Examining a new liquidity risk factor: cash and short-term investments

Yannick Wamelink

S4634527

Master Economics: Corporate Finance and Control

Radboud University Nijmegen

Nijmegen School of Management

Supervisor: Dr. Sven Nolte

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Abstract

Companies with much cash and short-term investments are growth companies with a weak operating profitability and an aggressive investment style. Liquid companies carry a return premium. Annually, the 5 portfolios with the highest liquidity ratio, hence the CSI ratios, outperformed the 5 illiquid portfolios with 1,34%. However, this significant return premium is not caused by a risk premium. According to the Fama-McBeth regressions, this return premium was not caused by a risk premium, because the liquidity risk factor LMI is not priced in the cross-section of stock returns.

In addition to this, liquid companies outperform illiquid companies during rising stock market as well as during recessions, respectively with 0,18% and 0,19% monthly. Liquid assets are associated with a higher risk, because it proxies for growth opportunities. However, the results show that this is not the case. Even in market downturns liquid companies do perform significantly better. These companies do not have problems with higher interest expenses when they want to raise new capital during recessions. They can invest their proceeds when these companies sell the short-term investments. This is in line with the precautionary motive of Keynes (1937).

Table of contents

1. Introduction

Since the seminal work of Fama and French (1993), using risk factors to determine the excess return of stock prices, the finance literature started to change their opinion about the Capital Asset Pricing Model (CAPM). The CAPM displays a linear relationship between the amount of systematic risk and expected return. Historically, there are several risk factors important in determining the expected return, instead of only the systematic risk of an asset. For example, small companies have a risk premium in comparison with large companies. As the investor's investment horizon expires, an investor wants to take less risk. A pension fund therefore reduces the amount of small companies and includes mature companies in the portfolio, mitigating the risk of the total portfolio.

This thesis develops and test empirically a new risk factor. The new liquidity risk factor is cash and short-term investments to total assets. This ratio is called the CSI ratio. The goal is to analyze whether companies with much cash and short-term investments carry a return premium caused by a risk premium. To answer this question, it is important to examine in which economic stages liquid companies perform better than illiquid companies, hence during rising stock markets or during economic downturns.

The dataset consisted of 310 American listed companies. Every year, the time frame ran from 1980 to 2019, these companies are assigned to 1 of the 10 decile portfolios. If the number of the portfolio rises the CSI ratio increases as well. Portfolio 1 consisted of companies with the 10% lowest CSI ratios. In contrast, portfolio 10 included only companies with the highest CSI ratios. Thereafter, all the monthly stock returns are assigned to the subsequent portfolios. This ensured that portfolio X only had the monthly stock returns of companies that were assigned to portfolio X in one of the 38 years. Because of this it, became clear whether companies with much cash and short-term investments carried a return premium. To examine whether this return premium was caused by a risk premium, the thesis used Fama-McBeth-regressions.

It turned out the companies with much cash and short-term investments are growth companies with a weak operating profitability and an aggressive investment style. The results show that liquid companies do carry a return premium. Annually and historically the 5 portfolios with the highest CSI ratios outperformed the 5 illiquid portfolios with 1,34%. However, this thesis did not find any evidence that this return premium is caused by a risk premium. The Fama-McBeth-estimates were not statistically significant.

The other results show that liquid companies perform much better than illiquid companies during rising stock markets as well as during stock market downturns. Liquid companies are therefore no riskier than illiquid companies, because their stock price is falling less rapidly during economic downturns. Liquid assets are even protection opportunities, because it avoids high expenses regarding raising additional capital during recessions. This corresponds with the precautionary

motive of Keynes (1939).

Chapter 2 is about the literature review. Risk factors are discussed in more detail and it analyzes whether companies with much cash and short-term investments are riskier. Cash is also analyzed from the perspective of the investor. From the literature review are drawn three hypotheses which is stated in chapter 3. Chapter 4 has as goal to describe the methodological approach. This chapter classifies which data is used and shows the results as well as the corresponding empirical tests. Chapter 5 tests the hypotheses. Chapter 6 draws a conclusion and chapter 7 discusses this thesis. In addition, chapter 7 gives advice for future research. Lastly follow the bibliography and the appendix.

2. Literature review

The literature review consists of three main subjects. First, it explains what risk factors are, what the most important risk factors are and how these risk factors can be explained. Second, it explains for which companies use cash, and what the risks are of holding cash. The third main topic is the perspective of the investor. This means how investors value cash on the balance sheet of the company.

2.1. Risk factors

The study of risk factors is subject to changes. It all started with the 'Modern portfolio theory' (Markowitz, 1952). Markowitz (1952) suggested that investors should make a portfolio of different asset classes. This combination of assets classes must lead to the highest expected return with the lowest amount of volatility. A combination of different assets classes mitigates the volatility and hence the risk, or in other words diversification occurs. The most well-known, general and widely accepted assumption is the trade-off between risk and return. When an investor wants to increase the expected return, the investor should take more risk.

Among others, Sharpe (1964) and Lintner (1965) developed and improved the 'Modern portfolio theory' to the Capital Asset Pricing Model. They added the Risk-free rate to this theory. The market rewards investors for the "price of time" and for the "price of risk" (Sharpe, p. 425, 1964). The price of time is related to the risk-free rate. This is the amount an investor will earn, when he takes the least amount of risk and therefore an investor will always be compensated for this.

According to the 'Capital Asset Pricing Model' (CAPM) the relationship between systematic risk and expected return should be linear, provided that the portfolio consists of an efficient combination of risky assets (Sharpe, p. 436, 1964). The assumptions of the linear relationship between systematic risk and expected return are: stock markets do not have transactions costs and investors do not have to pay taxes (Lintner, p.25, 1965), investors are risk averse (Lintner, p.18, 1965), there is an asset without risk and the portfolio of an investor is "mean-variance-efficient portfolio" (Fama & French, p. 26, 2004). An investor will be compensated for the systematic risk and will not get compensated for the unsystematic risk, because unsystematic risk can be diminished due to diversification. Therefore, the expected return minus the risk-free rate is the market return premium.

However, since the publication of the papers written by Sharpe (1964) and Lintner (1965) the CAPM is widely used and widely criticized. Empirical studies show that the CAPM is not widely supported by other research and results (Black, 1972; Shanken, 1985; Bhandari, 1988; Fama & French, 2004). Fama and French (2004) conclude that linear relationship between expected return and systematic risk is flatter than forecast by the CAPM. Companies with more systematic risk, hence

a higher β, have a lower return than predicted by the CAPM (Black, 1972; Jegadeesh, 1992; Fama & French, 2004).

In the scientific literature, market inefficiencies and risk factors are mentioned as the two major reasons why the linear relationship between the expected return and the systematic risk cannot hold. Ball (1978), examined the market inefficiencies. Abnormal returns are often realized after the disclosure of new information, such as new results about the profitability of the company. In perfect markets, where everyone has the same access to information, an abnormal return cannot exist.

In the course of the years, financial economists doubted the linear relationship of the CAPM and examined whether specific factors of a company determine whether a stock lies above the CAPM line or underneath the CAPM line. They questioned whether only the systematic risk determines the expected return of an asset or whether the systematic risk can be subdivided into different factors. These factors are called risk factors. This is the second explanation why the CAPM cannot hold. The CAPM does only take the systematic/market risk into account, other risk factors are not included in the model. A CAPM with additional risk factors does not provide a linear relationship (Reinganum, 1980). Abnormal returns among companies with different characteristics still exist, these abnormal returns are not caused by information anomalies between investors (Reinganum, 1980). In addition to this, the relationship between systematic risk and average returns of stocks is not linear, however the relationship is flat (Fama & French, 1992). It is only flat when the systematic risk is independently of the market capitalization of company. This suggests that the market capitalization of a company is important in determining the expected return of a stock.

Much attention went out to the market capitalization of a firm. Small firms have a "higher risk-adjusted return" (Banz, 1981; Fama & French, 1993). Which means that small companies, hence companies with a relatively low market capitalization, have higher returns in comparison with firms with a large market capitalization.

However, many economists agree with each other why this 'size premium' exists. Small companies carry a risk premium, because small companies are riskier than big companies. Big companies have many current and noncurrent assets. In addition to this they have large operating cash flows because they have a higher turnover. As a result of this big companies are less vulnerable for economic downturns, they can raise additionally capital more quickly and cheaper. In comparison, small companies have fewer assets and cannot sell assets when they are in need for additional capital. Investors require a return premium, because small companies carry a risk premium. Investors want to be compensated for the additional risk they take with their investment.

The second risk factor was the factor value. Fama and French (1993) concluded that firms with a high book to market value (value firms) outperformed firms with low book to market values

(growth stocks). As a result of this, value firms are considered as riskier. It turned out that value firms are less profitable than growth stocks, have often more financial problems, have higher debt ratios and there is unpredictability about the net profit (Chen & Zhang, 1998; Fama & French, 1995). However, the profitability ratios of the value and the growth stocks are becoming similar during the years (Fama & French, 1995; Lakonishok, Shleifer & Vishny, 1994). According to Lakonishok et al, (1994) this has nothing to do with risk, but with investor biases. Investors overvalue the profit ratios of growth stocks; they overestimate the probability that growth stocks will earn abnormal returns. It is the other way around for value stocks, investors are too pessimistic about the profitability of value stocks. As a result of this, the economic results of growth stocks can only be disappointing and the results of value stocks can only be better than expected (Lakonishok et al., 1994).

After the three-factor model of Fama and French (1993), they developed a five factor model (Fama & French, 2015). They added two new risk factors to the existing model. The added factors are: profitability and investment ratio. Very profitable firms outperform firms with a lower profitability, hence profitable firms have a higher return and contain a profitability premium (Fama & French, 2008, 2015). According to the risk factor literature, these firms contain a risk premium resulting in a return premium. Nonetheless, this sounds illogical. Companies that make a lot of profit are just better performing companies. They can increase the profitability year after year, because of this, these companies suffer less from financial distress. The question is whether this profitability premium is caused by risk. A possible explanation to this question are investor biases. There is evidence that the profitability premium is caused by underreaction of investors (Wang & Yu, 2010). Investors are not able to value the information about profitability, this leads to an underpricing of profitable companies (Wang & Yu, 2010). Wang and Yu (2010, p.3) state that inattentive investors cause underpricing.

Another often mentioned risk factors is the investment ratio of a company. Firms with a low growth of assets, outperform firms with a high growth of assets (Fama & French, 2008, 2015). Also, this sounds illogical. When a company does not do his upmost best to increase the assets of a company and hence the value of company, the value of the stocks of these companies increases. There are two widely used explanations for this anomaly. An investor is not able to reflect the opportunities and information about company investment in the price of the stock, this leads to a mispricing of the value of the stock (Lam & Wei, 2011). The second explanation is, companies will invest more when the cost of capital is devalued and will invest less when the cost of capital increases (Lam & Wei, 2011).

The sixth most important factor is momentum. Carhart (1997) introduced the momentum factor. If a stock price performs well, it is likely that this stock price keeps on increasing. Asness, Moskowitz, and Pedersen (2013) support this view. Also, the risk factor momentum can be caused by

investor biases. Investors see a stock rising; they think that this also will happen in the near future. "Extrapolative expectations and overconfidence" (Hou, Peng, & Xiong, p.2, 2009) are the drivers of momentum. Especially in booming markets (Hou et al., 2009). Investors become overconfident; investors see that all the stocks are increasing in value during rising stock prices. They become enthusiastic and buy additional stocks, because they think the prices will continue to increase. Investors are afraid of missing a stock price rally, they suffer from herd behavior (Bikhchandani et al., 2001). However, this increases the price of the stock, while the economic value or the intrinsic value of the stock remains the same. Over- and underreaction of the stock price happens many times, this is because investors over- and underreact to information (Fama, 1998). This shows that investors are not fully rational (Bikhchandani et al., 2001). They value new additional information differently and they think that the new information predicts a more profitable future than it turned out. However, it is important to mention, investors overreact to information just as often as investors underreact to information (Fama, 1998). In addition, this might also drive the momentum factor. At the time investors overreact to information the stock price will boost up. The stock gets positive attention and new investors analyze the information. It is likely that these investors value the stock the same way, what leads to a positive momentum of the stock.

Harvey, Liu, and Zhu (2016) concluded that more than 316 factors are tested and that this looks like data mining. They suggest that, when the risk factor is not based on first principles, a t-value of 3.0 is appropriate.

2.2.   Cash and short-term investments/liquid assets

First, it is important to examine for what companies use cash and other current assets. Keynes (1939), is the first one characterizing the benefits of holding cash and other cash equivalents. Keynes mentions the transaction cost motive and the precautionary motive. When a company is in need for cash, they can easily sell their liquid assets. A company does not have to make large payments to banks or to investment banks, when they want to raise additional capital to keep the business running. This is called the transaction cost motive. The second reason is called the precautionary motive. Companies with many liquid assets do not have to raise additional capital when they want to make an investment in the future. These companies have enough resources and do not have to sell their most important illiquid assets, to take advantage of investment possibilities or when the economy changes into a recession.

The history shows that firms increased their relative amount of cash and other current assets, it is striking that the cash holdings have increased strongly (Bates, Kahle, & Stulz, 2009). Bates, Kahle and Stulz (2009) empirically examined why this is the case. They concluded that it has to do with the idiosyncratic risk and the precautionary motive. Companies encounter too much risk they cannot fully hedge, therefore they need extra cash holdings to offset these risk. Some industries are riskier than others. Bates, Kahle and Stulz (2009) conclude that companies in industries that experience more idiosyncratic risk hold more cash than others.

The first intuition is that much cash and short-term investment ensures a safer company. A liquid company can make investments during a poor running economy. These firms can still pay the bills and buy inventory and the company is being capable of taking advantage over unforeseen circumstances. A very liquid company does not have to sell their illiquid assets with which they make their profit.

This is the economic intuition, however the economic literature and the empirical results show that this is not always the case. Opler et al (1999), Pinkowitz and Williamson (2001) conclude that companies with riskier actions, such as fast-growing companies and small companies have relatively much cash. In contradiction, big mature companies have relatively little money. The theory behind this is that fast-growing firms do not want to give up profitable investment chances in the future (Ozkan & Ozkan, 2004). Companies use the extra liquid assets for bad times, when the at that moment current cash flow is not enough for the predetermined investments. Otherwise, fast-growing companies should raise new capital at higher prices, because they are risky. Banks and investors that offer the loans do not know whether the new investment opportunities will lead to a high return.

This view is supported by the credit spread, banks demand different amounts of interest for fast growing companies. However, the conclusion why companies hold much cash differs from the

conclusion of Ozkan & Ozkan (2004). As said before whether banks see liquid companies as risky can be analyzed by the credit spreads. Acharya, Davydenko, & Strebulaev (2012), examined a positive relationship between the cash to total assets ratio and credit spreads. Banks do see companies with much cash and short-term investments as riskier. The theory behind this is that companies that face bankruptcy in the near future or see financial distress in the near future, build up their amount of cash (Acharya et al., 2012). As a result of this these companies will not have liquidity problems, because they have enough liquid assets. These companies do not have to sell their most important illiquid assets.

In the scientific literature, a company with much cash and cash equivalents is seen as riskier (Bernardo, Chowdhry, & Goyal, 2008; Carlson, Fisher, & Giammarino, 2004; Dechow, Sloan, & Soliman, 2004) because much cash and cash equivalents is seen as a proxy for high growth opportunities. A growth opportunity can be seen as a call option (Myers, 1977). He adds that when the future does not look bright, the firm does not want to continue with the growth opportunity. As a result of this, the value of the growth opportunity becomes worthless. However, when there are good economic times the company might exercise the call-option, because it is "in the money" (Myers, 1977). The growth opportunity becomes valuable and cause a steady cash flow.

There are two reasons why growth opportunities are risky. Carlson, Fisher & Giammarino (2004), concluded that a growth opportunity has choices within the growth opportunity. For example, a company is not entirely sure whether the investment will lead to a profit, or maybe they could cancel the project. These choices have a systematic risk element. The second reason has to do with unforeseen macroeconomic elements. A cash flow of a growth opportunity has a long horizon, or a long duration. How longer the time, how higher the risk. So, the value of the growth opportunity is reactive to inflation and other macroeconomic elements. Therefore, a growth opportunity is riskier and should have a higher beta (Dechow et al., 2004).

This fits in seamlessly with the results of Simutin (2010). Simutin (2010) concluded that much cash is a proxy for fast-growing companies. The stock return of companies which much excess cash did perform worse during recessions. In contrast, these companies achieved better results during flourishing stock markets (Simutin, 2010). This is in line with the idea that excess cash is a proxy for growth opportunities and with the theory of Myers (1977) that a growth opportunity is equal to a call option. In recessions, the value of the growth opportunities becomes less valuable, as a result of this the stock return of these firms will decline. In flourishing markets companies with much cash can capitalize their investment chances. For example, during a recession, customers spend money on luxury goods less quickly. When a car company had the growth opportunity to construct a luxury car, this option becomes less valuable. The expected operating cash flow decreases, because customers are not willing to buy a luxury car. The growth opportunity is "out the money" and the entire

company becomes less valuable. Due to this, companies with excess cash are riskier than companies without much liquid assets (Simutin, 2010). They are riskier because the value of the stock will decline sharply during a recession, therefore investors want to be compensated for this risk.

Another problem for fast-growing firms are the bankruptcy costs. Fast-growing companies have relatively much intangible assets, because a growth opportunity is equal to an intangible asset. Companies with much intangible assets will suffer more often from financial distress and are more likely to face a bankruptcy (Thorburn, 2000). Intangible assets do not have collateral, because of this these assets will decrease sooner in value than tangible assets. As a result of this fast-growing firms will have more cash and cash equivalents, because they want to keep away from financial distress (Oliver E. Williamson, 1987; Ozkan & Ozkan, 2004).

There is also some evidence where increasing the cash and short-term investment leads to a decrease of the refinancing risk. However, increasing cash and short term investments decreases the refinancing risk (Harford, Klasa, & Maxwell, 2014). This theory assumes that the company becomes less risky, because the chance the company will face a bankruptcy becomes less. Harford, Klasa, & Maxwell (2014) conclude this, because a firm will only refinance their debt structure when they can extend the maturity of the debt. When this is not possible the company increases the cash and short-term investments. Therefore, the company does not have to sell their most important illiquid assets or face a bankruptcy (Harford et al., 2014).

2.3. Investors' perspective

It became clear why companies hold cash. Companies use extra cash holdings for the transaction cost motive and for the precautionary motive (Keynes, 1939). Another reason is that cash provides new growth opportunities (Myers, 1977). Cash rich companies do not have to raise additional capital, when they want to capitalize the growth opportunities. However, this is the company's perspective. But what is the investors' perspective?

Since shareholders are the owners of the company, the board of directors should do everything to maximize the shareholder value. Increasing the shareholder value can be done by paying out dividends or by increasing the market value of the stock. Therefore, companies with cash on hand have 'holding costs', because these companies can do value enhancing opportunities (Eppen & Fama, p. 311, 1971). Dividend payments reduce the cash balance and therefore the value of the company (ex-dividend) but gives the cash back to the investors. Another option is that companies invest the excess cash in new assets that will earn a profit in the future (Eppen & Fama, 1971). This increases the total value of the company.

However, investors should be indifferent between dividend payments and capital gains. For rational investors it does not make sense how they earn money, whether it is through dividend payments or capital gains (Miller & Modigliani, 1961). According to Miller and Modigliani (1961), paying out dividends does not increase the value of the firm. Nowadays, this is called the 'dividend irrelevance theory'. The assumptions of this theory are that "capital markets are perfect", "investors behave rationally" and "there is perfect certainty" (Miller & Modigliani, p. 412, 1961).

When companies use the excess cash as retained earnings, instead of dividend payments, the future dividend increases. With the cash, companies can capitalize on new investment opportunities. This leads to a higher net income in the future, because they have invested more money. These capital gains positively affect the total value of the company. As a result of this dividend payments are irrelevant (Miller & Modigliani, 1961).

Miller and Modigliani have given an often-mentioned example. A company paying out dividends might have problems with suddenly emerging investment opportunities. Due to dividend payments this company does not have enough money to invest in these opportunities. Therefore, the company issues new shares. In the future, there are more shares that are entitled to dividend. This reduces the share price and finally a lower market value of the company (Miller & Modigliani, 1961).

The dividend irrelevance theory suggest that investors should not want dividends but capital gains. However, a major advantage of dividends payments is the "bird in hand" principle (Gordon, 1963). According to Gordon (1963) dividends are not worthless. Since investors do not know whether the new capital gains actually will be a capital gain, the dividend payments are literally 'money in

hand'. Investors do not know whether the future investment opportunities will turn into a profit, therefore they like dividends (Gordon, 1963). As a result of this, dividends are less risky.

Whether an investor likes dividends or capital gains depends on the risk tolerance of the investor. If an investor wants less risk, he must buy dividend paying companies. If an investor is willing to take more risk, he might buy companies with many retained earnings. These retained earnings will be invested in new growth opportunities. However, Modigliani and Miller (1961) suggest that investors that want cash can sell their shares. This creates a cash flow that creates the same effect as a dividend payment, namely cash in hand.

In addition to this, a company should use cash to invest in new profitable investment opportunities, because when an investor wants cash holdings in his portfolio, he chooses to sell his shares and put the remaining cash in a deposit. Therefore, a company must try to mitigate the 'holding costs', by looking for new profitably investment opportunities.

When an investor wants more cash in his portfolio, he does not want that the company holds cash for him, because the company can invest in value enhancing opportunities with the cash. The investor can sell his shares and increase the amount of cash in his portfolio.

Since the assumptions of the 'dividend irrelevance theory' are unrealistic, such as that there not taxes in the world, it is not entirely applicable to the real world. Therefore, it is important to examine how investors value cash holdings in the real world. How investors value cash is dependent on the characteristics of the firm (Pinkwitz & Williamson, 2002). Investors value one dollar more than the book value of one dollar when the company has many growth opportunities, companies without many growth opportunities carry a discount on their dollars (Pinkwitz & Williamson, 2002). This is in line with the 'dividend irrelevancy theory', because the value of the company increases when the company invest their proceeds in growth opportunities. In addition to this, when a company distributes the dividends to their shareholders the shareholders must pay income taxes. As a result of this the value of one dollar in the savings account of the company must be valued less than one dollar dividend, because the shareholder must pay taxes.

Companies that will face financial problems in the future, their cash is less worth than the amount of cash that is stated on the balance sheet (Pinkwitz & Williamson, 2002). For example, due to this a company must pay higher interest rates on their debt. This causes a lower net income, resulting in lower amount of money for the equity investors.

When an investor easily can estimate the investments that a company might undertake, then the cash of the company has a lower value according to investors (Pinkwitz & Williamson, 2002). Companies know how much cash they need to keep the business running. Therefore, they can easily estimate how much cash they need for their investing purposes. In contrast, companies with fluctuating investment opportunities do not know how much cash they need. One year they need

more cash than the other year. When an investment opportunity springs up, the company cannot go to the capital market to raise additional capital, because this takes too much time and capital providers are less willing to offer extra capital because they do not know whether this investment opportunity will turn into a profit. When the investment opportunities are less profitable than expected, capital providers might face a loss on their investment. Therefore, excess cash as related to profitable investments. Investors think that the company uses this cash only for profitable investment opportunities (Pinkwitz & Williamson, 2002).

3. Hypotheses

Taking a higher risk is accompanied by a higher expected return. According to the Capital Asset Pricing Model (CAPM), this relationship is a linear relationship. However, as the literature review shows an investor is not only compensated for the taken systematic risk. There are six common risk factors that are associated with a historically higher return. Because of this an investor is not fully compensated for the systematic risk, but he is compensated for the systematic risk and for the risk premia.

This thesis examines whether cash and short-term investments is a risk premium. The research question is: 'what is the effect of cash and short-term investments on the stock return of well diversified portfolios?' Companies with much excess cash contain a risk premium and therefore a return premium (Simutin, 2010). So, companies with much cash, hence liquid firms, are considered riskier than illiquid firms. This is because current assets are growth opportunities (Myers, 1977). A company will exercise this growth opportunity when the cash flow is positive. However, when the expected cash flow is negative a company will not exercise this growth opportunity. This involves additional risk for the company and their investors.

During a recession the growth opportunity becomes worthless. For example, because customers spend less money. As a result of this the expected return of the growth opportunity decreases in value, resulting in a lower stock price. The opportunities will decrease in value, because the possibility of a positive Net Present Value mitigates. Therefore, the market value of the company disappears, because the future cash flow of the company drops.

The opposite should be true when the economy is flourishing. The growth opportunity is 'in the money' and the expected return of the growth opportunity becomes more valuable leading to a higher stock price (Myers, 1977; Simutin, 2010). So, if liquid assets proxy for growth opportunities, companies with many liquid assets should underperform relative to illiquid companies during economic downturns. During rising stock markets, companies with much cash and short-term investments should outperform illiquid companies.

This leads to the following three hypotheses: portfolios of American companies with much cash and short-term investments, will have a better stock performance than portfolios of American companies without much cash and short-term investments. These companies will have a return premium. This return premium is caused by a risk premium. Because of this, companies with much cash and short-term investments have a worse stock performance in comparison with companies without much cash and short-term investments during decreasing stock markets.

H_{1-A}: Portfolios consisting of American companies with much cash and short term investments do not perform better than portfolios of American companies without much cash and short term investments.

H_{1-B}: Portfolios consisting of American companies with much cash and short term investments perform better than portfolios of American companies without much cash and short term investments.

H_{2-A}: Portfolios consisting of American companies with much cash and short-term investments to total assets do not have a risk premium.

H_{2-B}: Portfolios consisting of American companies with much cash and short-term investments to total assets do have a risk premium.

H_{3-A}: Portfolios consisting of American companies with much cash and short-term investments to total assets do not underperform relative to portfolios consisting of American companies without much cash and short-term investments to total assets during stock market downturns.

H_{3-B}: Portfolios consisting of American companies with much cash and short-term investments to total assets do underperform relative to portfolios consisting of American companies without much cash and short-term investments to total assets during stock market downturns.

4. Empirical analysis and results

First, a new model containing the new liquidity ratio is formed. After that, it is examined whether liquid companies carry a return premium. This is done by forming 10 portfolios. These portfolios are arranged by liquidity ratio. Consequently, it can be analyzed whether liquid companies carry a return premium. It has been researched whether liquid companies perform during economic downturns and during economic flourishing markets. In addition to this correlation statistics between the risk factors are provided. Then it becomes clear what kind of companies liquid companies are. Afterwards, with Fama-McBeth regressions (1973) is tested whether the return premium is caused by a risk premium.

4.1. Six-factor model

Following from the literature review the six most common risk factors are systematic risk, size, value, profitability, investment and momentum. The Fama-French five-factor model included all these risk factors, except for the risk factor momentum (Fama & French, 2015). The risk factor SMB (size) is calculated by subtracting the average monthly return of big companies from the average monthly return of small companies. Therefore, the risk factor is called SMB, what literally means small minus big. The idea behind this is an investor should buy small companies, hence take a long position in small companies and should sell big companies, hence take a short position in big companies (Fama & French, 1993, 2015). This creates the risk factor SMB (size).

Every risk factor is the difference between two portfolios, for example Fama and French (2015) use as 'big' companies the thirty percent largest companies in the dataset. Subsequently, the 'small' companies are the thirty percent smallest companies of the dataset. In addition, the risk factor HML (value) is calculated by subtracting the average monthly return of companies with a low book to market ratio from the average monthly return of companies with high book to market ratio. This same method applies for the variables: profitability, investment and it also applies for the new liquidity variable cash and short-term investments. The risk factor of the variable liquidity is called **L**MI. This stands for **L**iquid minus **i**lliquid. LMI is calculated by subtracting the average monthly return of illiquid companies from the average monthly return of liquid companies. A more detailed explanation about the LMI calculation is given in section 4.8. Table 1 below shows the variables, the corresponding explanation and the subsequent calculation (risk factor).

A liquidity ratio needs to be developed, to rank companies by liquidity. The calculated liquidity ratio is called the Cash and short-term investment ratio (CSI ratio). The CSI ratio is calculated by dividing cash and short-term investments by total assets and multiplying by 100. It is divided by the total assets, because large firms will have more liquid assets than small firms. Due to this the size of a company does not matter, because it has changed to a ratio. Otherwise, it does not proxy for

liquidity but for the size of the company. The appendix shows which assets are considered as cash and short-term investments.

$$CSI\ ratio = \frac{Total\ Cash\ and\ Short\ Term\ Investments}{Total\ Assets} * 100$$

Table 1: This table shows the variables with explanation and shows how the risk factors are calculated.

Variable	Explanation	Risk factor
Systematic risk	Return on the value weight market portfolio minus the risk-free rate	R_{mt}-R_{Ft}
Size	Market Value of the firm (Number of shares * Price of the share)	SMB (Fama and French, (2015): difference between the return of small and big firms
Value	Book to market ratio	HML: (Fama and French, (2015): difference between the return of high and low B/M stocks
Profitability	Operating profit= Operating income/Net sales or revenues * 100	RMW: (Fama and French, (2015): difference between robust and weak profitability
Investment	Current Year's total assets/Last Year's Total assets-1)*100	CMA: (Fama and French, (2015): difference between conservative and aggressive investment firms
Liquidity	CSI ratio = Total cash and short-term investments/ total assets * 100	LMI: difference between the returns of liquid firms and illiquid firms.

These variables can be combined into an equation, the variable cash and short-term investments extends the five-factor model to a six-factor model. Leading to a new regression.

$$R_{it}\text{-}R_{Ft}= \alpha_i+\beta_i(R_{mt}\text{-}R_{ft})+s_iSMB_t+h_iHML_t+r_iRMW_t+c_iCMA_t+l_iLMI_t+e_{it}$$

This equation states that the excess return, this is the return of an asset when the risk free rate is taken into account, of an asset i in time t depends on the systematic risk/the market risk, the size of the company, the value of the company, the profitability of the company, the investment style of the company and the liquidity of the company.

4.2.   Data and methodology

The accounting numbers (cash, short term investments and total assets) and the monthly stock returns are downloaded from the database EIKON. The accounting data was only available since 1980. That is the reason why the timeframe of the stock returns runs from 1-7-1981 to 1-6-2019. The stock price is the unadjusted stock price, in total there are 456 months.

The dataset consists of American companies. These companies are listed on the New York Stock Exchange (NYSE) or the NASDAQ Composite. In total there are 1724 companies in the original dataset. Nevertheless, not all these companies are used in the final dataset. As time goes by, more companies are listed on the stock exchange. Some companies are delisted, taken over or went into bankruptcy. In contrast, other new companies went to the stock exchange. This leads to a discrepancy in the age of the companies, because some companies have been listed on the stock exchange for a long time.

Some of these companies have a CSI ratio of almost 100%. Table 11, provided in the appendix, shows the CSI ratios of these companies. When zooming in on these companies it becomes clear that all these companies are pharmaceutical or biotechnological companies. As a result of this the CSI ratio does not proxy for liquid companies but this ratio proxies for pharmaceutical companies. Pharmaceutical companies must have much cash for research and development purposes and for buying patents. Only pharmaceutical companies have such a balance sheet, since these companies have almost only liquid assets, their balance sheet is not a 'normal' balance sheet.

To counteract this, the final dataset consists of 310 companies. The main requirement is that these companies exist since 1980 and never have been delisted from the stock exchange or went into bankruptcy. These companies do know how to make money and do know how to remain competitive. Because of this it becomes clear whether liquid companies have a higher return than illiquid companies. Companies with a CSI ratio of 0 or 100 are excluded from the dataset, because a company cannot exist without cash and it makes no sense that a company only has cash. As a result of this the 'outliers' are removed from the dataset.

Financial companies are excluded from the sample as well. More specific, companies related to the sectors: banks, financial services, life insurance, nonlife insurance, real estate investment and service and real estate investment trusts have been removed from the dataset. Governments oblige these companies to hold certain amounts of liquid assets, to prevent a bank run. Consequently, these companies have cash on the balance sheet for reasons other than strategic or financial ones.

The monthly return for month t is calculated by subtracting the beginning value of the stock price of month $t+1$ from the beginning value of the stock price of month t divided by the beginning value of stock price of month t, multiplied by 100. This the monthly percentage increase. In total there are 141360 (310*38*12) monthly returns.

Thereafter, the proper monthly returns must be related to yearly accounting data. However, in some cases the yearly accounting data is published in June while other firms publish their annual report at the end of the year. To offset this issue the same methodology will be used as Mohrschladt and Nolte (2018). The accounting data of a company ending in year *t-1* are connected to the monthly return from July *t* to June *t+1* (Mohrschladt and Nolte, 2018).

4.3.   CSI ratio and monthly return

To examine whether cash and short-term investments has a return premium, 10 portfolios must be created. The portfolios are equally weighted, and they each consist of 31 companies. This thesis uses 31 companies, because a portfolio of 31 companies diversifies almost all the unsystematic risk (Hillier et al, 2014). Adding extra companies to the portfolio, does not have a significant effect on the diversification of the portfolio. In addition to this, as said before, the dataset consists of companies that have existed at least since 1980. This requirement causes a limited number of companies.

First, 10 decile percentiles are calculated based on the CSI ratio. These percentiles are calculated for every year. Table 2 shows the decile percentiles. Naturally, the CSI ratio increases when the number of the percentile increases. Table 2 and table 11 show that companies have chosen to keep more and more liquid assets as time goes by. This is in line with previous research (Bates, Kahle, & Stulz, 2009).

The portfolios are ranked from low cash and short-term investments compared to total assets to high cash and short-term investments compared to total assets. So, these portfolios are ranked from a low CSI ratio to a high CSI ratio. The portfolios are decile which means, a company in portfolio 4 has CSI ratio higher than 30% of the companies but a CSI ratio lower than 60% of the companies. Thereafter, the 310 companies are assigned to one of the 10 portfolios. For example, a company with a CSI ratio of 3,40 would be in portfolio 5 in year 1980. In year 1981, a company with the same CSI ratio would be assigned to portfolio 4. This is done for 310 companies, every year. This results in 380 portfolios consisting of 31 companies.

It happened many times that a company is assigned to portfolio X in year A and the same company is assigned to portfolio Y in year B because the CSI ratio has increased or decreased. That benefits the research. Then it becomes clear what happens with the stock price of the same company when the liquidity changes.

Table 2: This table consists of ten decile portfolios; the values are the yearly CSI ratios. Which means, for portfolio 5 the minimum CSI ratio is 3,13 and the maximum CSI ratio is 5,08 in year 1980. A company with a CSI ratio within these two values is assigned to portfolio 5. The last column consists of the 99th percentile. Which means that 1% of the companies has CSI ratio above that value and 99% of the companies has a value below that value, this value is just for intuitive reasons.

Year	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	0,99
1980	0,70	1,52	2,23	3,13	5,08	6,62	8,22	11,02	17,09	43,57	34,67
1981	0,61	1,36	2,13	3,63	5,13	6,83	8,72	12,36	17,25	47,67	38,30
1982	0,92	1,57	2,45	3,87	5,49	7,31	9,83	13,68	21,12	60,35	42,72
1983	0,82	1,85	3,52	5,04	7,87	10,25	13,05	16,80	23,33	65,17	46,22
1984	0,96	1,87	2,88	4,22	6,23	9,11	12,15	15,53	19,85	69,24	48,29
1985	0,96	1,79	2,96	4,22	6,03	8,68	10,95	15,84	22,81	70,83	46,88
1986	0,82	1,81	2,63	4,13	6,39	8,36	10,47	15,70	23,86	69,34	47,83
1987	0,60	1,33	2,40	3,35	4,78	8,08	11,33	16,67	22,90	67,89	47,03
1988	0,77	1,47	2,08	2,81	4,78	6,62	9,94	13,43	21,20	76,90	41,29
1989	0,68	1,16	1,83	2,69	4,02	6,36	9,53	13,22	18,61	73,87	41,85
1990	0,59	1,14	1,57	2,32	3,59	5,18	8,24	11,84	17,95	79,11	37,98
1991	0,55	1,02	1,86	2,80	4,02	6,08	8,88	13,26	20,25	75,29	36,08
1992	0,57	1,08	1,73	2,80	4,06	6,53	9,49	14,05	20,06	79,38	39,34
1993	0,56	1,09	1,71	2,78	4,49	7,10	10,27	13,57	19,51	77,98	40,37
1994	0,50	1,01	1,66	2,75	3,79	5,73	8,36	12,36	17,39	76,35	40,15
1995	0,52	0,88	1,57	2,33	3,10	4,97	7,50	10,72	17,23	71,61	33,10
1996	0,48	0,98	1,53	2,24	3,78	5,05	7,77	11,59	18,50	79,91	41,12
1997	0,55	1,01	1,52	2,35	3,50	4,88	7,90	12,59	18,30	79,59	46,60
1998	0,47	0,94	1,51	2,09	2,73	4,67	6,81	10,68	17,92	81,84	46,81
1999	0,52	1,03	1,54	2,01	3,06	4,04	6,10	9,35	16,44	79,67	40,97
2000	0,42	0,95	1,41	1,86	2,66	3,87	5,56	8,13	17,41	77,18	49,78
2001	0,72	1,32	1,88	2,48	3,58	5,45	7,29	11,11	19,01	72,01	49,14
2002	0,77	1,32	2,25	3,11	4,51	5,91	7,90	12,56	18,90	71,45	47,40
2003	0,86	1,88	2,68	3,76	5,58	7,72	10,29	14,18	21,29	70,87	53,07
2004	1,01	2,06	3,24	4,55	6,49	8,67	11,44	15,37	20,88	68,61	56,61
2005	1,25	2,09	2,86	4,84	6,77	9,08	12,60	16,62	23,53	72,67	57,49
2006	1,20	2,22	3,18	4,50	6,36	8,33	10,13	15,53	23,51	98,24	55,40
2007	0,92	1,92	2,99	4,36	5,76	7,68	10,77	15,21	20,80	97,38	62,50
2008	1,13	1,97	2,83	3,78	4,95	6,75	9,23	12,56	19,46	99,75	48,80
2009	1,34	2,31	4,14	5,45	7,92	10,01	13,37	17,48	23,76	94,36	53,89
2010	1,74	3,05	4,13	5,76	7,87	10,80	14,26	18,40	24,11	71,25	45,22
2011	1,37	2,60	3,81	5,28	6,85	9,47	12,92	16,46	22,82	72,45	52,46
2012	1,34	2,25	3,35	5,17	7,61	9,72	13,22	16,93	22,92	74,89	54,00
2013	1,27	2,44	3,87	5,78	8,09	9,99	13,56	18,34	22,67	74,45	59,52
2014	1,07	2,08	3,59	5,53	7,39	9,93	12,99	16,92	23,50	81,01	56,99
2015	1,00	1,93	3,39	4,77	6,91	9,12	12,00	16,37	22,99	89,25	54,51
2016	0,93	2,28	3,46	5,37	7,89	9,94	13,69	16,53	22,89	84,36	53,13
2017	1,00	1,91	3,02	4,48	6,81	8,97	12,45	16,35	23,84	77,32	58,63
2018	0,81	1,63	2,63	3,73	5,05	7,51	10,52	14,83	19,88	64,03	51,44

Table 3 shows 5 random companies that have been assigned to the portfolios. For example, Walt Disney is assigned to portfolio 10 in year 1980, while it has been assigned to portfolio 1 in year 1982

because this company had a CSI ratio below 0,92. As a result of this it becomes clear what will happen with the stock price of a company when a company increases his cash holdings.

Table 3: This table consists of 5 random companies, in total there are 310 companies. Every year these companies are assigned to one of the 10 portfolios based on their CSI ratio. The numbers show to which portfolio the companies are allocated.

Year	3M	APACHE	HAWAIIAN ELECTRIC INDS.	NL INDUSTRIES	WALT DISNEY
1980	5	2	1	3	10
1981	4	2	1	2	9
1982	4	5	1	3	1
1983	4	2	1	3	1
1984	4	7	1	5	2
1985	3	8	1	4	2
1986	6	9	2	7	3
1987	6	6	1	8	7
1988	8	7	3	9	10
1989	7	7	3	10	9
1990	7	9	5	10	9
1991	6	8	5	9	9
1992	6	5	4	8	9
1993	6	1	4	8	9
1994	5	2	4	9	8
1995	7	2	4	9	9
1996	7	7	3	8	4
1997	6	4	5	8	7
1998	6	4	5	9	1
1999	6	5	3	9	2
2000	5	5	4	9	5
2001	6	7	6	9	3
2002	5	8	6	8	4
2003	8	9	5	6	4
2004	8	9	3	10	4
2005	5	9	1	9	4
2006	7	8	2	8	4
2007	7	5	2	7	6
2008	8	8	3	7	5
2009	8	7	2	6	4
2010	8	6	3	4	3
2011	7	6	3	2	4
2012	8	6	3	7	4
2013	7	6	2	6	4
2014	6	4	1	8	4
2015	5	5	1	10	5
2016	6	4	1	10	4
2017	7	5	1	9	4

Subsequently, the monthly returns of a company are calculated. The monthly returns are assigned to the corresponding companies and to the corresponding yearly accounting data, this is done for every year. The accounting data of a company in year 1980 corresponds with the monthly returns of the company from July 1981 to June 1982. In addition, the companies are regrouped in July 1982. This corresponds with the accounting data of year 1981. So, every year in July the companies are regrouped.

Now for every year the companies are assigned to a portfolio and the average monthly returns are corresponding with the same company. This results in 10 portfolios; every portfolio consists of '1178' companies (38*31). Of course, many companies are assigned multiple times to the same portfolio. For example, Walt Disney is assigned 12 times to portfolio 4.

Thereafter, only the monthly returns of all the companies assigned to portfolio X are distilled, this is done for every year. Now the average monthly return of all the companies assigned to portfolio X is calculated, so this portfolio consists of the monthly returns of all the companies that in one of the years (1980-2017) are assigned to portfolio X. This leads to the average monthly return of portfolio X. This is done for every portfolio, resulting in table 4.

Table 4: This table presents the average monthly return and the average CSI ratio of the ten portfolios. These values are based on a timeframe from 1-7-1981 to 1-6-2019. The return good years is the average monthly return of the portfolio when the timeframe only consists of flourishing stock markets, these years are 1981, 1984, 1993, 1995, 1996, 2002, 2008, 2009, 2011 and 2012. It is important to mention that these years are the years of the accounting data, which means that stock prices of other years correspond with these years. For example, 1981 corresponds with the average monthly return of July 1982 to June 1983. The return bad years is the average monthly return of the portfolio when the time period only consists of declining stock markets, these years are 1980, 1982, 1986, 1992, 1998, 2006, 2007, 2013 and 2017. The previous explanation also applies to these years. All the numbers are stated in %. Two Asterix (**) stands for a 5% level of significance. Three Asterix (***) stands for a 1% level of significance. The T-test is a two-sided T-test.

Portfolio	Average monthly return	Average CSI-Ratio	Return good years	Return bad years
Low	1,05	0,55	2,36	-0,68
2	0,99	1,32	2,39	-0,56
3	0,95	2,11	2,23	-0,67
4	0,95	3,23	2,33	-0,62
5	0,95	4,64	2,35	-0,86
6	1,05	6,46	2,33	-0,44
7	1,04	8,84	2,49	-0,49
8	1,11	12,08	2,51	-0,54
9	1,07	17,03	2,62	-0,60
High	1,18	31,68	2,59	-0,38
P10-P1	0,13	31,13	0,23	0,30
P6:P10-P1:P5 (LMI)	0,112	12,85	0,18	0,19
P-value (T-test)	0,0274**	0,0000***	0,0146**	0,0130**

Table 4 shows the average monthly return of ten decile portfolios and the corresponding CSI ratios. LMI stands for the difference between the liquid portfolios (portfolio 6,7,8,9 and 10) and the illiquid portfolios (portfolio 1,2,3,4 and 5).

What strikes is the high monthly return of portfolio 1 (1,05%) with an average CSI ratio of 0,55. This return is fairly high in comparison with the returns of portfolio 3,4 and 5. The explanation for the high average monthly return from portfolio 1 is that portfolio 1 proxies for very large mature manufacturing companies. These companies have many noncurrent assets, such as buildings. This increases the total assets and mitigates the CSI ratio. These companies have a steady cash flow and therefore will have had an increasing stock price. This results in a high average monthly stock return. This explanation is also supported by the correlation statistics, because there is a strong correlation between illiquidity and high book to market value. The correlation statistics are provided in section 4.4.

Liquid companies (portfolio 6,7,8,9 and 10), have had higher stock returns than illiquid companies (portfolio 1,2,3,4 and 5), and have a return premium. The average monthly return of the 5 liquid portfolios outperform the 5 illiquid portfolios with 0,112% per month. Liquid companies, portfolio 6,7,8,9 and 10, had an average CSI ratio of 15,22%. Illiquid companies, portfolio 1,2,3,4 and 5 had an average CSI ratio of 2,37%. The excess return is statistically significant.

Based on historical returns, liquid companies have significantly higher returns. Annually, companies with a high CSI ratio outperform companies with a low CSI ratio with 1,34%. When an investors yearly bought the liquid companies in portfolio 6,7,8,9 and 10, hence took a long position and the same investor sold the illiquid companies in portfolio 1,2,3,4 and 5, hence took a short position, he would earn an average yearly return of 1,34%. Whether this return premium is caused by a risk premium must be analyzed with the Fama-MacBeth regressions.

4.4.   Relation between LMI and HML, RMW, CMA

To examine what kind of companies liquid companies are, the correlation coefficient between these risk factors must be calculated. Whether liquid companies are big or small, whether these companies have a high book to market ratio or a low book to market ratio, whether companies with a high CSI ratio have a robust or weak profitability and whether liquid companies have a conservative or an aggressive investment style. Overall it becomes clear what kind of companies are in the dataset. Especially these outcomes might be beneficial for the average return results of liquid companies in good and bad years.

The risk factors average monthly return are downloaded from the data library of French (French, 2019). Hence, these risk factors are SMB, HML, RMW and CMA. The risk factor LMI is added to this dataset. To test how these risk factors are related to each other, a correlation matrix has been

prepared. This correlation matrix consists of the pairwise Pearson correlation coefficient. The time frame runs from 1-7-1981 to 1-6-2019. Table 5 shows some summary statistics, such as the mean, standard deviation and the minimum and maximum value of the risk factors. The following table 6 shows the correlation matrix. Two stars (**) means that the Pearson correlation coefficient is significant at a 5% level. Three stars (***) means that the correlation coefficient is significant at a 1% level.

Table 5: Summary statistics of the risk factors. The statistics are Mean (%), standard deviation and the minimum and the maximum value of the risk factor.

	SMB	HML	RMW	CMA	LMI
Mean (%)	0.0670	0.2531	0.3638	0.2743	0.1121
Std. Dev.	0.7557	1.158	0.8185	0.6931	0.3697
Min (%)	-1.2575	-2.095	-1.7808	-0.635	-0.8632
Max (%)	1.7608	4.1408	3.187	2.694	1.4313

*Table 6: This table provides the Pearson correlation coefficient between the risk factors. ** means that the risk factor is significant at a 5% level and *** means that it is significant at a 1% level.*

	SMB	HML	RMW	CMA	LMI
SMB	1.00				
HML	0.1835	1.00			
RMW	0.0798	0.5504***	1.00		
CMA	0.3445**	0.7151***	0.5069***	1.00	
LMI	-0.0533	-0.6707***	-0.5576***	-0.4682***	1.00

Table 6 shows that SMB (size) and LMI (liquidity) are not correlated. This means that companies with a low market capitalization might have the same cash and short investments ratio as large companies. This also applies the other way. It is not the case that large companies have much cash and short-term investments or are illiquid. It is very diverse; a company's market capitalization does not say anything about the liquidity.

It turns out that HML (value) and LMI (liquidity) are correlated a 1% level. This correlation is negative. LMI increases when the average monthly stock return of liquid companies increases relative to the average monthly return of illiquid companies. This might happen because liquid companies outperform illiquid companies or because the stock value of illiquid companies fall harder.

The correlation is negative which means that when companies with a high CSI ratio outperform companies without a high CSI ratio, companies with a low book to market ratio outperform companies with a high book to market ratio. It is of course also the other way around,

when companies with a high book to market ratio outperform companies with a low book to market ratio, companies without a high CSI ratio outperform companies with a high CIS ratio.

Following from the literature review companies with a high book to market ratio are considered as value stocks and companies with a low book to market ratio as growth stocks (Fama & French, 1993). This is due to investors' perceptions. Investors think that growth companies will earn a lot of money in the future. That is why investors are willing to pay much more than the book value of a company, resulting in a low book to market ratio. According to the correlation matrix liquid companies are generally growth stocks and illiquid stocks are value stocks, because the correlation between HML (value) and LMI (liquidity) is a negative correlation.

This is in line with the literature review. Growth stocks need cash and short-term investments to expand their business and to keep growing. Therefore, growth companies need liquid assets to capitalize the growth opportunities. In contrast, illiquid companies are predominantly value stocks. Value stocks are often mature companies. Over the years value stocks have shown how to generate a positive income. Value companies control a part of the selling market and have fewer growth opportunities because they cannot expand their selling market. And as a result of this, they do not need much cash to expand their business. Therefore, they will often pay dividends to the shareholders.

The correlation between RMW (profitability) and LMI (liquidity) is also negative. When companies with a robust operating profitability outperform companies with a weak operating profitability, illiquid companies outperform liquid companies. Which means that generally seen illiquid companies have a robust profitability and liquid companies have a weaker profitability. This in line with the above-mentioned negative correlation between value and liquidity.

Companies with much cash and short-term investments need this cash for growth opportunities. Since they are growth companies, they have a weaker profitability in comparison with value stocks. Nowadays, growth companies have a low operating profit. These companies must invest in their growth opportunities to earn a large profit in the future. In contrast, companies without much cash and short-term investments have a robust operating profitability. These companies have proved that their business model earns a large profit. They know how to make money and their selling market does not disappear. As a result of this their operating profit is higher in comparison with the operating profit of growth companies. The operating profit of growth companies will rise in the future due to the investments, that is what investors expect.

The last correlation is the correlation between CMA (investment style) and LMI (liquidity). The results show that when companies with a conservative investment style outperform companies with an aggressive investment style, companies without much cash and short-term investments outperform companies with much cash and short-term investments. It is the other way around when

companies with an aggressive investment style outperform companies with a conservative investment style, then liquid companies outperform illiquid companies.

If liquid companies, hence companies with relatively much cash and short-term investments, are growth stocks and have relatively weak operating profitability, then they should have an aggressive investment style. These companies do not know whether the growth opportunities will turn into a profit in the future. However, to capitalize these growth opportunities they must invest much cash and short-term investments. This is considered as an aggressive investment style.

It turned out that companies with relatively much cash and short-term investments have an aggressive investment style. This fits seamless with the other correlation results. In contradiction, value companies with a yearly steady cash flow should have a conservative investment style, because they do not have to invest much cash and short-term investment to earn a profit in the future. And since these companies have a steady cash flow these companies do not have to expand their business. This theory is in line with the results, because when the liquidity decreases the conservative investment style increases.

The correlation matrix shows that liquid companies have a relative low book to market ratio, have a relative weak operating profitability and have a relatively aggressive investment style. All these correlations between cash and short-term investments and the other variables are in line with the theory that liquid companies proxy for growth opportunities. In contrast, illiquid companies have a high book to market ratio, have a robust operating profitability and have a conservative investment style.

4.5.   Robustness checks

Let's start with the correlations between size and other variables. The size (SMB) of a company is not correlated with the value (HML) and with the profitability (RMW) of the company. Meaning that a big company can have a high book to market value as well as a low book to market value. This is also applicable for a small company, a small company can both have a high or low book to market ratio. This is also true for the correlation between size and profitability of a company. The size of company does not say anything about the operating profitability. A small company might have a high operating profit, however a company with almost the same market capitalization can have a low operating profitability.

There is only a correlation between SMB (size) and CMA (investment). This correlation is significant at a 5% level and the correlation is positive. This positive correlation is however a bit strange. When small companies outperform big companies, companies with a conservative investment style outperform companies with an aggressive investment style. Nevertheless, one would expect that small companies are accompanied with an aggressive investment style. Small

companies have the opportunity to grow, to expand their business opportunities small companies must make investments. Therefore, one would expect that to take advantage of these investment opportunities small companies have an aggressive investment style. The correlation matrix shows that this is not the case and that big companies have an aggressive investment style.

Another robustness check is the correlation between HML (value) and other variables. It turned out that when companies with a high book to market ratio outperform companies with a low book to market ratio, at the same time companies with robust operating profitability outperform companies with a weak operating profitability. This correlation is positive at a 1% level of significance.

Companies with a high book to market ratio are value stocks. These companies have had a steady cash flow for several years. Companies with a low book to market ratio are growth stocks. Investors think that these companies will earn a profit in the future, therefore investors are willing to pay much more than the book value of the company. However nowadays, these companies do not have a robust operating profitability. As a result of this growth companies are correlated with companies with a relatively weak operating profitability.

HML (value) is positively correlated with CMA (investment). Value stocks are accompanied with companies with a conservative investment style, and growth stocks are accompanied with companies with an aggressive investment style. This is in line with the theory. Growth stocks who want to capitalize their growth opportunities must have an aggressive investment style. An aggressive investment style is needed to pace up their growth and to meet investors' expectations. In contrast, value companies have taken advantage of the selling market in the past. Value companies do not have to make large investments to grow, because these companies have less growth opportunities and they have proven that their business model works.

The last robustness check is the correlation between RMW (profitability) and CMA (investment style). When companies with robust operating profitability outperform companies with a weak operating profitability, companies with a conservative investment style outperform companies with an aggressive investment style.

Companies with a weak operating profitability, must make investment that increases the operating profitability. These companies must invest in a new business plan and for example must invest in new plants or in new machinery. Building a new business plan takes a lot of money. Therefore, these companies are considered as companies with an aggressive investment style. In contrast, a robust operating profitability is correlated with a conservative investment style.

Companies with a robust operating profitability do not have to make large investments to improve their robust operating profitability in comparison with companies with a weak operating profitability, because they proved that their business model works. These companies do not have to

set up a new factory, where they make new products. Companies with a weak operating profit need to invest relatively much to turn this weak operating profit into a robust operating profit.

4.6.   Comparing stock returns in good and bad years

There is big difference between the return of the portfolios during flourishing stock markets and decreasing stock markets. Liquid companies, that are companies with high CSI ratios performed statically better during bull and bear markets. When the 5 illiquid portfolios and the 5 liquid portfolios are compared with each other, it becomes clear that companies with high CSI ratios, hence portfolios 6 to 10, have a better average monthly return during flourishing stock markets and during economic downturns, respectively with 0,18% and 0,19%.

These results are partly in line with the results of Simutin (2010). Liquid companies performed better in increasing stock markets and performed worse in stock market downturns (Simutin, 2010). Liquid companies should perform worse during recessions, because their growth opportunities become less valuable or even worthless during recessions (Simutin, 2010). For example, the new production line is losing its value as sales will stagnate.

During economic flourishing markets, the opposite is true. The new production line is 'in the money' (Myers, 1977), because new customers are more likely to buy new products. Therefore, one would expect that liquid companies have a better stock performance than illiquid companies during economic booms and will have a worse stock performance during economic bursts.

When investors are not able to estimate the value of the growth opportunity during normal economic markets (Lam & Wei, 2011), then one could question whether investors are able to estimate the value of these growth opportunities during economic downturns.

The results, that liquid companies had a better stock performance during economic downturns, are in line with the precautionary motive (Keynes, 1939). Companies use this precautionary motive to hedge against unforeseen circumstances (Bates, Kahle, & Stulz, 2009). During recessions, investors and banks will be less willing to lend money to companies. Interest rates increase and raising additional capital will be accompanied by higher expenses. As a result of this, liquid companies will have fewer troubles refinance their capital structure and do not have problems with raising additional capital (Harford, Klasa, & Maxwell, 2014). They can easily sell their short-term investments and invest their money, to keep the business running or to take advantage of new investment opportunities.

In contrast, companies without liquid assets cannot do this and will have troubles with raising additional money at high interest rates, the high interest expenses cause a lower net income. As a result of this, liquid assets should be seen as growth opportunities that are valuable during recessions rather than risky and worthless during recessions.

Generally seen, when liquid companies have a better stock return in comparison with illiquid companies, companies with low book to market ratio outperform high book to market ratio companies, weak operating profitability companies outperform companies with robust operating profitability and companies with an aggressive investment style have better stock performance than companies with conservative investment style. Therefore, liquid companies have a low book to market ratio, weak operating profit and have an aggressive investment style. This information might also explain why liquid companies outperform illiquid companies during bursting economic markets.

A low book to market ratio means that investors are willing to pay more than the accounting value of the assets. Investors think that these assets will generate a big positive net income in the future, therefore they are willing to pay much more for the assets. It is important to mention that intangible assets are not included in the formula. Nowadays, intangible assets are very important. For example, the brand name of company itself might generate income. Customers would like to be associated with the brand name.

Following from the literature review, companies with a high book to market ratio have often more financial problems, have higher debt ratios and there is unpredictability about the net profit (Chen & Zhang, 1998; Fama & French, 1995). Due to this, financial problems might occur in the future. As a result of this, investors do not want to pay the same value as the net value of the assets, investors require a discount.

Economic downturns might accelerate this. During bad economic times the financial problems and the higher debt ratios might become even worse, which scares investors. Therefore, investors do not want to invest in companies with high book to market ratios during economic downturns. Consequently, investors are more likely to opt for companies with low book to market ratios. Resulting in an outperformance of liquid companies during economic downturns, because liquid companies are associated with growth companies.

However, it is important to mention that HML (value) and RMW (profitability) are positively correlated. When companies with high book to market ratios outperform companies with low book to market ratios, companies with robust operating profit outperform companies with a weak operating profit. Meaning that value stocks have a better operating profit than growth stocks. In contradiction operating profit does not say anything about financial problems and debt ratios, while it can be an indicator.

Liquid companies are related to companies with a weak operating profit. According to the Fama and French 5 factor model, companies with a robust operating profit have higher stock returns than companies with a weak operating profit (Fama & French, 2015). It sounds illogically that companies with a weak operating profit have a better stock performances during economic downturns. Investors biases might be an explanation for this.

Since investors are not able to value information about profitability, profitable firms are underpriced (Wang & Yu, 2010). Economic downturns may accelerate this process of underpricing, because companies with a robust operating profit are big mature companies. Due to this there is a good chance that they will lose part of their profit during a recession, because they have a larger sales market. Because of this, investors have more profit to lose and if an investor can lose more, the investor will be very careful. This results in a worse stock performance of illiquid stocks (illiquid stocks are correlated with companies with a robust operating profit).

The last correlation between liquidity and other risk factors, is the negative correlation between LMI (liquidity) and CMA (investment). Liquid companies have an aggressive investment style. They need the liquid assets to meet the requirements of the aggressive investment style. Without liquid assets a company cannot invest and take advantage of the growth opportunities. Companies with a conservative investment style, hence companies with a low growth of assets, have a better stock performance than companies with an aggressive investment style (Fama & French, 2008, 2015).

However, companies with an aggressive investment style can benefit of this style during economic downturns. During bad economic times the cost of capital increases. The interest rate will rise as well as the cost of equity, because investment banks are less willing to offer equity. Since banks do not know whether their lending will be repaid, banks require a higher interest rate.

Liquid companies do not have problems with raising additional capital when a profitable investment opportunities arises. They are used to investing cash and will keep doing this during economic downturns, because they have already reserved money for investment proposes. Since they are independent of new capital providers, they will have less expensive capital on their balance sheet in the future. Therefore, they might outperform stocks during economic downturns, because they can still take advantage of investment opportunities without raising expensive capital.

It is important to mention how these returns are calculated. The return during good years is the average monthly return during flourishing markets. These years are 1981, 1984, 1993, 1995, 1996, 2002, 2008, 2009, 2011 and 2012. The years of decreasing stock markets are 1980, 1982, 1986, 1992, 1998, 2006, 2007, 2013 and 2017. All these years are the accounting years. Meaning that the monthly return must correspond with the accounting years. For example, 1984 corresponds with the monthly returns of July 1985 to June 1986. And 2013 corresponds with the monthly returns of July 2015 to June 2016. So, the average monthly return for every portfolio is calculated during economic flourishing markets and during economic downturns.

Booming markets		Bursting markets	
Accounting data:	Months:	Accounting data:	Months:
1981	July 1982 to June 1983	1980	July 1981 to June 1982
1984	July 1985 to June 1986	1982	July 1983 to June 1984
1993	July 1994 to June 1995	1986	July 1987 to June 1988
1995	July 1996 to June 1997	1992	July 1993 to June 1994
1996	July 1997 to June 1998	1998	July 1999 to June 2000
2002	July 2003 to June 2004	2006	July 2007 to June 2008
2008	July 2009 to June 2010	2007	July 2008 to June 2009
2009	July 2010 to June 2011	2013	July 2014 to June 2015
2011	July 2012 to June 2013	2017	July 2018 to June 2019
2012	July 2012 to June 2014		

A year is considered as 'booming markets' when all the 10 portfolios had a positive average monthly return. Since there are more years considered as 'booming markets' then 'bursting markets', the 10 years with the highest average monthly return were used.

A year is considered as 'bursting markets' when all the 10 portfolios had a negative average monthly return. So, all the years when all the 10 portfolios had a negative average monthly return are used as proxy for economic downturns.

4.7. Investors' perspective and results

Following from the literature review, companies that holding cash have 'holding costs'. These holding costs are distributing dividend payments to the shareholders or searching for investment opportunities which will lead to a capital gain (Eppen & Fama, p. 311, 1971). So, companies should do everything to increase the shareholder value. However, capital gains can ultimately lead to a higher return (Miller & Modigliani, 1961). Companies will invest the excess cash in growth opportunities, these opportunities will earn the company a high profit in the future. However, dividends payments are less risky for investors (Gordon, 1963). Investors do not know whether these growth opportunities will turn into a profit, it might be the case that the entire economy becomes worse or enters a recession. Therefore, the Net Present Value (NPV) of the investment opportunities decreases and will become even a negative NPV. Investors do not have this risk when the company distributes the cash to them.

However, investors can easily sell their shares to create their own dividend (Miller &

Modigliani, 1961). A company should invest their money into growth opportunities, because this is better in creating shareholder value. When an investor is willing to have cash in his portfolio, he can do this by selling his shares and increase his cash holdings in his portfolio. The company does not have to hold cash for him, because it has better value enhancing growth opportunities and the investor can create his own dividend (Miller & Modigliani, 1961). So, when an investor wants to decrease the risk, he must sell his shares and increase the cash holdings in his own portfolio.

This theory is supported by empirical research, investors prefer that a company with many growth opportunities has many cash holdings. A company without many growth opportunities has a discount on their cash balance, investors value one dollar on the cash balance less than the book value of one dollar when the company does not have good profitable investment opportunities (Pinkwitz & Williamson, 2002). It can be concluded that investors prefer cash holdings of a company, only when the company has many growth opportunities.

The results in table 4 show that liquid companies outperform illiquid companies. In addition, table 6 displays when liquid companies outperform illiquid companies, growth stocks outperform value stocks, companies with a weak operating profitability outperform companies with a robust operating profit and companies with an aggressive investment style outperform companies with a conservative investment style. Generally seen, liquid companies are growth companies with a weak operating profit and with an aggressive investment style.

Investors prefer that companies have much cash, provided that companies have many growth opportunities (Pinkwitz & Williamson, 2002). Since the liquid companies are growth companies with an aggressive investment style, investors like that these companies have many liquid assets. The aggressive investment style means that the company increases the total amount of assets year after year. Increasing the total amount of assets, means that the company has capitalized the growth opportunities. Or in any case, they have bought new assets with which the cash flow can be increased. This increases eventually the net profit in the future and leads to a capital gain, that is what investors expect. Therefore, investors do not want that the company has to many cash holdings, because these cash holdings can be invested into profitable investments.

Since liquid companies have a better average stock performance than illiquid companies, investors do like that these companies invest their cash holdings. Otherwise, liquid growth companies with an aggressive investment style and a weak operating profitability would not outperform illiquid value companies with a conservative investment style and a robust operating profitability.

4.8.   Fama-Macbeth-regressions

It became clear that liquid companies carry a return premium. This section tests whether the return premium is caused by a risk premium. To examine whether the CSI ratio is priced in the cross-section of stock returns, a Fama Macbeth (1973) regression must be carried out. The Fama-McBeth regression has three steps. First, ten time-series regressions are performed. This is done for every portfolio. The portfolio return is regressed on the risk factor. Second, cross-sectional regressions are performed where the portfolio return is regressed on the obtained betas, leading to gammas and lambdas. Third, the lambdas and gammas are averaged, leading to the Fama-McBeth estimates.

As said before the variable is the Cash and short-term investment ratio (CSI ratio). The statistical risk factor is the difference between the average monthly return of portfolio 6 to 10 and portfolio 1 to 5. The first 5 portfolios are considered as illiquid. These portfolios have the lowest CSI ratio. The second 5 portfolios (portfolio 6 to 10) are considered as liquid, because these have the highest CSI ratios. Therefore, the risk factor is called LMI. LMI stands for **L**iquid **M**inus **I**lliquid, or in other words the average monthly return of portfolio 6 to 10 minus the average monthly return of portfolio 1 to 5.

Table 8 shows the risk factor LMI. This is the average monthly stock return, when an investor takes a long position in liquid stocks and a short position in illiquid stocks. However, the year t corresponds with July *t+1* to June *t+2.* When LMI has a positive value, this means that liquid companies outperformed illiquid companies. In contrast, it means that illiquid companies outperformed liquid companies, when LMI has a negative value. So, an outperformance could mean that liquid companies had had a better stock return. However, an outperformance could also mean that liquid companies had a lesser fall in the stock price. For example, the stock price of illiquid companies declined with 2%, and the stock price of liquid companies declined with 1,5%. Therefore, LMI is 0,5, because liquid companies performed less bad. LMI had a positive average return in 22 years and had a negative average return in 16 years.

*Table 8: This table shows the risk factor LMI, standing for **L**iquid **M**inus **I**lliquid. The risk factor is the difference of the average monthly return between the 5 liquid portfolios and the 5 illiquid portfolios. In other words, this is the average monthly return when an investor takes a long position in liquid stocks and takes a short position in illiquid stocks. Year 1980 corresponds with the monthly returns of July 1981 to June 1982.*

Year	Risk factor (LMI)	Year	Risk factor (LMI)
1980	-0,01514	1999	-0,86319
1981	0,357894	2000	-0,39873
1982	-0,18488	2001	0,610266
1983	0,330669	2002	-0,03769
1984	-0,08376	2003	0,213745
1985	-0,10317	2004	-0,12031
1986	0,173927	2005	0,110715

1987	0,037573	2006	0,104418
1988	0,487614	2007	0,388434
1989	0,055378	2008	0,123328
1990	-0,27756	2009	0,550518
1991	-0,08885	2010	-0,02562
1992	0,016968	2011	-0,14217
1993	0,634592	2012	-0,10476
1994	0,153334	2013	-0,07861
1995	0,526894	2014	0,117964
1996	-0,06707	2015	0,140152
1997	0,444352	2016	-0,17482
1998	1,431331	2017	0,015854

4.8.1. Ten time-series regressions

First, 10 time-series regressions are performed. This step finds out how exposed the return is to the risk factor LMI (Eviews, 2014). So, the portfolio return is regressed on the risk factor (LMI). The equations below show the time-series regression.

$$R_{1,t}= \alpha_i+\beta_1 LMI_t+e_{1,t}$$

$$R_{2,t}= \alpha_i+\beta_2 LMI_t+e_{1,t}$$

$$R_{n,t}= \alpha_i+\beta_n LMI_t+e_{1,t}$$

These equation states that the return of portfolio n in time t depends on the corresponding LMI. It is important to mention that every regression has the same LMI values. Because otherwise it is impossible to examine how exposed the return is to the risk factor LMI (Eviews, 2014). Since LMI changes after 1 year, the return is regressed 12 times on the same LMI value.

The regression is performed for every portfolio, leading to 10 betas. Table 9 shows the ten portfolios and the subsequent betas, obtained by a time-series regression. This table also provides the subsequent t-values. It is striking that the sign between the 5 illiquid portfolios and the 5 liquid portfolios is different. According to these results the return is not exposed to the risk factor LMI, because only portfolio 10 is statistically significant. However, to draw correct conclusions, cross sectional regressions must be examined.

Portfolio	Beta (β̂)	T-value
1	-0,546919	-0,93
2	-0,0855293	-0,15
3	-0,6343538	-1,05
4	-0,700372	-1,12
5	-0,4065342	-0,62
6	0,23661	0,42
7	0,1175996	0,20
8	0,1318589	0,21
9	0,5624004	0,85
10	1,577858	2,38

4.8.2. Cross-sectional regressions

The next step is running T cross-sectional regression. This is done for every time period. The portfolio return is regressed on the obtained betas (β̂,table 9), leading to new betas and new intercepts. These new betas are called gammas (γ) and the new intercepts are called lambdas (λ). The equation below shows the cross-sectional regressions.

$$R_{i,1} = \lambda_1 + \gamma_1 \hat{\beta}_{i,LMI} + e_{i,1}$$

$$R_{i,2} = \lambda_2 + \gamma_2 \hat{\beta}_{i,LMI} + e_{i,1}$$

$$R_{i,T} = \lambda_T + \gamma_n \hat{\beta}_{i,LMI} + e_{i,1}$$

So, these equations state that the return of portfolio i in time T is regressed on the obtained beta (β̂). Therefore, for portfolio i the $\hat{\beta}_i$ does not change over time. The goal is to examine whether a bigger exposure to the risk factor LMI corresponds with a higher return (Eviews, 2014).

4.8.3. Averaging the gammas (γ) and lambdas (λ)

The last step is averaging all the obtained gammas (γ) and lambdas (λ), this leads to the Fama-McBeth-estimates. Table 10 shows the average gammas and lambdas for the corresponding years.

Table 10: The Fama-McBeth-estimates. The portfolio return is regressed on the obtained betas from table 9.

Year	Gamma	Lambda	Year	Gamma	Lambda
1980	0,001849	-1,00502	1999	-0,73553	1,676294
1981	0,776187	5,115858	2000	-0,73316	0,56167
1982	-0,25419	-0,69824	2001	0,736672	0,331943
1983	0,080065	2,071271	2002	-0,37004	2,402651
1984	-0,20179	2,338714	2003	0,029418	1,188124
1985	-0,80834	1,554417	2004	-0,3908	1,07699
1986	-0,03116	0,287887	2005	0,021425	1,882652
1987	0,103646	1,099178	2006	0,026934	-1,14771
1988	0,488469	0,774594	2007	0,420619	-0,73412
1989	0,139305	0,879743	2008	-0,00955	2,132867
1990	-0,86805	1,237816	2009	0,344123	2,888035
1991	0,410769	1,521269	2010	-0,00123	0,268094
1992	0,027929	0,298776	2011	-0,21483	2,032443
1993	0,429411	1,563558	2012	-0,09462	2,021272
1994	-0,04489	1,373248	2013	-0,2719	0,086864
1995	0,501487	1,930276	2014	0,04524	0,365506
1996	0,192645	1,675836	2015	0,477994	1,294381
1997	0,443315	0,66279	2016	0,04473	0,56989
1998	1,624544	-0,3268	2017	-0,08595	-2,20063
Average Gamma: 0,0592303		**T-Value: 0,7702**			
Average Lambda: 1,0276946		**T-Value: 4,8601**			

Table 10 shows the average gammas and lambdas and the subsequent T-value. The average gamma has a t-value of 0,7702. This means that the average gamma does not differ significantly from zero. The null hypothesis, where the mean is equal to zero, cannot be rejected. As a result of this, the Fama-McBeth-estimates does not differ significantly from zero. This means that the risk factor LMI is not priced in the cross-section of stock returns. An increase in the CSI ratio does not ensure a higher stock return. A decrease of the CSI ratio does also not ensure a lower stock price. The Fama-McBeth-estimates conclude that LMI is not a risk factor, because LMI is not priced in the cross-section of stock returns.

The average lambda does differ significantly from zero at a 5% level of significance and at a 1% level of significance, because the corresponding T-value is 4,86. Therefore, the null hypothesis must be rejected. The average lambda contains a positive value. This means that there are risk factors missing from the equation. For example, the generally accepted risk factor SMB (proxies for the size of the company) was not in the equation. However, correlation statistics between LMI and

other risk factors are provided. As a result of this, it became clear what kind of companies liquid companies and illiquid companies are.

5. Hypotheses testing

The hypothesis supposed that liquid companies, companies with much cash and short-term investments in comparison with the total assets, should have a return premium caused by a risk premium. Liquid companies have possible growth opportunities. These opportunities may include new profitable investments. Consequently, investors do not know whether these opportunities will turn into a profit and therefore it leads to a higher risk. This is the theory, the results show that a part of the hypotheses are correct. However, some hypotheses must be rejected.

First it is important to show what kind of companies liquid companies are. Table 6 shows that liquid companies are companies with a low book to market ratio (growth stocks), companies with a weak operating profit and companies with an aggressive investment style. Since liquid companies are growth stocks with an aggressive investment style, the theory that liquid assets proxy for growth opportunities holds. However, the question is whether it proxies for risky growth opportunities.

As the results show, especially table 4, portfolios consisting of American companies with high CSI ratios have a better stock performance than portfolios of American companies with a low CSI ratio. Liquid companies have a return premium. These results are in line with hypothesis 1 that liquid companies have a return premium. Therefore, hypothesis H_{1-A} should be rejected and H_{1-B} will be accepted.

Nevertheless, this return premium is not caused by a risk premium according to the Fama-McBeth-regression. The gamma of the Fama-McBeth-estimates did not differ significantly from zero, therefore the risk factor LMI is not priced in the cross section of American stock returns. This means that according to the Fama-McBeth-estimates LMI is not a risk factor. Consequently, hypothesis H_{2-A} cannot be rejected.

That hypothesis H_{2-A} cannot be rejected is supported by other results. Table 4 shows that liquid companies perform better during booming and bursting economic markets. The literature review showed that growth opportunities are valuable during economic flourishing markets and worthless during economic downturns (Simutin, 2010; Myers 1977). When this theory holds liquid assets can be seen as a risk factor, because a valuable investment option might become useless and worthless in the future. Therefore, investors want to be compensated for this risk.

However, it turned out that companies with high CSI ratios performed better during stock markets downturns. This is not in line with the hypothesis and hypotheses H_{3-A} and H_{3-B} will be rejected. Because, if the theory holds, liquid companies should have had a worse stock performance in comparison with illiquid companies during economic downturns, because their growth opportunities became worthless leading to a mitigating of the stock price. The results show that liquid companies have performed statistical significantly better than illiquid companies during recessions.

If LMI was a risk factor, liquid companies should have had performed worse during economic downturns. However, according to the Fama-McBeth-estimates LMI is not a risk factor because LMI is not priced in the cross-section of stock returns and liquid companies did not perform worse. This makes both results compatible with each other.

6. Conclusion

This thesis has analyzed whether companies with a high CSI ratio, hence companies with much cash and short-term investments relative to total assets, have a return premium caused by a risk premium. American companies listed on the NYSE or NASDAQ since 1980 were analyzed. These companies are never merged, taken over or delisted from the stock exchange. Every year, these companies were assigned to one of the ten portfolios. The portfolios were decile portfolios, meaning that portfolio 1 had the 10% companies with lowest CSI ratios. In comparison, portfolio 10 had 10% of the companies with the highest CSI ratios. The companies were regrouped every year. Thereafter, it is examined whether companies with high CSI ratios have had a return premium in comparison with low CSI ratio companies. Monthly returns were used. The monthly returns were assigned to the yearly accounting data. By means of Fama-McBeth-regressions is analyzed whether the return premium is caused by a risk premium. The risk factor was the difference of average monthly return between liquid and illiquid companies (LMI).

The literature review concluded that liquid companies are riskier. Companies with much cash can easily invest in new investment opportunities. Therefore, liquid companies have many growth opportunities. Investors value these growth opportunities as valuable during economic flourishing markets, because the growth opportunities have a positive Net Present Value. On the other hand, during economic downturns the growth opportunities become worthless resulting in a negative Net Present Value. Because of this change from a positive NPV to a negative NPV during recessions, liquid companies should have a worse stock performance than illiquid companies in these circumstances.

The results showed that portfolios consisting of companies with high CSI ratios have had a better stock performance than portfolios of companies with low CSI ratios. The average monthly outperformance of liquid companies was 0,112%. Annually, the 5 portfolios with the highest CSI ratios outperformed the 5 illiquid portfolios with 1,34%.

Other results showed that liquid companies are growth stocks with a weak operating profitability and with an aggressive investment style. Since growth stocks with an aggressive investment style are considered as risky, because investors do not know whether these investments will turn into a profit, it seems like that liquid companies are riskier than illiquid companies. This can explain the higher return of liquid companies. However, according to the Fama-McBeth regressions, this return premium was not caused by a risk premium, because risk factor LMI is not priced in the cross-section of stock returns.

The stock performance during flourishing stocks markets and during economic downturns can give further details about this contrast. Companies with high CSI ratios performed better during increasing stock markets as well as during stock downturns. The average monthly outperformance was respectively 0,18% and 0,19%. If LMI indeed was a risk factor, during economic downturns liquid

companies should have had a worse stock performance, because the growth opportunities become worthless. Since this was not the case, investors do not consider it as a risk factor during economic downturns. Otherwise, liquid companies should have had a worse stock performance than illiquid companies during recessions.

Liquid companies, with an aggressive investment style, can easily sell their short-term investments and invest these proceeds and do not have high expenses associated with raising new capital during recessions, resulting in a lower fall of the stock price. Their earnings per share will not decline sharply, because they do not have to pay higher interest rates in the future. This is in line with the precautionary motive and the protection against unforeseen circumstances arising from this motive.

Historically, companies with much cash and short-term investments to total assets have a better stock performance than companies without these assets. They have a better stock performance during increasing stock markets as well as during recessions. Therefore, liquid companies have a return premium. However, this return premium is not caused by a risk premium. Consequently, the CSI ratio is not a risk factor. Liquid companies have even a better stock performance during economic downturns. So, it turned out that investors should not see cash and short-term investments as a risky growth opportunity, but as a protection and hedge opportunity.

7. Discussion and future research

7.1. Discussion

The 10 portfolios consist each one of 31 companies. All these companies are listed since 1980 and are never delisted, merged or taken over. On the one hand this is an advantage. These are mature companies. They know how to make money and how to increase the cash flows. If these were not able to keep the business running, they went into bankruptcy or delisted. On the other hand, this might be a disadvantage. Many companies have appeared on the stock exchange in recent years. This increases the number of companies in the dataset, creating a wider variation of CSI ratios. However, it must be considered that the CSI ratio of portfolio 10 increases to almost 100%. As a result of this, it might become clear what will happen with the stock price of companies with an extreme high CSI ratio. Nevertheless, as is mentioned in the data section, this portfolio proxies for pharmaceutical and biochemical companies. This gives a distorted picture, because these companies must hold an extremely large amount of current assets for research and development purposes.

An important conclusion is that liquid companies, hence companies with a high CSI ratio, perform better during stock market downturns in comparison with illiquid companies. This result contrasts with previous research and with the literature review (Simutin, 2010). Liquid companies have many growth opportunities. These growth opportunities become worthless during economic downturns, resulting in a lower stock price. However, these researches had a time frame that started in 1960 and ended around 2006. The time frame of this analysis was 1980-2019. So, the time frame of this thesis includes the financial and credit crisis (2008-2009). In contrast, this time frame does not include the economic downturns of the years 1973-1974. This may have caused the difference between the conclusions.

Although, the most important difference between the researches might be the used companies. As said before the companies used in this dataset exist at least since 1980. These companies are then followed for 39 years and assigned to different portfolios each year. Over the years, many companies have been listed on the stock exchange. These 'younger' companies are not included in the dataset. The stock price of these 'younger' companies might react differently to economic downturns resulting in a decreasing stock price. In addition, liquid assets proxy for growth opportunities according to previous research. Fast-growing companies are considered as companies with much growth opportunities. The dataset consisted of companies that existed since 1980. It might be happened that these companies did not proxy for fast-growing companies. Nevertheless, if the CSI ratio therefore did not proxy for growth opportunities, companies with a high CSI ratio did outperform illiquid companies. What have caused the return premium? It could be the case that liquid companies are just better performing companies. They know how to make money, however they did not find a suitable investment opportunities for their cash. When they cannot find a good

investment opportunity, they use it as a precautionary motive for unforeseen circumstances. This is particularly useful during recessions, because liquid companies do not have problems with raising additional capital.

Another explanation are investors biases. One could argue whether investors are able to value the growth opportunities. Investors do not know for which the company will use the cash. Due to this, investors cannot value the growth opportunities and certainly not during a recession.

The fact that this dataset only used companies that existed since 1980, might also be the explanation for the conclusion that LMI, hence difference in average monthly return between companies with much cash and short-term investments to total assets and companies without these assets, is not a risk factor. Other studies concluded that liquidity is a risk factor. It might be the case that other conclusions were drawn when the portfolio could exist of 'younger' companies.

However, a big difference between the studies is how the risk factor liquidity is defined. This thesis added short term investments, resulting in a CSI ratio. Perhaps, other conclusions would be drawn when cash and short-term investments was divided by current assets instead of total assets. Or when only cash is divided by current assets. This must be considered for future research.

In addition, the high monthly average return of portfolio 1 is striking. However, portfolio 1 proxies for extreme large mature manufacturing companies. These companies have many noncurrent assets such as plants. These manufacturing companies know how much cash and short-term investments they need every year to produce their goods. The liquid assets will be invested in noncurrent assets. These companies have a cash flow that increases every year resulting in a positive development of their stock price.

Another limitation of this research is that it only uses one risk factor. The lambda of the Fama-McBeth-estimates shows that there are other risk factors missing in the equation. It is difficult to add extra risk factors. The risk factors are based on average monthly return. For example, LMI is based on cash. As a result of this, the portfolios have returns based on the cash ratio. So, the portfolios are arranged based on the CSI ratio. SMB portfolios are based on market capitalization. The dependent variable (return) changes, because there are different companies in both the LMI portfolio and the SMB portfolio. Therefore, one cannot have the same dependent variable when an extra risk factor is added to the equation.

Future research should insert the risk factor LMI in the Fama and French five-factor model. Due to this the results become more convincing. If then the gamma of the Fama-McBeth-estimate is significant, one can conclude that cash and short-term investment does not proxy for profitability or another risk factor. However, the correlation statistics provided a nice indication. These showed that liquid companies are growth stocks with a weak operating profit and with an aggressive investment style.

This thesis used as risk factor the difference between the average monthly return of portfolios 6 to 10 and portfolios 1 to 5. So, every portfolio is used in computing the risk factor. Other research used the difference in average monthly return between portfolio 8 to 10 and 1 to 3. An advantage of this is that the difference between liquid and illiquid companies increases, because portfolios 4,5,6 and 7 are excluded from the research. However, with all the portfolios the amount of data increases resulting in a more convincing conclusion. In addition, with all the portfolios one does not have only the extreme portfolios. If it turned out that LMI was a risk factor, the chance that it is a risk factor increased, because the dataset has also companies that have an average CSI ratio. If the dataset only consists of extreme portfolios, the dataset misses many companies with an average CSI ratio. As a result of this, conclusions are drawn too quickly.

There are also two general disadvantages using risk factors. The risk factor LMI is in the equation. LMI is the difference in average monthly return between liquid companies and illiquid companies. The variable cash and short-term investments itself is not in the equation. In addition, these results are based on historical monthly stock returns. If the efficient market hypothesis holds, all the historic information is captured in the stock price. Meaning that risk premia cannot exist.

7.2.   Future research

The most important part for future research is adding more risk factors to the equation. For example, the risk factor LMI must be added to the Fama-French five factor model. Thereby the risk factor LMI gains more explanatory power and it becomes clear whether LMI is a proxy for another risk factor such as profitability.

The risk factor LMI itself could also be changed. To see if another calculation of liquidity leads to the same conclusions. For example, cash and short-term investments can be divided by current assets instead of total assets. Because of this, the CSI ratio of big manufacturing companies decreases. Another option is dividing current assets by total assets. However, not every current asset is considered as a liquid asset.

Another option for future research is using different years. A timeframe of 1960 to 2019 would be a good solution. Due to this, the research has many years with economic flourishing markets as well as recessions. A drawback might be finding a proper database. For example, the database EIKON had only stock prices of American firms since 1973 and only accounting data since 1980.

Many of the studies are American oriented. It is important to examine whether LMI or other risk factors also are a risk factor in the European Union. The European Union has a different monetary policy. In addition, the laws, especially between common law and civil law countries, are different. Because of this, the stock performance of these companies might differ. Therefore, a risk

factor might be applicable to American companies, while this will not be the case for European

companies.

8. Bibliography

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9. Appendix

9.1. Decile CSI ratios of the 1724 companies

Table 11: These would be the 10 decile portfolios when the 1724 companies where used. The numbers are the CSI ratios. In year 1980, when a company has a CSI ratio of 1,40 it would be have assigned to portfolio 2. However, as the CSI ratios shows these ratios are extremely high. Therefore, the CSI ratio does not proxy for liquid companies, but it proxies for biochemical and pharmaceutical companies. That is why this thesis uses the portfolios and CSI ratios of the companies represented in table 2.

Year	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1980	0,74	1,52	2,24	3,11	4,83	6,26	7,76	10,61	16,74	40,36
1981	0,61	1,20	2,13	3,51	5,11	6,52	8,75	12,87	18,52	46,97
1982	0,85	1,54	2,45	3,75	5,36	7,22	9,76	13,66	20,01	44,17
1983	0,82	1,78	3,43	4,84	7,49	10,04	13,09	16,98	23,47	50,41
1984	0,91	1,79	2,91	4,36	6,32	9,36	12,78	16,63	23,20	51,59
1985	0,93	1,74	2,80	4,20	6,06	8,92	12,18	16,80	23,89	48,97
1986	0,78	1,71	2,57	4,16	6,31	8,48	11,34	16,50	24,85	52,67
1987	0,59	1,35	2,45	3,55	5,51	9,11	12,73	18,57	27,32	54,16
1988	0,77	1,48	2,21	3,35	5,34	8,36	11,57	16,01	25,22	56,90
1989	0,64	1,16	1,93	2,88	4,77	7,33	11,54	15,65	23,92	56,68
1990	0,57	1,16	1,70	2,69	3,99	6,45	10,20	14,72	23,02	70,59
1991	0,53	1,05	2,06	3,27	5,34	7,52	11,02	17,35	28,52	82,55
1992	0,59	1,20	2,23	3,46	5,48	8,33	12,46	19,33	33,93	87,17
1993	0,63	1,23	2,18	3,64	6,10	9,45	13,51	19,66	36,39	83,84
1994	0,60	1,16	2,17	3,64	5,67	9,11	13,15	20,46	34,96	85,27
1995	0,58	1,23	2,05	3,17	5,28	8,78	14,81	23,27	36,36	85,99
1996	0,61	1,20	2,13	3,92	5,86	9,83	16,64	29,48	49,71	90,90
1997	0,64	1,27	2,35	4,10	7,15	12,29	18,34	31,99	57,98	92,00
1998	0,71	1,37	2,30	4,30	7,03	12,32	21,07	35,88	55,63	92,89
1999	0,72	1,45	2,40	4,14	7,30	13,33	21,29	35,60	59,99	95,21
2000	0,67	1,42	2,41	3,98	6,81	11,63	21,01	33,66	56,41	93,10
2001	0,88	1,75	2,97	5,32	8,19	14,41	23,22	36,56	62,14	91,21
2002	0,88	1,97	3,39	5,66	9,12	15,24	23,10	38,46	57,15	90,98
2003	1,11	2,54	4,53	7,79	11,86	17,80	27,72	40,28	60,08	94,67
2004	1,32	3,21	5,78	8,78	12,84	19,63	28,31	43,01	61,48	96,21
2005	1,39	2,75	5,43	8,70	13,34	19,45	28,65	43,89	61,63	94,83
2006	1,44	3,07	5,47	8,77	13,30	19,34	29,04	45,03	65,11	97,14
2007	1,29	2,89	5,12	8,25	13,02	18,39	28,39	41,84	65,71	96,84
2008	1,31	2,76	4,63	7,54	11,80	17,74	26,26	37,47	59,87	92,15
2009	1,74	4,36	7,25	10,81	15,40	21,67	29,30	42,80	60,98	93,62
2010	2,19	4,41	7,20	11,08	15,77	21,00	28,65	40,21	61,37	94,65
2011	1,91	4,02	6,61	10,71	15,92	21,70	31,80	45,03	70,64	96,85
2012	1,90	4,08	6,62	10,31	15,75	20,95	29,24	42,96	69,33	97,77
2013	1,99	4,36	7,48	11,39	17,56	24,02	33,62	48,42	75,84	98,32
2014	1,76	4,07	7,41	11,42	16,03	23,00	32,70	48,84	77,51	97,86
2015	1,69	3,73	6,82	10,43	15,64	22,20	32,81	51,18	77,01	97,88
2016	1,82	3,73	6,72	10,51	15,68	21,95	31,56	49,43	75,50	97,76
2017	1,54	3,39	6,01	9,72	14,57	22,42	32,14	49,77	73,47	96,74
2018	1,51	3,18	5,51	8,92	14,33	20,53	29,81	48,72	73,61	97,21

9.2. CSI ratio

$$CSI\ ratio = \frac{Total\ Cash\ and\ Short\ Term\ Investments}{Total\ Assets} * 100$$

Cash and short-term investments represent the sum of cash and short-term investments (EIKON, 2019). It contains: Cash on hand, undeposited checks, cash in banks, checks in transit, cashier's checks, credit card sales, drafts, cash in escrow, restricted cash, money orders, letters of credit, demand deposits, mortgage bond proceeds held in escrow, time deposits, Eurodollar bank time deposits, U.S. Government treasury bills, corporate securities stocks and bonds, municipal securities, commercial paper, money market mutual fund shares, post office checking/GIRO accounts, post office time deposits, post office saving accounts, central bank deposits and temporary investments.