total returns of the entire holding period. Average monthly returns can be found in Appendix III

¹² See Table I

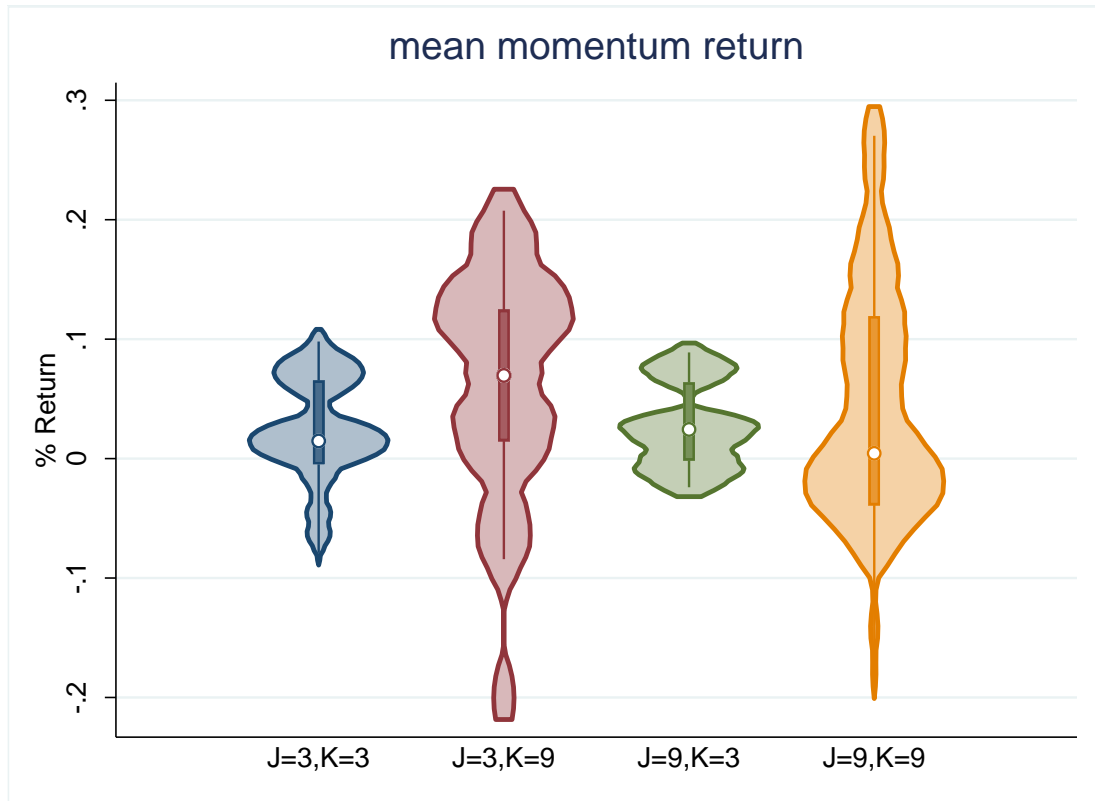


FIGURE II: VIOLIN PLOT OF MEAN MOMENTUM PROFITS

The violin graph shows that the momentum strategies yield slightly positive returns across countries. The violin graph shows similar results when the one month lag is removed¹³. The standard deviations in the momentum returns are higher when the holding period increases.

To test if the momentum strategy can outperform the market, and the anomaly still exists, the market return is subtracted from the momentum profit. After this subtraction, profits tend to diminish and the evidence for the market anomaly weakens. From this subtraction the following mean returns are observed for the different trading strategies:

¹³ See Appendix III

TABLE II: MOMENTUM PROFITS MINUS MEAN MARKET RETURNS

Mean of momentum profits – mean market return		
	Momentum strategy	Mean
1 month lag	J3,K3	.024
	J3,K9	.025
	J9,K3	.076
	J9,K9	.047
No lag	J3,K3	-.017
	J3,K9	-.007
	J9,K3	.030
	J9,K9	.033

Source: Authors calculations

Table II illustrates that a momentum strategy with a one month lag is better at outperforming the market than without the delay. Here again, momentum strategies in European countries are especially good at beating the market.

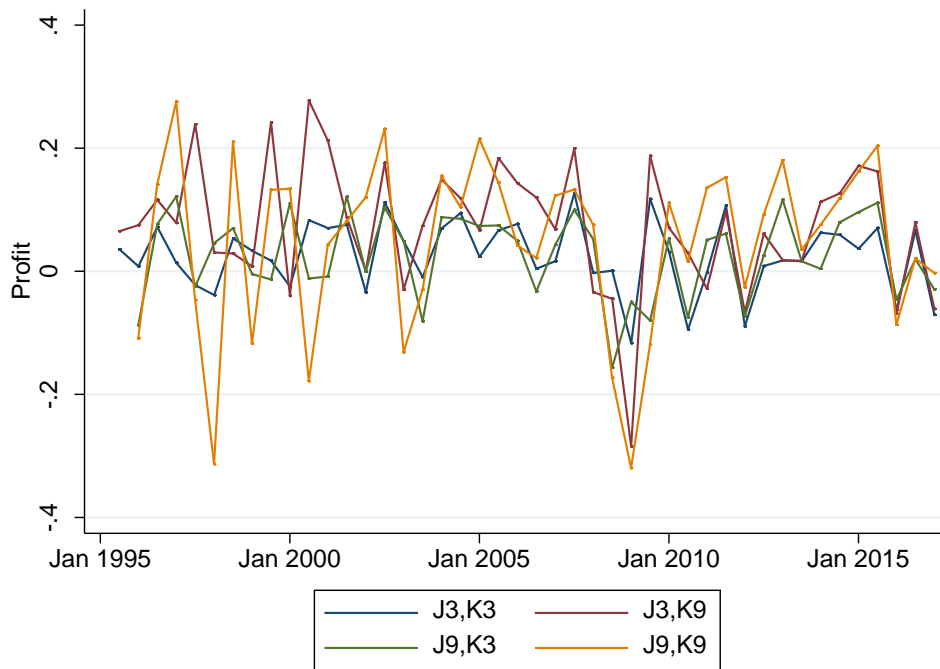


FIGURE III: MOMENTUM PROFITS OVER TIME

Notes: The lines are the mean of the momentum strategies (with one month lag) of all countries.

Figure III displays the mean momentum profits through time. The financial crisis can explain the drop in 2009. The literature already stated that momentum profits tend to crash in periods of economic crisis and the findings in this study confirms that statement. When the market drives back

to the normal state, momentum returns have the tendency to increase. Furthermore, this figure shows that the profits are quite volatile over time, especially when the formation and holding periods are extended.

5.2. Financial systems

TABLE III: STRUCTURE INDEX PER COUNTRY

Country	Structure	Country	Structure
<i>Australia</i>	.178318	<i>Morocco</i>	-.1159491
<i>Austria</i>	-.249831	<i>Netherlands</i>	.0883883
<i>Belgium</i>	-.045204	<i>Norway</i>	-.0778521
<i>Brazil</i>	-.0165748	<i>Pakistan</i>	.2956284
<i>Canada</i>	.1238287	<i>Portugal</i>	-.2435148
<i>Chile</i>	.2019792	<i>Saudi Arabia</i>	.5950015
<i>Egypt</i>	-.088365	<i>Singapore</i>	.4757879
<i>Germany</i>	-.0939412	<i>South Korea</i>	.
<i>Iraq</i>	.	<i>Switzerland</i>	.3507704
<i>Japan</i>	-.114091	<i>Tunisia</i>	-.2788646
<i>Jordan</i>	.1626685	<i>United Kingdom</i>	.1227131
<i>Malaysia</i>	.1309795	<i>United States</i>	.7275878

Notes: This index for the financial structure is the mean of the structure index for every year Source: Author calculations

Table III shows the structure index per country. This index is a mean over the period 1995-2015. A negative number in the table indicates that a nation is bank-based and a positive number means that the country is market-based. For South Korea and Iraq, there wasn't enough data for this research to determine the financial structure over time, so from here on these two countries are excluded from the research. For every country each year a structure ratio is calculated and a country can switch between market and bank-based over time. There are no extraordinary changes in ratios over time, for example the United States is market-based and Japan bank-based in every period. Saudi Arabia became more market-based over the entire period and Pakistan, Malaysia, and Singapore grow into a more market-based country during crisis years.

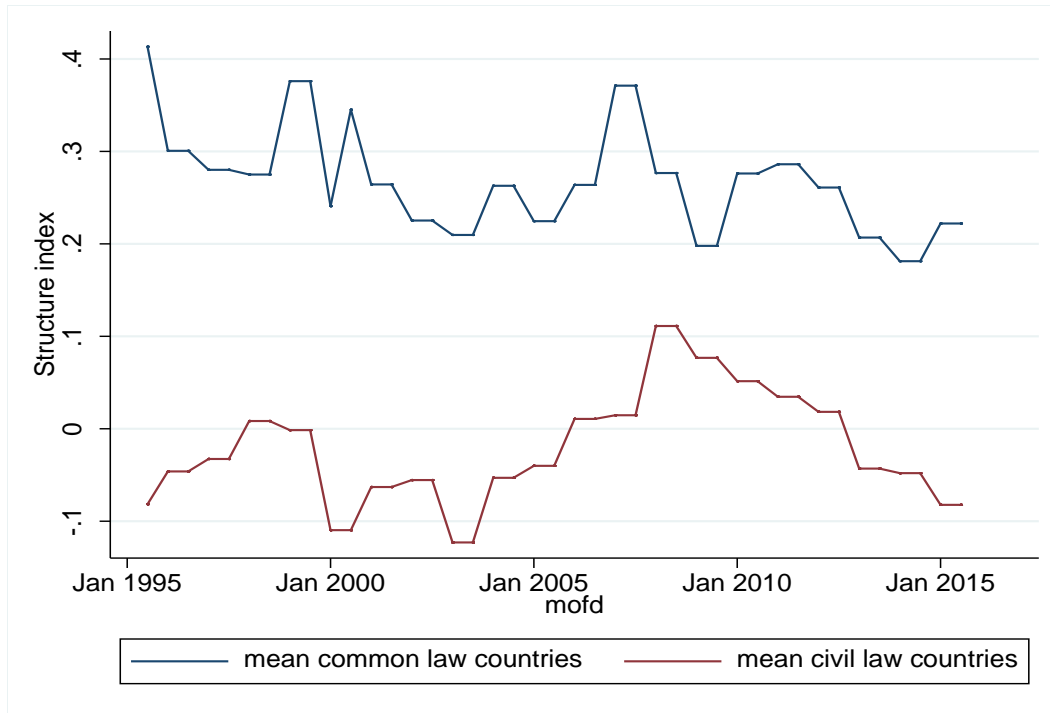


FIGURE IV: THE STRUCTURE INDEX IN DIFFERENT LAW SYSTEMS

This graph confirms the findings from the literature study since it displays that countries with a common law system are more market-based than civil law countries. The increase of the structure index for civil law countries in the period 2004-2009 is due to the increase of the total traded value in the stock market in a percentage to the GDP. At the start of the crisis this percentage declines due to the lower confidence in equity markets.

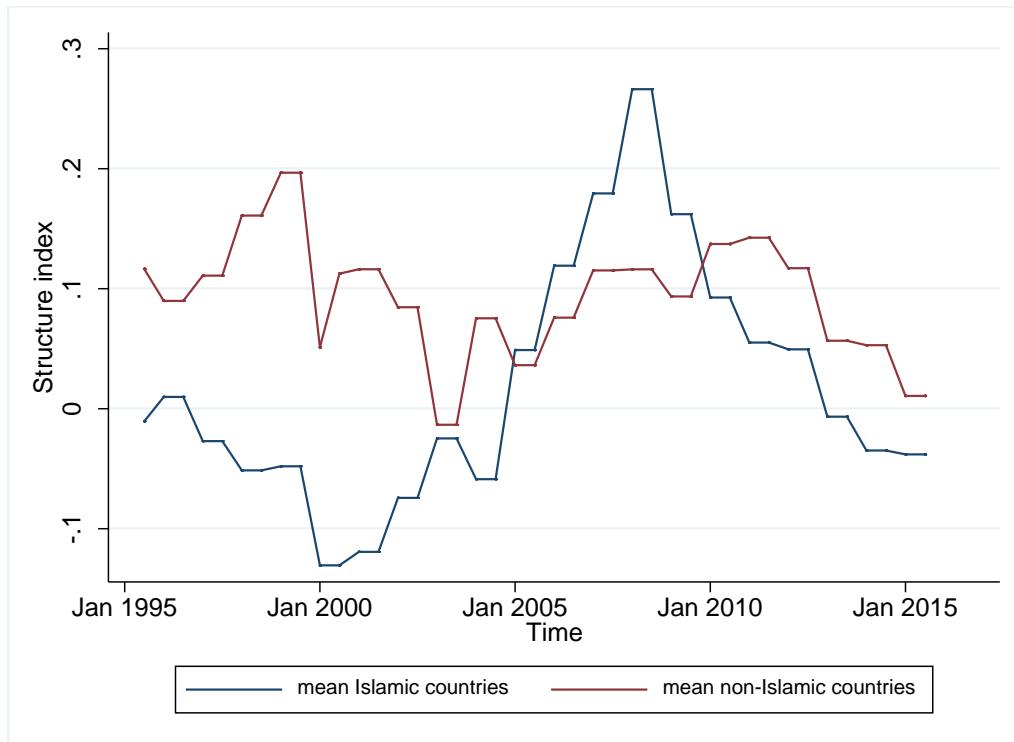


FIGURE V: STRUCTURE INDEX

Figure V shows that in the past 20 years the differences between the structure indexes from the two different groups, divided by religion, declines. This is in line with the literature that explained that capital markets became more important for Islamic countries in the previous decades. The peak in 2009 is due to the growth of the stock market capitalization and the total value of all trading on the stock market as percentage of the GDP. Another reason for the peak is the low percentage of the private credit deposited by banks and other financial institutions in that period.

5.3. Correlation

Before regressions or other test are done, a correlation matrix shows the correlation between the different dependent and independent variables.

TABLE IV: MATRIX OF CORRELATIONS

Variables	(1)
(1) WML33	1.000
(2) WML39	0.573
(3) WML93	0.500
(4) WML99	0.333
(5) FS	-0.029
(6) LS	-0.062
(7) R	-0.042

Notes: This matrix shows the momentum profits with one month lag. The structure index determines if a country is market- or bank-based and number 6 & 7 are the dummies for the legal system and Islamic or non-Islamic. *Source:* Author calculations.

TABLE V: MATRIX OF CORRELATIONS

Variables	(1)
(1) WML33nolag	1.000
(2) WML39nolag	0.627
(3) WML93nolag	0.397
(4) WML99nolag	0.372
(5) FS	0.020
(6) LS	-0.084
(7) R	-0.077

Notes: This matrix shows the momentum profits without the one month lag. *Source:* Author calculations.

The results from the correlation matrix display a tendency for a negative effect of the legal system and the religion on momentum profits. This result implies that a country with a common law legal system contains fewer momentum profits than a country with a civil law legal system. The same goes for Islamic countries; they tend to have a smaller amount of momentum profits too.

The effect of the financial system on momentum profits is hard to determine from this matrix.

5.4. Mann-Whitney U test

TABLE VI: MANN-WHITNEY U TEST

Momentum strategy		Mann-Whitney U test					
		Structure index	Pr. 0>1	Legal system	p-value Pr. 0>1	Religion	Pr. 0>1
1 month lag	J3,K3	0.0079**	0.557	0.2946		0.6015	
	J3,K9	0.0654*	0.539	0.9443		0.0216**	0.552
	J9,K3	0.4423		0.6171		0.4155	
	J9,K9	0.0589*	0.540	0.3941		0.0385**	0.546
No lag	J3,K3	0.2134		0.0500**	0.541	0.2451	
	J3,K9	0.1607		0.2659		0.044**	0.565
	J9,K3	0.5878		0.5833		0.0023***	0.572
	J9,K9	0.2149		0.2244		0.0023***	0.572

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. Source: Author calculations.

To get an indication if the momentum profits are dependent on the financial structure the Mann-Whitney U test is done¹⁴. To make the data functional for the test the structure index variable is changed to a dummy variable with 1 when the ratio is positive (market-based) and 0 when the ratio is negative (bank-based). The number in the tables represent the p-values of the influence of the independent variables on momentum profits. When significant values are found the probability that a dummy value of 0 (bank-based) is bigger than 1 (market-based) is calculated.

For the evaluation and holding period of 3 months and one month lag ($j=3, k=3$) the test can reject the 0 hypothesis because of the p-value of 0.0079. This means that it is not equally likely that when a momentum profit value is randomly selected from the sample, this value will be smaller or bigger than another random value. The rejection of this zero hypothesis gives an indication that there is a relationship between momentum profits and the financial structure of a country. The rejection of the zero hypothesis is not significant anymore when the momentum strategy is changed to ($J=9, K=3$) or ($J=9, K=9$). When the observations for July are removed, the zero hypothesis for the

¹⁴ See Appendix IV for the extended results on this test

momentum strategy of $J=3$ $K=3$ can be rejected too. This can be due to the January effect. When the momentum profits without lag are observed no significant results are detected to reject the 0 hypothesis. If the legal system is compared to momentum profits the 0 hypothesis, momentum profits are randomly distributed between the two legal systems, can only be rejected for the strategy with $J=3$ $K=3$ and without the lag. When the results are observed of the relationship between momentum profits and the religion dummy the results become more interesting. For five of the eight momentum strategies, the 0 hypothesis can be rejected (see Table VI).

When the Mann-Whitney U test rejects the zero hypothesis (with an alpha of 0.05 or 0.10) the probability that the variable of one group is bigger than the other group is also tested. The observed probabilities are between 0.539 and 0.558 which indicates that the independent variables have only a minor influence on the momentum profits but a negative one. This means negative influence means that when the structure index is lower, so a country is bank-based instead of market-based, the momentum profits increases. For the legal system, this means that civil law countries contain more momentum profits and that countries that are non-Islamic contain more momentum profits. It is important to note that the evidence is rather weakly and the effect is small.

5.5. Permutation test

To extend the findings in the previous paragraphs a permutation test is done. The permutation test determines if there is a statistical difference between two group means (see chapter four). In this case, the observed variable is the momentum profit and the two groups are bank-based countries and market-based countries. A dummy is created to divide countries into the two groups. For the permutation test on the financial system, the countries South Korea and Iraq are dropped because of the absence of reliable data about the financial structure of the country.

TABLE VII: PERMUTATION TEST

Momentum strategy		Permutation test		
		Structure index = 1	p-value	
			Legal system = 1	Religion = 1
1 month lag	J3,K3	0.7499	0.4976	0.6979
	J3,K9	0.7881	0.3181	0.9388*
	J9,K3	0.8125	0.6934	0.7833
	J9,K9	0.8373	0.8818	0.9261*
No lag	J3,K3	0.9519**	0.4966	0.8241
	J3,K9	0.8140	0.4350	0.9048*
	J9,K3	0.3502	0.4319	0.6599
	J9,K9	0.7825	0.6978	0.9485*

Notes: *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

Although Table VII shows that there are only a few significant results regarding the permutation test, the numbers can give an indication of the effect of the independent variables. Because the numbers of structure index are closer to one than to zero, it implies that bank-based countries have higher momentum profits than market-based countries. The same argument goes for the religion dummy. Here does the table imply that countries without Islamic as state religion contain more momentum profits. The results regarding the legal system are divided.

This test is done by using the mean momentum profits per country and a not over time changing dummy variable for the financial system.

5.6. Regression

Before regressions are run some tests are done to test for heteroscedasticity autocorrelation and multicollinearity. Because there is no extreme correlation between variables (see previous correlation matrix), it can be expected that there is no multicollinearity. A Variance Inflation Factor (VIF) test cannot be done for the random effect model so it is tested on normal regression. This test shows low VIF rates so there is no multicollinearity in the dataset. The data is furthermore tested on heteroscedasticity, autocorrelation before the tests and the regressions are ran. By these test no evidence of heteroscedasticity or autocorrelation is found.

TABLE VIII: RANDOM EFFECT MODEL

	WML 33	WML 39	WML 93	WML 99	WML 33 No lag	WML 39 No lag	WML 93 No lag	WML 99 No lag
FS	-0.023 (0.47)	-0.064 (0.28)	0.004 (0.91)	0.009 (0.90)	0.024 (0.50)	-0.014 (0.82)	0.038 (0.38)	0.044 (0.56)
LS	-0.013 (0.54)	0.001 (0.97)	-0.016 (0.39)	-0.081* (0.06)	-0.037 (0.11)	-0.035 (0.39)	-0.010 (0.69)	-0.069 (0.19)
R	-0.011 (0.61)	-0.075* (0.06)	-0.002 (0.91)	-0.063 (0.15)	-0.011 (0.63)	-0.069* (0.09)	-0.026 (0.34)	-0.083 (0.13)
gdpgrowth	0.039 (0.57)	-0.119 (0.32)	-0.009 (0.90)	0.108 (0.47)	0.078 (0.29)	-0.093 (0.46)	-0.063 (0.55)	0.088 (0.56)
inflation	0.078 (0.71)	0.344 (0.36)	-0.683** (0.02)	-1.959*** (0.00)	-0.179 (0.43)	0.042 (0.91)	0.305 (0.45)	-1.088 (0.11)
constant	0.040*** (0.00)	0.109*** (0.00)	0.056*** (0.00)	0.154*** (0.00)	0.022 (0.14)	0.102*** (0.00)	0.034** (0.04)	0.146*** (0.00)
<i>N</i>	728	734	755	758	737	737	699	699

Notes: pval in parentheses *** p<0.01, ** p<0.05, * p<0.1 Source: Authors calculations

When the random effect model is used to run regressions, no clear significant results can be found for all the different momentum strategies with or without the one month lag with regard to the financial structure. The regression shows that a country's religion and legal system in some momentum strategies has a negative significant effect on momentum profits. This result is in line with the hypotheses. All the coefficients with the strategies show small impacts which indicate that the effect of the dependent variables in this study is not that enormous.

To test for the January effect, a January dummy is created to test the momentum profits separately for January and July. Table IX and X displays this separation.

TABLE IX: RANDOM EFFECT MODEL WITHOUT JANUARY

	WML 33	WML 39	WML 93	WML 99	WML 33 No lag	WML 39 No lag	WML 93 No lag	WML 99 No lag
FS	0.014 (0.72)	-0.091 (0.24)	0.059 (0.19)	-0.015 (0.85)	0.037 (0.32)	-0.069 (0.37)	0.094** (0.05)	0.050 (0.56)
LS	-0.016 (0.53)	0.005 (0.93)	0.005 (0.86)	-0.041 (0.38)	-0.041* (0.07)	-0.022 (0.68)	-0.035 (0.20)	-0.071 (0.16)
R	-0.016 (0.52)	-0.071 (0.18)	0.022 (0.42)	-0.019 (0.69)	-0.033 (0.15)	-0.077 (0.14)	-0.044 (0.13)	-0.067 (0.21)
gdpgrowth	-0.078 (0.39)	-0.341** (0.03)	-0.137 (0.22)	-0.184 (0.32)	-0.068 (0.45)	-0.358** (0.03)	-0.138 (0.23)	-0.254 (0.21)
inflation	0.219 (0.35)	0.482 (0.25)	-0.829* (0.06)	-2.579*** (0.00)	-0.087 (0.70)	0.078 (0.85)	-0.255 (0.59)	-1.957** (0.02)
constant	0.054*** (0.00)	0.154*** (0.00)	0.040** (0.03)	0.172*** (0.00)	0.049*** (0.00)	0.156*** (0.00)	0.060*** (0.00)	0.191*** (0.00)
<i>N</i>	402	403	407	408	405	405	370	370

Notes: pval in parentheses *** p<0.01, ** p<0.05, * p<0.1 Source: Authors calculations

TABLE X: RANDOM EFFECT MODEL WITHOUT JULY

	WML 33	WML 39	WML 93	WML 99	WML 33 nolag	WML 39 nolag	WML 93 nolag	WML 99 nolag
FS	-0.061 (0.14)	-0.018 (0.81)	-0.060 (0.16)	0.008 (0.93)	0.031 (0.56)	0.070 (0.41)	-0.026 (0.73)	0.042 (0.69)
LS	-0.011 (0.64)	-0.004 (0.92)	-0.038 (0.13)	-0.110** (0.05)	-0.038 (0.24)	-0.051 (0.31)	0.019 (0.66)	-0.066 (0.32)
R	0.004 (0.87)	-0.066 (0.14)	-0.029 (0.26)	-0.100* (0.09)	0.023 (0.48)	-0.052 (0.32)	-0.004 (0.93)	-0.087 (0.21)
gdpgrowth	0.177* (0.08)	0.152 (0.40)	0.148 (0.16)	0.489** (0.05)	0.229** (0.05)	0.218 (0.25)	0.039 (0.83)	0.491** (0.03)
inflation	-0.574 (0.15)	-0.056 (0.93)	-0.534 (0.17)	-1.844** (0.04)	-0.565 (0.23)	-0.100 (0.90)	0.798 (0.23)	-0.567 (0.53)
constant	0.035** (0.03)	0.063** (0.03)	0.075*** (0.00)	0.143*** (0.00)	-0.003 (0.89)	0.041 (0.23)	0.008 (0.79)	0.107** (0.02)
<i>N</i>	326	331	348	350	332	332	329	329

Notes: pval in parentheses *** p<0.01, ** p<0.05, * p<0.1 Source: Authors calculations

The separation of in these formation months leads to interesting results. There is a small positive significant relationship between momentum returns and the financial system for the $J=9$, $K=3$ without the lag strategy. This contradicts our hypothesis. There is furthermore a small negative significant association between the legal system and momentum profits for the $J=3$, $K=3$ without the lag strategy. This applies to the portfolios that are formed in July.

When the portfolios that are made January are observed, there is one strategy that shows negative significant results for a country's legal system and religion. This momentum strategy is $J=9$, $K=9$ with a month lag. These negative findings are in line with the stated hypotheses.

6. Conclusion

This study covers a dataset of 24 countries and tests whether their stock markets contain momentum profits between 1995 and 2017. Furthermore, this paper tests whether their financial system, their legal system and their religion influences these profits. This paper contributes to the literature by using more recent data and tests the effect of a country's financial system, legal system and religion on the momentum effect. The findings on the momentum effect are as follows.

First, this study can conclude that the momentum anomaly is not extinct and still exists in multiple stock markets. The momentum effect is the strongest in northern European countries like Norway, United Kingdom, Germany, Austria, Switzerland, and Belgium. The momentum profits are not as substantial as they were back in the time that the momentum strategies were reported for the first time (in the United States, in 1993). The decrease in the momentum effect could be due to all the academic research and publications on this topic. Moreover, the momentum returns decline when there is a financial crisis, which is in line with the findings from the literature study.

Secondly, a significant effect cannot be clearly explained by the financial system of a country. In both systems the momentum effect can be found. This finding does not mean that momentum profits do not have an impact, because a broader time span or a broader set of countries could discover a significant relationship, therefore, is one of the limitations of the research. The tests do imply that there is some relationship between the financial system and momentum profits. Although this study is not able to find significant results, it does suggest some connection. Therefore it is a remarkable topic that demands further research.

Thirdly, there are no significant results of the impact of the legal systems on momentum profits. Although the correlation matrix and the Mann-Whitney U test suggest that countries with a civil law system tend to hold more momentum than nations with a common law system. This is in line with the findings in the literature study, since the equity markets in civil law countries are more likely to be less efficient than those in common law countries. The poorer market efficiency in these countries leads to a more significant presence of the anomaly.

Fourthly, religion has a significant impact on momentum profits when the portfolios formed immediately after the formation period. However, this is mainly due to the January effect. When momentum profits in January are added to the study, this result is not significant. The religion's impact is negative, which implies that momentum profits are lower in Islamic countries than in

non-Islamic countries for some strategies in this study. In contrast to the regression, the correlation matrix, the permutation test and the Mann-Whitney U test do imply that Islamic nations contain less momentum than non-Islamic countries.

This study helps in the understanding of stock price movement and it displays the current presence of the anomaly. The evidence on momentum profits and the influence of the variables can help momentum traders choose in which indices/countries to invest.

A limitation of this study is the absence of a large sample of stock data in Islamic countries. This absence makes it harder to find specific patterns in their stock markets. This absence is caused by the fact that financial markets are relatively new and smaller in these countries than in conventional nations. Another limitation of this study is the number of countries and the time span that is used in this study. A broader dataset could be better in finding the momentum effect and the effect of the dependent variables on momentum profits. By expanding the time span and the number of nations, the anomaly might be detected better. However, this can also be caused by data mining instead of the actual presence of the momentum effect. This study ignores the influence of transaction costs and it implies the unlimited possibilities of short-selling. In practice, these factors do influence the profitability of momentum strategies.

Lastly, this study used the most well-known momentum strategies described in the literature, but the findings could change by using different strategies. Examples of these changes are smaller or bigger formation and holding periods, different lags in between or changing the number of stocks that are bought and shorted (top decile or quintile).

Like many other papers, this study shows that the momentum effect persists in multiple stock markets. Further research on this market anomaly could improve risk- and behavioral-based models to thoroughly explain the momentum anomaly. Although there is some relationship observed between the country's financial system, legal system and religion on the momentum profits, the effect is rather small and insignificant. Additional research on this topic could overcome these limitations and make a better contribution to the market anomaly. Furthermore, it would be interesting to do more research on European momentum, because of the various findings on the profitability of momentum strategies in these countries. The contradicting evidence on the efficiency of stock markets in Islamic countries and the absence of a large quantity of studies on momentum in these countries make the momentum effect a remarkable topic for further research.

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8. Appendices

8.1. Appendix I: Descriptive statistics

Momentum return

Variable	Obs	Mean	Std.Dev.	Min	Max
WML33	853	.027	.181	-1.423	1.135
WML39	858	.076	.318	-1.374	1.941
WML93	885	.027	.205	-1.469	.968
WML99	887	.051	.394	-4.794	2.293
WML33nolag	862	.002	.191	-1.232	.786
WML39nolag	861	.053	.331	-1.467	1.96
WML93nolag	824	.027	.264	-1.337	4.198
WML99nolag	823	.064	.386	-2.419	3.265

Descriptive variables

Variable	Obs	Mean	Std.Dev.	Min	Max
FS	881	.07	.283	-.604	.971
LS	1056	.292	.455	0	1
R	1056	.333	.472	0	1

8.2. Appendix II: Momentum return

If month is January and with one month lag.

Country	Firms	Momentum returns			
		J3,K3	J3,K9	J9,K3	J9,K9
Australia	1920	-0.013	-0.019	-0.002	-0.019
Austria	71	0.011	0.138	0.073	0.170
Belgium	153	0.069	0.163	0.026	0.127
Brasil	415	-0.005	0.018	-0.007	-0.055
Canada	807	0.023	0.100	0.029	0.080
Chile	192	0.059	0.045	0.002	-0.011
Egypt	175	0.035	0.070	0.006	-0.039
Germany	595	0.098	0.119	0.080	0.196
Iraq	85	-0.058	-0.068	0.023	-0.045
Japan	2906	0.014	0.015	0.030	0.032
Jordan	192	0.002	-0.049	-0.022	-0.009
Malaysia	798	0.015	0.020	0.000	0.004
Morocco	74	0.065	0.122	0.064	0.119
Netherlands	103	0.012	0.122	0.039	0.092
Norway	209	0.089	0.189	0.067	0.270
Pakistan	280	0.014	0.088	-0.024	-0.176
Portugal	54	-0.079	0.017	-0.013	-0.045
Saudi Arabia	185	-0.030	-0.201	0.017	0.001
Signapore	530	0.025	0.132	0.024	-0.022
South Korea	1251	-0.050	-0.084	-0.020	-0.108
Switzerland	242	0.077	0.208	0.089	0.261
Tunesia	79	0.071	0.124	0.072	0.088
United Kingdom	1283	0.072	0.172	0.087	0.166
United States	1694	0.017	0.058	0.026	0.039

If month is January and with no month lag

Country	Firms	Momentum returns			
		J3,K3	J3,K9	J9,K3	J9,K9
Australia	1920	-0.041	-0.060	-0.019	-0.011
Austria	71	-0.055	0.092	0.055	0.236
Belgium	153	0.014	0.148	0.039	0.119
Brasil	415	-0.039	-0.003	0.039	-0.015
Canada	807	-0.015	0.054	0.006	0.074
Chile	192	0.057	0.061	0.001	-0.008
Egypt	175	0.038	0.095	-0.006	-0.040
Germany	595	0.068	0.142	0.105	0.239
Iraq	85	0.026	-0.127	0.094	0.029
Japan	2906	0.019	0.012	0.011	0.024
Jordan	192	-0.012	-0.043	-0.031	-0.013
Malysia	798	-0.016	0.007	-0.022	-0.037
Morocco	74	0.019	0.069	-0.024	0.090
Netherlands	103	0.007	0.076	0.071	0.096
Norway	209	0.114	0.204	0.054	0.324
Pakistan	280	-0.051	0.016	0.058	-0.063
Portugal	54	-0.097	-0.043	-0.103	-0.113
Saudi Arabia	185	-0.036	-0.151	0.034	-0.008
Signapore	530	-0.024	0.063	0.040	0.028
South Korea	1251	-0.082	-0.131	-0.056	-0.128
Switzerland	242	0.053	0.195	0.106	0.278
Tunesia	79	0.006	0.066	0.055	0.106
United Kingdom	1283	0.061	0.186	0.098	0.191
United States	1694	0.011	0.051	0.049	0.078

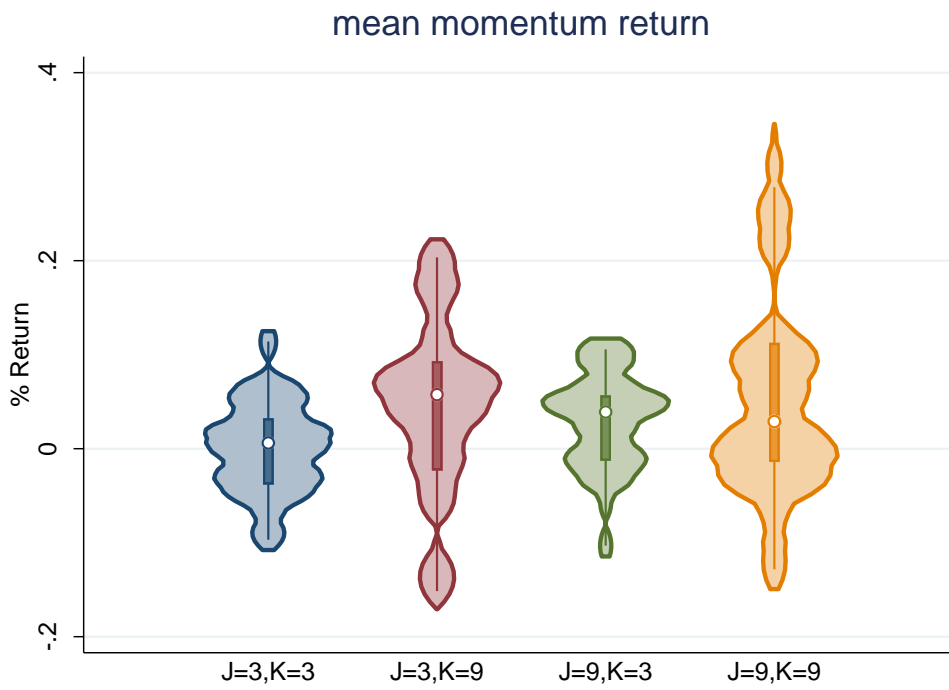
If month is July and with one month lag

Country	Firms	Momentum profits			
		J3,K9	J9,K3	J3,K3	J9,K9
Australia	1920	-0.013	-0.019	-0.002	-0.019
Austria	71	0.011	0.138	0.073	0.170
Belgium	153	0.069	0.163	0.026	0.127
Brasil	415	-0.005	0.018	-0.007	-0.055
Canada	807	0.023	0.100	0.029	0.080
Chile	192	0.059	0.045	0.002	-0.011
Egypt	175	0.035	0.070	0.006	-0.039
Germany	595	0.098	0.119	0.080	0.196
Iraq	85	-0.058	-0.068	0.023	-0.045
Japan	2906	0.014	0.015	0.030	0.032
Jordan	192	0.002	-0.049	-0.022	-0.009
Malysia	798	0.015	0.020	0.000	0.004
Morocco	74	0.065	0.122	0.064	0.119
Netherlands	103	0.012	0.122	0.039	0.092
Norway	209	0.089	0.189	0.067	0.270
Pakistan	280	0.014	0.088	-0.024	-0.176
Portugal	54	-0.079	0.017	-0.013	-0.045
Saudi Arabia	185	-0.030	-0.201	0.017	0.001
Signapore	530	0.025	0.132	0.024	-0.022
South Korea	1251	-0.050	-0.084	-0.020	-0.108
Switzerland	242	0.077	0.208	0.089	0.261
Tunesia	79	0.071	0.124	0.072	0.088
United Kingdom	1283	0.072	0.172	0.087	0.166
United States	1694	0.017	0.058	0.026	0.039

8.3. Appendix III: Average monthly momentum returns

Country	Firms	J3,K3	J3,K9	J9,K3	J9,K9	J3,K3	J3,K9	J9,K3	J9,K9
					One month lag		No lag		
Norway	209	0.030	0.021	0.022	0.030	0.038	0.023	0.018	0.036
Switzerland	242	0.026	0.023	0.030	0.029	0.018	0.022	0.035	0.031
Germany	595	0.033	0.013	0.027	0.022	0.023	0.016	0.035	0.027
Austria	71	0.004	0.015	0.024	0.019	- 0.018	0.010	0.018	0.026
United Kingdom	1283	0.024	0.019	0.029	0.018	0.020	0.021	0.033	0.021
Belgium	153	0.023	0.018	0.009	0.014	0.005	0.016	0.013	0.013
Morocco	74	0.022	0.014	0.021	0.013	0.006	0.008	-0.008	0.010
Netherlands	103	0.004	0.014	0.013	0.010	0.002	0.008	0.024	0.011
Tunesia	79	0.024	0.014	0.024	0.010	0.002	0.007	0.018	0.012
Canada	807	0.008	0.011	0.010	0.009	- 0.005	0.006	0.002	0.008
United States	1694	0.006	0.006	0.009	0.004	0.004	0.006	0.016	0.009
Japan	2906	0.005	0.002	0.010	0.004	0.006	0.001	0.004	0.003
Malaysia	798	0.005	0.002	0.000	0.000	- 0.005	0.001	-0.007	-0.004
Saudi Arabia	185	- 0.010	- 0.022	0.006	0.000	- 0.012	-0.017	0.011	-0.001
Jordan	192	0.001	- 0.005	- 0.007	-0.001	- 0.004	-0.005	-0.010	-0.001
Chile	192	0.020	0.005	0.001	-0.001	0.019	0.007	0.000	-0.001
Australia	1920	- 0.004	- 0.002	- 0.001	-0.002	- 0.014	-0.007	-0.006	-0.001
Signapore	530	0.008	0.015	0.008	-0.002	- 0.008	0.007	0.013	0.003
Egypt	175	0.012	0.008	0.002	-0.004	0.013	0.011	-0.002	-0.004
Portugal	54	- 0.026	0.002	- 0.004	-0.005	- 0.032	-0.005	-0.034	-0.013
Iraq	85	- 0.019	- 0.008	0.008	-0.005	0.009	-0.014	0.031	0.003
Brazil	415	- 0.002	0.002	- 0.002	-0.006	- 0.013	0.000	0.013	-0.002
South Korea	1251	- 0.017	- 0.009	- 0.007	-0.012	- 0.027	-0.015	-0.019	-0.014
Pakistan	280	0.005	0.010	- 0.008	-0.020	- 0.017	0.002	0.019	-0.007

8.4. Appendix IV: Violin plot without one month lag



8.5. Appendix V: Mann-Withney U test

Mann-Withney U test			
	Momentum strategy	Structure index	Pr. 0>1
For January			
1 month	J3,K3	0.005**	0.590
lag	J3,K9	0.299	
	J9,K3	0.006*	0.585
	J9,K9	0.143	
No lag	J3,K3	0.117	
	J3,K9	0.413	
	J9,K3	0.491	
	J9,K9	0.206	
For July			
1 month	J3,K3	0.282	
lag	J3,K9	0.138	
	J9,K3	0.125	
	J9,K9	0.215	
No lag	J3,K3	0.902	
	J3,K9	0.287	
	J9,K3	0.164	
	J9,K9	0.622	

8.6. Appendix VI: RE regression for January

VARIABLES	WML	WML	WML	WML	WML	WML	WML	WML
	33	39	93	99	33	39	93	99
					No lag	No lag	no lag	No lag
FS	0.01 (0.806)	-0.12* (0.095)	0.04 (0.320)	-0.06 (0.462)	0.03 (0.351)	-0.10 (0.160)	0.08* (0.079)	0.02 (0.853)
LS	-0.02 (0.519)	0.01 (0.862)	0.01 (0.825)	-0.03 (0.525)	-0.04* (0.057)	-0.02 (0.727)	-0.03 (0.208)	-0.07 (0.190)
R	-0.01 (0.575)	-0.07 (0.165)	-0.00 (0.986)	-0.08* (0.097)	-0.04* (0.085)	-0.09* (0.079)	-0.05** (0.048)	-0.12** (0.023)
Constant	0.06*** (0.000)	0.15*** (0.000)	0.02 (0.286)	0.11*** (0.000)	0.04*** (0.000)	0.14*** (0.000)	0.05*** (0.002)	0.14*** (0.000)

pval in parentheses
 *** p<0.01, ** p<0.05, * p<0.1