THE EFFECT OF MONETARY POLICY ON STOCK RETURNS UNDER DIFFERENT FINANCIAL STRUCTURES

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ผลกระทบของการดำเนินนโยบายทางด้านการเงินต่อผลตอบแทนของหลักทรัพย์ภายใต้โครงสร้างทางการเงินที่แตกต่าง

นายโจฮันเนส แชงค์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตร์มหาบัณฑิต

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นาย โจฮันเนส แชงค์ : ผลกระทบของการดำเนินนโยบายทางด้านการเงินต่อผลตอบแทนของหลักทรัพย์ภายใต้โครงสร้างทางการเงินที่แตกต่าง (THE EFFECT OF MONETARY POLICY ON STOCK RETURNS UNDER DIFFERENT FINANCIAL STRUCTURES)
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งานวิจัยชิ้นนี้ศึกษากระทบของการเปลี่ยนแปลงนโยบายทางด้านการเงินโดยมิได้คาดหมายต่อผลตอบแทนหลักทรัพย์ภายใต้โครงสร้างทางการเงินที่แตกต่าง จากการวิเคราะห์ข้อมูลช่วงยาว (Panel data) ในระดับประเทศ 20 ประเทศ ผู้วิจัยพบว่าผลตอบแทนหลักทรัพย์มีความสัมพันธ์ในทิศทางตรงกันข้ามกับการเปลี่ยนแปลงอัตราดอกเบี้ยโดยมิได้คาดหมาย และผลตอบแทนหลักทรัพย์ได้รับผลกระทบจากการเปลี่ยนแปลงอัตราดอกเบี้ยโดยมิได้คาดหมายในภาวะเศรษฐกิจถดถอยมากว่าในช่วงที่เศรษฐกิจขยายตัวได้ดี นอกจากนี้ การศึกษาชิ้นนี้ยังพบว่าการเปลี่ยนแปลงอัตราดอกเบี้ยโดยมิได้คาดหมายส่งผลกระทบมากต่อผลตอบแทนหลักทรัพย์ในประเทศที่พึ่งพิงสถาบันการเงินเป็นหลักในการระดมทุน (bank-based countries) ในประเทศที่มีระดับการเปิดเสรีทางการเงินต่ำ (low liberalization degree) และในประเทศที่ตลาดหลักทรัพย์มีการพัฒนาในระดับต่ำ (low stock market development) มากกว่าประเทศที่มีโครงสร้างทางการเงินรูปแบบอื่น ผลการศึกษาจึงสรุปได้ว่าผลกระทบของการเปลี่ยนแปลงนโยบายทางการเงินต่อผลตอบแทนหลักทรัพย์ขึ้นอยู่กับโครงสร้างทางการเงินของแต่ละประเทศ ทั้งนี้ผลการศึกษาที่พบดังกล่าวอาจเป็นผลมาจากองค์กรเผชิญข้อจำกัดในการจัดหาเงินในภาวะเศรษฐกิจถดถอย ในประเทศที่พึ่งพิงสถาบันการเงินเป็นหลักในการระดมทุน ในประเทศที่มีการเปิดเสรีทางการเงินในระดับต่ำ และในประเทศที่ตลาดหลักทรัพย์มีการพัฒนาในระดับต่ำมากกว่าประเทศที่มีโครงสร้างทางการเงินรูปแบบอื่นอันส่งผลให้องค์กรที่ตั้งอยู่ในประเทศที่มีโครงสร้างดังที่กล่าวมาได้รับผลกระทบมากจากการเปลี่ยนแปลงอัตราดอกเบี้ยโดยมิได้คาดหมาย

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This paper studies the reaction of stock returns to unexpected monetary policy changes under different financial structures. Using a country-level panel data set for twenty countries, I find that stock returns are negatively related to interest change surprises and that stock returns react more sensitive during recessions than during expansions. Furthermore, this paper provides evidence that unexpected interest rate changes have a greater effect on stock returns in bank-based countries, in countries with a low liberalization degree and in countries with a low stock market development degree, implying that the strength of unexpected monetary policy changes on stock returns depends on financial structures of countries. This is due to financing constraints of firms which are stronger during recessions, in bank-based countries, in countries with a low liberalization and a low stock market development degree leading to a higher sensitivity of firms to unanticipated interest rate changes.

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CHAPTER I

INTRODUCTION

1.1 Background and Problem Review

It is important to understand how monetary policy can affect the stock market because stock prices determine the wealth of people and firms. The stock market is an important channel of monetary policy to influence real economic activity and stock prices can affect the economy through a number of channels. Therefore, it is important to study how the stock market reacts to monetary policy changes and what determines the magnitude of the stock market's response to monetary policy changes.

Based on different monetary transmission channels, an increase in the stock price will raise investment spending and aggregate output. According to the asset price channel (Tobin's q theory), an expansionary monetary policy will increase demand for stocks and consequently raising stock prices. This will lead to a higher Tobin's q and hence higher investment and higher output. In addition, when stock prices rise, the value of financial wealth increases and thereby increasing lifetime resources of consumers and thus consumption and output. The balance sheet channel predicts that an expansionary monetary policy will cause a rise in stock prices which in turn raises the firm's net worth. This results in a reduction of adverse selection and moral hazard and therefore lending will increase and give rise to higher investment spending and higher aggregate output. Moreover, when stock prices rise, the value of financial assets will rise as well. Thus, the likelihood of financial distress will go down and as a consequence increase consumer durable and housing expenditures and aggregate output. In summary, the theory forecasts that the monetary policy affects stock prices and thus investment, consumption and output which are highly correlated to the overall wealth of people and firms in an economy. Therefore, it is essential to examine how the central bank's actions influence stock returns. If the monetary policy of the central bank has an effect on stock prices, total output and wealth can be increased by the central bank. Consequently, it is crucial to find further evidence that stock prices increase when the monetary policy is expansive.

Additionally, because the value of a stock is given by the sum of discounted future dividends, an easing or tightening of monetary policy will affect the stock price through expected future dividends and through the rate at which they are discounted. Hence, a monetary change will affect the financial wealth of investors which influences private consumption. Firms' cost of capital will also change which has an effect on real investment spending. Consequently, the resulting shift in real activity will have an impact on inflation.

Investors follow the monetary policy of the central bank closely and many studies show that they are wise to do so because changes in monetary policy are significantly correlated with both short- and long-term stock market performance. Previous findings point out that trading strategies made to exploit the relation between monetary policy and the stock market may be profitable (Durham, 2003).

My study is different from previous research in the way that I examine how the reaction of stock returns to an unexpected monetary policy change depends on different country characteristics. It is necessary to investigate whether stock returns react different to monetary policy under a different degree of liberalization and stock market development and under the two types of financial systems, i.e. whether the returns respond more sensitive to a policy change. There are good reasons to believe that stock returns react different to unexpected monetary policy changes across countries with different financial structures. The strength to which firms are affected by monetary policy changes depends on the country characteristics and so the stock returns. Firms in bank-based countries will be more affected by a restrictive monetary policy change because they highly depend on bank loans and a restrictive policy change will decrease the available bank loans. Furthermore, firms in countries with a low liberalization and stock market development degree are likely to face more financial constraints. These firms will be more affected by an unexpected monetary policy change because they are not able to use internal funds as to an extent as unconstrained firms and have to raise funds through banks and capital markets and because difficulties to borrow money will decrease more than for unconstrained firms which face already very little problems. Hence, country characteristics play an important role in determining the intensity of the monetary policy effect on firms and stock returns. If it is true that the stock returns' reaction depends on financial structures, then the central bank might change its policy in a different way. That means, if the stock market reacts already to small changes in the monetary policy heavily in a bank-based country, the central bank might use its monetary instruments more carefully. If the stock prices in a bank-based country are more sensitive to a monetary policy change, then investors in bank-based economies should observe the monetary policy even more carefully and can expect a higher increase in the stock price and higher returns than in market-based countries, if the policy change is expansive and at least partly unexpected. At the same time, a restrictive policy change will decrease stock prices more than in a market-based country (i.e. lower returns). It is interesting to analyze the data in order to find out whether there is evidence for this suggestion. It is important to examine it because, if it is true, then investors in bank-based countries will be more affected by a monetary policy change than investors in market-based countries and central banks might employ monetary policy more sensitive when stimulating stock markets. Then a small decrease in the interest

rate might be enough in order to stimulate the stock market and the overall economy. Investors in bank-based countries should be more concerned about the central bank's actions because stock prices will decrease more sharply in response to a monetary contradiction than in market-based economies.

Studying how different country characteristics influence the reaction of the stock returns to interest rate changes, will help policymakers to predict the effect of a target rate change on the stock market.

The theory can also elaborate the relation between stock prices and monetary policy. The following Gordon growth model can explain the relationship:

$$P_0 = \frac{D_0 * (1+g)}{(k_e - g)} \quad (1)$$

When the central bank decreases interest rates, the return on bonds, which is an alternative to stocks, declines and investors will accept a lower required rate of return on equity (k_e). The lower k_e results in a higher stock prices (P_0). Furthermore, the lowering of interest rates will stimulate the economy and therefore the growth rate of dividends g is likely to increase. This rise in g will lead to a higher P_0 and rising stock prices.

It is also important to distinguish between anticipated and unanticipated monetary policy changes. If the central bank increases the money supply, the interest rate will decrease and the output will increase. What it does to the stock market depends on whether market participants anticipated the monetary expansion. If they fully anticipated the expansionary policy, the stock market will not react because neither its expectations of future dividends nor its expectations of future interest rates are affected. If however, the monetary expansion is at least partly unexpected, stock prices will increase because it will lower the interest rates for some time and it will lead to higher output for some time and therefore to higher dividends. The lower interest rates and higher dividends (both current and expected) will increase stock prices.

1.2 Research Questions

I examine whether the stock market reacts more sensitive to a monetary policy change under different country characteristics by using country level data.

First, I will study the effect of an unanticipated change in the monetary policy, measured by an unexpected change in the short-term nominal discount rate, on the country's stock return in different countries. Several studies show a negative correlation (Conover, Jensen and Johnson (1999), Wongswan (2009) and Chulia, Martens and van Dijk (2010)). I will examine how the

monetary policy affects the stock market in order to find out whether there is also a negative relation in the countries that I examine for the period from 1999 until 2011. This serves as a basis for a succeeding incorporation of the country characteristics. That leads to the first research question:

"Does a decrease in the unexpected interest rate have a positive effect on the stock return?".

Second, I will incorporate the economic condition in the basic regression in order to investigate whether the economic condition influences the stock returns' reaction to unexpected monetary policy changes. That is important because the economic condition will be included in a subsequent analysis under different country characteristics. Hence, I will examine whether a country's stock return responds less to an unanticipated change during expansive periods than during recessive periods. This gives the second research question:

"Does the stock return respond less to an unexpected monetary policy change during expansive than during recessive periods?".

Third, I will divide the chosen countries by the type of financial system (bank- and market-based), by the degree of liberalization (high, medium and low) and by the degree of stock market development (high, medium and low) and repeat the first two steps. This will show if the effect of an unexpected interest rate change on stock returns is more severe under different market characteristics, i.e. the monetary policy is more effective. If a country is market-based, with a high degree of liberalization and a high degree of stock market development, firms in this country are likely to face less financial constraints. Thus, stock returns should react less to an unexpected interest rate change. By repeating the first two steps with the division of the countries' characteristics, I can investigate whether stock returns are highly affected by a small change in the monetary policy for specific country characteristics (step one). It is necessary to study whether country characteristics influence the strength of the stock returns' reaction to policy changes. It is likely to be true because firms are more or less affected by unanticipated interest rate changes depending on financial structures. Hence, I can set up the third research question:

"Does the stock return of countries which are market-based, with a high liberalization degree and a high stock market development degree react less to an unexpected interest rate change?".

Additionally, I can show how stock returns response to an unexpected interest rate change combined with the economic condition (step two), i.e. whether the unexpected interest change has a greater effect on stock returns if the economy is in a recession and bank-based with a

low liberalization and stock market development degree. Therefore, I can set the fourth research question:

"Is the reaction of the stock returns to an unexpected interest rate change still greater during recession when dividing the countries by the country characteristics?".

1.3 Objectives

In contrast to the existing literature, I will study how the type of financial system and other country characteristics affect the stock market reaction to a monetary policy change. Previous research always focused on the relation between the stock market and monetary policy independently of the financial system. Cecchetti (1999) and Benito (2005) incorporate the type of financial system of countries but they focus on the effect of monetary policy on output and inflation (Cecchetti, 1999) and on the adjustment of inventories by firms (Benito, 2005). However, I think it is important to study the influence of the financial system on the relation between monetary policy and stock returns because there are good reasons to believe that the type of system can influence the response of the stock market to monetary policy changes. These reasons can be seen in the transmission mechanisms of the monetary policy.

According to the bank lending channel, an expansionary monetary policy leads to an increase of bank reserves and bank deposits which raise the quantity of bank loans available. This increase in loans will cause investment spending to rise because many borrowers depend on bank loans to finance their investments. Consequently, aggregate demand will rise. Following the reasoning of this channel, the reaction of the stock market to the monetary policy should be stronger in bank-based economies because banks play a special role in the bank-based system. The bank dependence hypothesis predicts the same: monetary policy effects should be greater for firms in a more bank-based financial system because there, firms are more bank-dependent in order to finance their investments.

Moreover, the degree of liberalization and of stock market development can affect the reaction of the stock returns to unexpected interest changes. Firms in countries with a low liberalization and stock market development degree are likely to face financial constraints. Financially constrained firms will be more affected by an interest rate decrease because the interest rate cut will reduce borrowing difficulties more than for unconstrained companies which face already very low adverse selection and moral hazard problems. Financially unconstrained firms should be more able to compensate unexpected interest rate changes by using internal funds instead of borrowing through banks and capital markets. Further, firms in countries with a high financial liberalization degree will find it easier to raise funds in a foreign country and hence are less affected by a domestic monetary policy change.

Companies in countries with a high stock market development degree can substitute bank loans and bonds easier by stocks compared to firms in countries with a low stock market development level and therefore are less influenced by an unexpected interest change. Consequently, it is reasonable to study how the different country characteristics influence the stock returns' response to unexpected interest rate changes.

The paper's main contribution is the classification of several countries in bank- and market-based, in a high, medium and low liberalization degree and in a high, medium and low stock market development degree and the investigation whether and how these country characteristics affect the response of stock returns to an unexpected monetary policy change. That means I will examine whether stock returns react more sensitive to a policy surprise under different market characteristics, i.e. whether the monetary policy is more effective. Furthermore, I will contribute to the existing literature by studying how the country characteristics interact with the economic condition, i.e. whether the stock returns react even more sensitive if e.g. the economy is bank-based and/or has low level of stock market development and is in a recession at the same time.

1.4 Research Hypotheses

1.4.1 Unexpected change in monetary policy

Previous studies (Bernanke and Kuttner (2005), Bohl et al. (2008) and Chulia et al. (2010)) show a negative relation between monetary policy and the stock return, whereby monetary policy was measured as interest rate and money supply changes. An expansive (contractive) monetary policy is associated with high (low) stock returns. The theory also predicts this negative relation. Since the price of a stock equals the present value of future expected dividends (discounted by current and expected future interest rates), lower interest rates lead to higher stock prices. If the central bank changes to an expansionary monetary policy and this change is at least partly unexpected, stock prices will increase because the rise in the money supply will raise the real money stock and thus lower nominal and real interest rates (discount rate); and because the lower interest rates will boost investment and aggregate demand and hence overall output for some time which in turn results in higher profits and higher dividends. The increase in the stock prices will lead to an increase in nonhuman wealth and therefore also in consumption which causes a higher demand of stocks and a further price increase. Following this reasoning, I can set the first hypothesis.

Hypothesis 1: *Stock returns are negatively related to an unexpected interest rate change in all countries.*

1.4.2 Economic condition

Intuitively, borrowers have better information about their creditworthiness than lenders have. This leads to an external finance premium between the cost of internally generated funds and funds from financial markets. Bernanke and Gertler (1989) point out that adverse selection of lending is largest in recessions, when weak balance sheets due to low cash flows cause higher costs of external finance which leads to lower investment and economic activity. Moreover, banks and other financial intermediaries may tighten credit standards which causes a decrease in supply of credit to weaker borrowers. These riskier borrowers have only a few other sources of credit and therefore are more affected by shocks in weak credit market conditions. Basistha and Kurov (2008) argue that, according to the credit channel of monetary transmission, firms should react more to shocks in recessions because of a general reduction in the availability of credit and because of a further adverse effect on the balance sheets of the financially constraint firms. Hence, I can set the second hypothesis.

Hypothesis 2: *Stock returns respond more sensitive to monetary policy shocks during recessions than during expansions in all countries.*

1.4.3 Country characteristics

According to the bank lending channel, an expansionary monetary policy increases bank reserves and bank deposits which raise the available quantity of bank loans. Therefore, investment and consumer spending will rise and so the stock prices. Based on this logic, monetary policy will have a greater effect on the stock returns in bank-based countries because the firms are more dependent on bank loans than firms in market-based countries which get funds directly through stock and bond markets and not to such a large extent through banks. Benito (2005) applies the same reasoning. Especially bank dependent firms, which are unable to mitigate the lower supply of bank loans with other sources of finance, are affected by a tightening monetary policy. Thus, financially constraint firms are more affected (see below).

Cecchetti (1999) states that interest rate changes have a smaller impact in countries, where nonbank finance is highly available, the secondary capital markets are large and well-developed and banks are a less important source of finance. These are indicators of market-based countries. The above described transmission mechanism is stronger in those countries where firms are more bank dependent and where the bank system is less healthy and less concentrated (many small banks). Then, firms have less access to capital markets and are less able to compensate the decline of bank loans. Thus, they are more affected.

Hence, I can formulate the third hypothesis.

Hypothesis 3: *Monetary policy effects on stock returns are greater in bank-based countries than in market-based countries.*

According to the credit channel, more financially constrained firms are likely to be more strongly affected by an interest rate change than firms which are less financially constrained. The channel predicts that an interest rate cut will increase firms' net worth, firms' cash flow and thus liquidity. This will result in lower adverse selection and moral hazard and hence increasing lending. Firms that are financially unconstrained will be less affected by an interest rate cut because they face already very low adverse selection and moral hazard problems and hence an interest rate cut will decrease the adverse selection and moral hazard problems not to such a high extent as for constrained firms.

Ehrmann and Fratzscher (2004) find that financially constrained firms are stronger impacted by the monetary policy. The asymmetric reaction of firms to monetary policy can be explained by the different degrees of financial constraints and investment opportunities of individual firms. Jansen and Tsai (2010) argue that firms without S&P debt ratings and with non-positive dividend payout ratios, which signals high financial constraints, are more impacted by monetary policy than other firms. They point out that financially constrained firms face higher costs of external finance and therefore are more strongly affected by monetary policy shocks, i.e. an interest rate increase. Their results support this suggestion. Financial unconstrained firms, i.e. firms with a high cash flow to income ratio, should be more immune to changes in interest rates because they have large cash flows and can use more internal financing instead of raising funds externally via bank loans and capital markets. Moreover, unconstrained firms tend to have a better debt rating than constrained firms and therefore should find it easier to raise funds for their investments and thus should be less affected by policy changes. Hence, less financial constrained firms should react less to an unanticipated monetary policy change.

The country characteristics which I use (the type of financial system, the degree of liberalization and the degree of the stock market development) are all closely related to the degree of financial constraints. Firms which conduct business in a market which is market-based, with a high degree of liberalization and a high level of development are likely to face less financial constraints because they can easily raise funds, compared to a market which is characterized by the opposite attributes. Therefore, a market-based economy, a high level of liberalization and a high level of stock market development is associated with a less sensitive reaction of the stock returns to an unexpected interest rate change and hence, monetary policy

is more effective. To investigate whether the degree of the stock return reaction to unexpected monetary policy changes varies depending on the country characteristics is the main contribution of this research study.

This is also consistent with the reasoning for financial constrained firms. Ehrmann and Fratzscher (2004) use firm size as a proxy for firm's financial constraints and find that constrained firms react stronger to monetary policy changes and Gertler and Hubbard (1988) and Gertler and Gilchrist (1994) show that small firms are more dependent on bank loans.

Furthermore, Karras (1999) reports that the output of countries with a high liberalization degree reacts less to monetary policy because a monetary expansion is reflected more on prices and less on output since the consequent depreciation and wage increases are higher in more open economies. The author uses annual panel data from 1953 to 1990 for 38 countries to examine the effect of the growth rate of M1 money supply on the output growth rate and on the inflation rate under different degrees of openness. Openness is defined as the sum of imports and exports as a fraction of GDP and as imports as a fraction of total consumption. Because output responds less in more open countries, stock returns should also react less since they are highly correlated. In contrast to Karras (1999), I study the effect of an unexpected interest rate change on stock returns by focusing on the degree of financial openness.

Several authors provide evidence that a high liberalization degree and a high stock market development degree are associated with a low degree of financial constraints (Ghosh (2006), Koo and Shin (2004), Gallego and Loayza (2001) and Love (2003)).

Firms in countries that have a high liberalization and openness degree are less affected by a domestic monetary policy change because they can raise funds easily abroad and are less dependent on domestic credit markets, compared to countries with a low liberalization degree.

Firms in countries with a high degree of stock market development are less affected by a monetary policy tightening because they can substitute bank loans and bonds more easily with equity financing than firms in countries with a low stock market development degree.

Based on the above reasoning and the high correlation of the liberalization and stock market development degree with the level of firms' financial constraints, I can form the fourth and fifth hypothesis.

Hypothesis 4: *Stock returns in countries with a high liberalization degree respond less sensitive to unanticipated policy changes than in countries with a lower liberalization degree.*

Hypothesis 5: *Stock returns in countries with a high stock market development degree respond less sensitive to unanticipated policy changes than in countries with a lower stock market development degree.*

CHAPTER II

LITERATURE REVIEW

There exists an extensive variety of literature that explains how the stock market reacts to monetary policy and a lot of research has been done on the interaction between monetary policy and stock returns. Monetary policy has been measured using money supply announcements, discount rate changes, both money supply announcements and discount rate changes, changes in the Fed funds rate target and open market operations. Since I will study the relation between stock market returns and the short-term nominal interest rate, I focus in the literature review on the effects of federal funds rate changes and discount rate changes.

2.1 Effect of an interest rate change on stock returns

Pearce and Roley (1985) study the effect of a change in the Federal Reserve's discount rate on stock prices (S&P 500) and find that upward changes of the discount rate have a negative effect on stock prices but significant only in the period after 1979. Hafer (1986) also uses US data and discovers a negative reaction of equity prices to unanticipated discount rate changes but only for the period between October 1979 and October 1982. Before and after this period he finds a positive but insignificant effect on stock prices. Hardouvelis (1987) examines the reaction of several US stock price indices to changes in the discount rate and discovers a negative effect during 1979 to 1982 but no effect afterwards. Jensen and Johnson (1995) investigate the long-term returns surrounding a change in the discount rate. They find a negative effect on equity returns in the preannouncement period, in the announcement period and in the postannouncement period. They classify the monetary environment as restrictive and expansive and conclude that US stock returns are significantly related to monetary conditions. Thorbecke (1997) find a significant negative effect on the percentage change in the Dow Jones Industrial Average from federal funds rate changes. Conover, Jensen and Johnson (1999) distinguish between a restrictive and an expansive monetary policy, measured by discount rate changes, and report a negative relation between monthly stock returns and discount rate changes for countries worldwide. Durham (2003) uses data of the federal funds rate of the US and the discount rates of 15 other countries. He defines monetary easing (tightening) episodes as periods in which the interest rate decreased (increased) and finds that the relationship between monetary policy and stock returns is less robust than previous papers have shown. Bernanke and Kuttner (2005) discover that an unanticipated 25-basis-point cut in the federal funds rate target leads to a roughly one percent increase in stock prices. Wongswan (2009) finds that an unexpected 25-basis-point decrease of the federal funds rate is associated with a 0.5-2.5% increase in foreign stock indexes. Bohl, Siklos and Sondermann (2008) study the impact of unexpected short-term interest rate changes, measured by the one-

month EURIBOR, on returns of European stock markets. They show that European stock markets decrease between 1.42% and 2.30% on the day when the interest rate increases by 25-basis-points. Bjornland and Leitemo (2009) find that real stock prices immediately fall by seven to nine percent due to a raise of the federal funds rate by 100 basis points by exploiting monthly US data. Fair (2002) finds that more than 30% of identifiable events that caused a large immediate price change in the stock market were monetary announcements. Basistha and Kurov (2008), Ehrmann and Fratzscher (2004) and Guo (2004) find out that stock returns react strongly negative to unanticipated changes in the federal funds rate. Chulia, Martens and van Dijk (2010) discover that an unanticipated increase in the federal funds rate of 10 basis points cause a stock return decrease of 46 basis points. In general, all major studies which use an interest rate as the monetary policy measure show that a tighter monetary policy causes lower equity prices.

2.2 Financing constraints

Jansen and Tsai (2010) examine asymmetries in the impact of monetary policy surprises on stock returns between bull and bear markets and show how the ability of firms to obtain external finance influence the impact. They find that the capacity of external finance is more important in a bear market. Ehrmann and Fratzscher (2004) reveal that more financially constrained firms are stronger influenced by a surprise change of monetary policy. Firms, which have low cash flows, a small size, poor credit ratings, low debt to capital ratios, high price-earnings ratios or a high Tobin's q, are more strongly impacted by monetary policy. Ghosh (2006) analyses 1000 listed Indian firms for the period 1995-2004 and finds that financial liberalization led to a reduction of financing constraints. Koo and Shin (2004) show that liberalization in Korean financial markets caused a reduction of financial constraints especially for small firms which faced high constraints before liberalization. Koo and Maeng (2005) find that financial constraints decline with financial liberalization. Financial liberalization improves the accessibility to external finance of firms. Gallego and Loayza (2001) show that financial development reduces the cost of capital and financing constraints. Love (2003) discovers that financial development reduces financing constraints, i.e. increases firms' ability to obtain external finance.

2.3 Economic condition

Basistha and Kurov (2008) observe that stock returns react more strongly to unexpected changes in monetary policy during recessions and in tight credit market conditions and that stocks of financial constrained firms are more affected by monetary policy changes in recessions and tight credit conditions than relatively unconstrained firms. Their findings support the credit channel by showing that macroeconomic cycles interact with firms'

financial characteristics to determine the effect of monetary policy shocks on stock returns. Guo (2004) finds out that monetary policy has a stronger impact on stock returns of smaller firms than of larger firms and that a recession makes this impact even larger. Livdan, Sapriza and Zhang (2009) report that financial constraints are more binding in economic expansions. Gertler and Gilchrist (1994) and Kashyap et al. (1994) find a strong connection between stock returns and macroeconomic conditions.

2.4 Type of financial system

Cecchetti (1999) argues that countries in which firms are more bank dependent are more sensitive to interest rate changes. His findings support this argument. His results suggest that a country's financial structure and monetary transmission mechanism are interconnected. He states that monetary policy has a smaller impact on output and inflation in market-based countries. Benito (2005) was the first author who related the financial system to the firm's reaction to monetary policy. Specifically, he studies the adjustment of inventories by firms in the UK and in Spain which are countries that represent a market-based and a bank-based economy. The author assumes that the monetary policy influences firms through their inventory accumulation. He investigates how the borrowing rate influences the change in real inventories. He uses company-level data and compares the data for the two countries. Previous papers suggest that firms can be classified as strong bank-dependent by using criteria such as bond ratings (Kashyap et al. 1994) and firm size (Carpenter et al. 1994). However, Benito compares across countries in respect of the type of financial system in order to find out whether the Bank Dependence Hypothesis holds, i.e. firm's inventory investment in the UK is less sensitive to monetary policy than in Spain. However, his findings are contrary to the Bank Dependence Hypothesis and not consistent with the bank lending channel.

2.5 Liberalization degree

Karras (1999) uses annual data from 1953 to 1990 of 38 countries and finds that the greater the openness, the smaller the effect of monetary policy on output. The stimulative power of a monetary expansion declines with the level of openness. Following a monetary expansion, wage demands will rise more in the more open economy because of the consequent depreciation of the currency. Hence, more of the monetary expansion is reflected on prices and less on output. Peersman and Smets (2005) find that sectors with a higher degree of openness are less affected by monetary policy than more closed sectors because a more open sector is less affected by a slowdown of the domestic economy caused by a tightening of the domestic monetary policy.

CHAPTER III

SCOPE OF THE STUDY

In my study, I examine the effect of an unexpected interest rate change on stock returns in general and the strength of the effect for expansive and recessive periods. Therefore, I compute the unexpected interest rate change, the monthly stock returns and the business cycle turning points for 20 countries. I mainly contribute to the existing literature by studying whether the reaction of the stock returns to a monetary policy change is stronger under numerous country characteristics. Hence, I categorize the countries by the type of financial system, the liberalization degree and the stock market development degree. Furthermore, I classify the countries as bank- or market-based, with a low, medium or high liberalization degree and with a low, medium or high stock market development degree for each year of the study period (1999 to 2011) to distinguish whether the country characteristics are time consistent or vary over time.

CHAPTER IV

DATA

4.1 Choice of countries

I will use data of twenty countries of which ten are bank-based and ten are market-based countries. The sample of countries must have a broad range of country characteristics in order to be able to classify the countries in a low, medium and high category of the liberalization and stock market development degree. Furthermore, comparable data must be available for all countries. Hence, I will analyze five financially developed bank-based, five developed market-based, five undeveloped bank-based and five undeveloped market-based countries, based on the classification of Demirgüc-Kunt and Levine (1999). They compare ratios across countries of the banking sector development (measured in terms of size, activity and efficiency) relative to the stock market development (also measured in terms of size, activity and efficiency). Countries with a ratio below the mean are classified as market-based, and otherwise as bank-based. To group countries as financially developed and underdeveloped, they study the development of both banks and markets. Countries are classified as financially underdeveloped if their claims of deposit money banks on the private sector over GDP is less than the sample mean and the total value traded as a share of GDP is less than the sample mean, and otherwise as financially developed. Demirgüc-Kunt and Levine (2004) still use the same classification that was also applied by several authors (Giovanni, 2005).

Table 1: Choice of countries

	Financially underdeveloped countries	**Financially developed countries**
Bank-based	Greece, Argentina, India, Sri Lanka, Indonesia	Germany, Spain, France, New Zealand, Italy
Market-based	Peru, Brazil, Mexico, Philippines, Turkey	UK, US, South Africa, Netherlands, Malaysia

Classification of countries based on Demirgüc-Kunt and Levine (1999)

4.2 Stock returns

I use monthly stock returns of the main stock index of the 20 above listed countries from 1999 until 2011. I apply price indices.

Table 2: Main stock indices

Country	Main stock index
USA	Dow Jones Industrials
Germany	DAX 30
UK	FTSE 100
France	CAC 40
India	BSE 100
Brazil	Bovespa
South Africa	FTSE/JSE All Share
Spain	IBEX 35
New Zealand	NZX All
Italy	FTSE MIB
Greece	Athex Composite
Argentina	MERVAL
Indonesia	IDX Composite
Peru	Lima SE General (IGBL)
Mexico	IPC (Bolsa)
Philippines	Philippine SE i (PSEi)
Turkey	Istanbul SE National 100
Netherlands	AEX Index
Malaysia	FTSE Bursa Malaysia KLCI
Sri Lanka	Colombo SE All Share

4.3 Measure of the unexpected change in monetary policy

In order to measure the monetary policy, I will use unexpected changes in the federal funds rate for the US and unexpected changes in the discount rate for the other countries. The discount rate is closely related to the federal funds rate and therefore can be used interchangeably. I will apply data of twenty countries (panel data) for the period from 1999 to 2011 since in 1999 the European Central Bank (ECB) began its operations for several European countries. I will exploit monthly unexpected changes in the nominal short-term interest rates.

I will use the method of Kuttner (2001) in order to get a direct measure of a monetary surprise. He measures surprise changes in the federal funds rate target from futures data. This direct measure of surprise monetary policy allows for a clean estimate of the immediate

impact of an unexpected change in the federal funds rate on stock returns. He uses the federal funds futures contracts traded on the Chicago Board of Trade to compute the surprise change in the federal funds rates.

I will use unexpected monthly changes in the interest rate because I use monthly stock returns. According to Kuttner (2001), the monthly unexpected interest rate change for the US can be calculated as the difference between the average market interest rate in month t and the 1-month futures rate on the last day of month t-1:

$$\Delta i_{t,US}^{u} = \frac{1}{m}\sum_{i\in t}\tilde{r}_i - f_{t-1,m}^{1} \tag{2}$$

where $\Delta i_{t,US}^{u}$ is the monthly unexpected interest rate change in month t for the US,

$\frac{1}{m}\sum_{i\in t}\tilde{r}_i$ is the average market interest rate in month t,

m is the number of days in month t and

$f_{t-1,m}^{1}$ is the 1-month futures rate on the last day of month t-1.

Wilhelmsen and Zaghini (2005) state that the daily surprise component of a monetary policy decision can be calculated by the change in money market interest rates on the days of the policy meetings:

$$\Delta {i_d}^{u} = |i_d - i_{d-1}| \tag{3}$$

where Δi_d^{u} is the daily unexpected interest rate change,

i_d is the market interest rate on the day of the meeting (close of day data).

The higher the level to which the market anticipates the policy decision, the smaller is the reaction of the short-term interest rates on the day of the announcement. They use daily (close of day) money market interest rates at 1-, 3- and 12-month maturity and suggest EURIBOR for the Euro area, Interbank rates for New Zealand, IBGBR for the UK, Federal Funds Rate for the US and Interbank rates for South Africa.[1] In addition to Wilhelmsen and Zaghini (2005), Brooke et al. (2000) also suggest using money market rates in order to infer interest rate expectations. They argue that money market rates can estimate expectations of future interest rates. Thus, money market rates can measure interest rate surprises. Since I will use monthly changes in the interest rate, I will follow Kuttner (2001) using money market interest rates for all countries except for the US. In order to calculate the unexpected interest rate

[1] Source: Global Financial Database; except for South Africa, New Zealand and the US: Source: DataStream

change for the other countries, I use the method of Kuttner (2001) with money market interest rates suggested by Wilhelmsen and Zaghini (2005):

$$\Delta i_{t,all}^{u} = \frac{1}{m}\sum_{i\in t}\tilde{r}_i - \tilde{r}_{t-1,m} \quad (4)$$

where $\Delta i_{t,all}^{u}$ is the monthly unexpected interest rate change in month t for all countries except for the US,

$\frac{1}{m}\sum_{i\in t}\tilde{r}_i$ is the average market interest rate in month t,

m is the number of days in month t and

$\tilde{r}_{t-1,m}$ is the money market interest rate on the last day of month t-1.

I use the following interest rates:

Table 3: Interest rates

Country	**Interest rate**
USA	US Fed Funds Rate
Germany	EURIBOR 3 Month
UK	UK Interbank 3 Month
France	EURIBOR 3 Month
India	Mumbai Interbank 3 Month
Brazil	Brazil CDI
South Africa	South African JIBAR 3 Month Discount
Spain	EURIBOR 3 Month
New Zealand	New Zealand 90 Day Bank Bill
Italy	EURIBOR 3 Month
Greece	EURIBOR 3 Month
Argentina	Argentina Interbank (BAIBOR) 90 Days
Indonesia	Indonesian Interbank 3M
Peru	Peru Interbank Interest Rate
Mexico	Mexico Balance (TIIE) Interbank Rate
Philippines	Philippine Interbank Call Loan Rate
Turkey	Turkey Interbank Overnight
Netherlands	EURIBOR 3 Month
Malaysia	Malaysia Interbank Deposit 3Month
Sri Lanka	Sri Lanka Call Money

4.4 Measure of the type of financial system

There are several characteristics to distinguish between bank- and market-based countries. In a bank-based financial system banks provide most of the credits to the economy. However, in a market-based financial system firms raise funds mostly in capital markets (bonds and equity markets). Demirgüc-Kunt and Levine (1999) studied the characteristics of the two types of financial systems by using data on a cross-section of up to 150 countries. They found that the financial systems of higher income countries tend to be more market-based. They constructed and compared ratios of the banking sector development relative to the stock market development which are both measured in terms of size, activity and efficiency. Countries with larger ratios are classified as bank-based and countries with a ratio below the mean are classified as market-based. Thus, they are able to group worldwide countries in bank-based and market-based economies. Since Demirgüc-Kunt and Levine (1999) use data to classify the countries which are older than my study period, I group the countries as bank- and market-based according to my own calculations with new data based on the ratios that Demirgüc-Kunt and Levine (1999) use. I categorize countries as bank- and market-based according to the size (domestic assets of deposit money banks divided by domestic stock market capitalization), activity (private credit by deposit money banks divided by stock market total value traded) and efficiency (stock market total value traded / GDP multiplied by bank overhead costs / total assets; and stock market total value traded / GDP multiplied by net interest margin) of the banks and the stock market. I compare the ratio of each country of each year (1999 to 2010) with the mean of all countries of each year. Countries with a ratio in the majority of the years greater than the mean of all countries are classified as bank-based (b) and otherwise as market-based (m). This gives the following classification which is for a few countries not consistent with Demirgüc-Kunt and Levine (1999):

Table 4: Classification by the type of financial system

Country	Size	Activity	Efficiency		**Total**
			Overhead costs	Net interest margin	
USA	m	m	m	m	**m**
Germany	b	m	b	b	**b**
UK	m	m	m	b	**m**
France	m	m	b	b	**m**
India	m	m	m	m	**m**
Brazil	m	m	b	b	**m**
South Africa	m	m	m	m	**m**
Spain	b	m	m	m	**m**
New Zealand	b	b	b	b	**b**
Italy	b	m	m	b	**m**
Greece	b	b	b	b	**b**
Argentina	m	b	b	b	**b**
Indonesia	b/m	m	b	b	**b**
Peru	m	b	b	b	**b**
Mexico	m	m	b	b	**m**
Philippines	m	b/m	b	b	**b**
Turkey	b	m	m	b/m	**m**
Netherlands	b	m	b	m	**b**
Malaysia	m	m	b	m	**m**
Sri Lanka	b	b	b	b	**b**

The countries are classified as bank-based (b) and market-based (m) according to ratios of size, activity and efficiency of the banks and the stock market (see further explanations above). The ratios of each country of each year are compared to the mean of all countries in order to classify the countries. A country is categorized as bank-based if the ratio indicates a country as bank-based (i.e. the ratio is greater than the mean) in the majority of the years (1999 to 2010) and otherwise as market-based. The total classification (last column) is based on the classification of the country according to size, activity and efficiency (overhead costs). In total, a country is classified as bank-based if the majority of the size, activity and efficiency (overhead costs) classification is bank-based and otherwise as market-based.

Time consistency:

I classified all countries as bank- or market-based for each year based on ratios for size, activity and efficiency of the banks and the stock market. The classification does not vary much over time; with a few exceptions (see the appendix for more details).

4.5 Measure of the liberalization degree

I will use the measure of financial openness developed by Chinn and Ito (2008). They develop an index which is called KAOPEN that measures the extent of openness in capital account transactions. Their index measures the extent and intensity of capital controls based on the information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. To construct KAOPEN, the authors assign dummy variables for four major categories: a variable indicating the presence of multiple exchange rates, a variable indicating restrictions on current account transactions, a variable indicating restrictions on capital account transactions and a variable indicating the requirement of the surrender of export proceeds. The authors measure the level of financial openness for 182 countries. I categories countries as high liberalization degree if they rank 1 to 55 of all countries of the KAOPEN index, medium liberalization degree for rank 56 to 109 and low liberalization degree for 110 to 165. Countries are categorized in low, medium and high by how they rank in the maturity of the years in the period 1999 to 2010, and not by the latest rank (2010). I use the updated version of 2010. This gives the following classification:

Table 5: Liberalization degree

Liberalization degree	**Countries**
Low	India, South Africa, Turkey
Medium	Argentina, Indonesia, Sri Lanka, Brazil, Mexico, Philippines, Malaysia
High	US, UK, Germany, France, Spain, Italy, Netherlands, New Zealand, Greece, Peru

Time consistency:

I classified all countries as having a low, medium or high liberalization degree for each year based on the KAOPEN index. The classification does not vary much over time; with a few exceptions (see the appendix for more details).

4.6 Measure of the degree of stock market development

Two common measures are the market-capitalization-to-GDP-ratio as an indicator of size and the turnover-to-GDP-ratio as an indicator of liquidity. I use the market-capitalization-to-GDP-ratio, as suggested by Levine and Zervos (1998), and classify the countries in a low, medium and high degree. The market capitalization equals the total value of all listed shares. This ratio

is a good indicator of the level of stock market development because the size of the stock market is positively correlated with the ability to raise capital and diversify risk.

From the annual market capitalization of listed companies in percent of GDP (1999-2011) of the 20 countries, I calculate the 33% percentile and the 66% percentile of all data. Then, I compute the mean of each country for the period 1999 to 2011 and group the mean in three sets (low, medium, high). This gives the following classification:

Table 6: Stock market development degree

Stock market development degree	**Countries**
Low (<= 33% percentile)	Turkey, Indonesia, New Zealand, Argentina, Sri Lanka, Mexico
Medium (> 33% to < 66% percentile)	Germany, India, Brazil, Italy, Greece, Peru, Philippines
High (>= 66% percentile)	France, UK, US, South Africa, Spain, Malaysia, Netherlands

Time consistency:

I classified all countries as having a low, medium or high stock market development degree for each year based on the market capitalization of listed companies in percent of GDP. The classification does not vary much over time; with a few exceptions (see the appendix for more details).

4.7 Measure of the economic condition

One of the measures to classify the state of the economy as expansive or recessive is the Leading Economic Index (LEI). If the six-month smoothed growth rate falls below minus two percent for several months, a recession begins. This method is used by the Bank of Thailand.[2] To calculate the annualized six month rate of change of CLIs the following formula can be used:

$$R(t) = \left(\left(\frac{C(t) * 12}{\sum_{i=1}^{12} C(t-i)} \right)^{12/6.5} - 1 \right) * 100 \qquad (5)$$

where $C(t)$ is the CLI in year t

and $\sum_{i=1}^{12} C(t-i)$ is the 12-month moving average of CLI.

[2] Source: Bank of Thailand

For the USA, I can apply the standard NBER business cycle turning points to distinguish between a recession and an expansion, as Basistha and Kurov (2008) suggest.

USA:

Table 7: NBER business cycle turning points for the US[3]

Peak	Trough
July 1990	March 1991
March 2001	November 2001
December 2007	June 2009

This gives the following recession and expansion periods for 1.1.1999 to 31.12.2012:

Table 8: US recession and expansion periods

Time Period	Economic condition
January 1999 – March 2001	Expansion
March 2001 – November 2001	Recession
November 2001 – December 2007	Expansion
December 2007 – June 2009	Recession
June 2009 – December 2012	Expansion

Other countries:

The OECD measures reference turning points by the OECD Composite Leading Indicators (CLI) (here: January 1999 to December 2012). The turning points indicate recessions and expansions. The components of the CLI vary across countries.

[3] Source: NBER, http://www.nber.org/cycles.html

Table 9: Business cycle turning points for several countries[4]

Country	Turning Points
France	Trough 1997M1, Peak 2000M12, Trough 2003M6, Peak 2007M12, Trough 2009M5
Germany	Trough 1999M1, Peak 2001M4, Trough 2005M2, Peak 2008M3, Trough 2009M5, Peak 2011M7
Greece	Trough 1998M2, Peak 2000M1, Trough 2002M7, Peak 2004M3, Trough 2005M6, Peak 2008M7, Trough 2009M6
Italy	Peak 1995M12, Trough 1999M2, Peak 2001M1, Trough 2003M7, Peak 2008M2, Trough 2009M5, Peak 2011M6
Mexico	Peak 1998M2, Trough 1999M4, Peak 2000M6, Trough 2003M8, Peak 2008M2, Trough 2009M5
Netherlands	Trough 1998M9, Peak 2000M7, Trough 2003M9, Peak 2008M2, Trough 2009M6, Peak 2011M4
New Zealand	Trough 1998M7, Peak 2000M2, Trough 2001M2, Peak 2005M7, Trough 2006M4, Peak 2007M8, Trough 2009M3, Peak 2010M6
Spain	Trough 1996M1, Peak 2000M4, Trough 2004M5, Peak 2008M2, Trough 2009M10, Peak 2011M8
Turkey	Peak 1998M3, Trough 1999M8, Peak 2000M9, Trough 2001M11, Peak 2002M11, Trough 2004M9, Peak 2007M12, Trough 2009M3, Peak 2011M7
UK	Trough 1996M11, Peak 2000M4, Trough 2002M12, Peak 2004M1, Trough 2005M2, Peak 2007M12, Trough 2009M5
Brazil	Peak 1997M9, Trough 1999M4, Peak 2000M12, Trough 2003M7, Peak 2004M9, Trough 2006M6, Peak 2008M5, Trough 2009M4, Peak 2010M9
India	Trough 1997M8, Peak 2000M2, Trough 2003M1, Peak 2007M11, Trough 2009M3, Peak 2011M1
Indonesia	Trough 1998M10, Peak 2003M5, Trough 2006M5, Peak 2008M6, Trough 2009M5
South Africa	Trough 1998M12, Peak 2000M10, Trough 2003M11, Peak 2008M5, Trough 2009M8, Peak 2011M3

Argentina:

I use the Leading Indicator of economic activity (IL) which forecasts the state of the economy aggregating a large number of economic variables (monthly from January 1998 to December 2012).[5] By applying the method of the Bank of Thailand (equation 5), I can define recessions and expansions.

I cross-check the classification of the business cycle by defining recessions and expansions based on monthly data of the consumer confidence index and the labour demand index from the Universidad Torcuato Di Tella, Argentina. I classify the economic condition as recessive and expansive by using equation five. The classification is very similar to the classification based on the Leading Indicator of economic activity.

[4] Source: OECD, http://www.oecd.org/std/clits/oecdcompositeleadingindicatorsreferenceturningpoints andcomponentseries.htm

[5] Source: Universidad Torcuato Di Tella, http://www.utdt.edu/ver_contenido.php?id_contenido=3870&id_item_menu=7550

Peru:

I use the monthly manufacturing index of the Central Reserve Bank of Peru.[6] I apply equation (5) to define recessions and expansions.

I also examine whether the classification is consistent with another method. Therefore, I use quarterly data of the GDP percent change and define a recession as two consecutive quarters of negative growth. I find out that this method gives very similar results as the categorization based on the monthly manufacturing index.

Philippines:

I use quarterly data of the Composite Leading Economic Indicator (Composite LEI) from Q1 1998 until Q4 2012.[7] I define a recession as two consecutive quarters of negative growth.

Further, I exploit quarterly data of the GDP percent change and find that this classification is consistent with the one which uses quarterly data of the Composite LEI.

Malaysia:

The Department of Statistics Malaysia defines the following recession periods (updated in January 2013):[8]

Dec 1997 – Nov 1998, Feb 2001 – Feb 2002, Jan 2008 – Mar 2009

Sri Lanka:

There is no leading economic indicator available but a similar index which is called the Private Sector Industrial Production Volume Index.[9] I use quarterly data from Q1 2001 until Q4 2010 and define a recession as two consecutive quarters of negative growth. I use annual data of the industrial production for the year 2011 from the data stream.

In addition, I apply quarterly data of the GDP growth and discover that it is consistent with the classification which uses quarterly data of the Private Sector Industrial Production Volume Index.

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[6] Source: Central Reserve Bank of Peru, http://www.bcrp.gob.pe/statistics.html

[7] Source: NSCB, http://www.nscb.gov.ph/lei/2012/4Qlei_12/4thQ12_LEI_highlights.asp

[8] Source: Department of Statistics, Malaysia, Malaysian Economic Indicators: Leading, Coincident and Lagging Indexes, January 2013, http://www.statistics.gov.my/portal/download_Economics/files/CLI/2013/CLI_JAN2013.pdf

[9] Source: Central Bank of Sri Lanka, http://www.cbsl.gov.lk/htm/english/08_stat/s_2.html

CHAPTER V

METHODOLOGY

I will run regressions consisting of panel data with fixed effects. First, I will investigate the relation between an unexpected interest rate change and countries' stock return. Hence, I will use the following regression:

$$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \epsilon_{i,t} \quad (6)$$

where

$R_{i,t}$ is the monthly stock return of country i in month t,

$\Delta i^u_{i,t}$ is the monthly unexpected change in the federal funds or discount rate for country i in month t

and $\epsilon_{i,t}$ is the error term for country i for month t.

Since I will use panel data and pool the countries together, I will have one regression in the first part.

First, I will run the regression without control variables. Then, I will include monthly data of inflation, the change of the stock market size in terms of market value and the one month lag of the monthly returns as control variables. These variables can capture a large proportion of stock return variations and all proxy a different thing such as inflation proxies uncertainty. The variables are widely used to explain stock returns.

$$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t} \quad (7)$$

where $\sum_{z=1}^{3} CV_{z,t}$ are three control variables for month t.

Inflation is negatively correlated with stock returns because increasing inflation is associated with uncertainty and people become more careful in buying stocks. Furthermore, increasing inflation indicates possible interest rate increases which make loans for firms more expensive. Since the stock price is the discounted sum of future revenues, rising inflation devalues these revenues and stock returns will decrease. Asprem (1989) studies the relationship between stock returns and several variables in ten European countries and finds that employment and inflation are negatively related to stock returns. Furthermore, I include stock market value as a measure of size because it can explain a large fraction of stock return variations as suggested by Fama and French (1993). They point out that there is a positive relation between the book to market ratio and average return and a negative relation between size and average

return. Bekaert et al. (2001) study several emerging countries and find that some variables such as market capitalization, inflation and the price earning ratio can explain differences in stock market performance. In addition, I include the lag of the monthly stock returns because it can also explain current stock returns well and because the current returns are heavily determined by the past returns. Not including the lagged returns could lead to an omitted variable bias and the results might be unreliable. I also include the lagged dependent variable to eliminate autocorrelation problems. The lagged stock returns are positively correlated with the current stock returns.

Second, I will examine the possible asymmetries in the effect of an unanticipated monetary policy change during expansion and recession. Therefore, I run both equation (6) and (7) for expansive and recessive periods. I expect to find that stock returns react more sensitive to unexpected interest rate changes during recessions than during expansions.

Third, I will divide all 20 countries by the type of financial system (bank- and market-based), by the degree of liberalization (high, medium and low) and by the degree of stock market development (high, medium and low) and run equations (6) and (7) again without and with a division by the economic condition. I expect to find a higher sensitivity of the stock returns to unexpected interest rate changes for bank-based countries, with a low liberalization degree and a low stock market development degree than in countries with the opposite attributes.

CHAPTER VI

EMPIRICAL RESULTS

I begin by looking at the summary statistics of all variables used. I exclude two outliers which are both unexpected monthly interest rate changes of Turkey. Table 10 provides summary statistics of the monthly returns, unexpected monthly interest rate change, inflation, monthly change in market value, lagged returns and economic condition of the aggregate sample. The inflation is calculated as the monthly change in the CPI and the market value represents the market capitalization of each stock index. The dummy variable for economic condition equals one if the economy is in a recession and zero if it is in an expansion.

Table 10: Descriptive statistics of all variables

Variable	**Number of observations**	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
$R_{i,t}$	3120	0.0061	0.0753	-0.5680	0.6728
$\Delta i^{u}_{i,t}$	3118	-0.0015	0.0254	-0.7294	0.2766
Inflation	3071	0.0036	0.0067	-0.0279	0.1039
Change market value	3062	0.0107	0.0821	-0.4279	0.7510
Lagged returns	3120	0.0063	0.0756	-0.5680	0.6728
Economic condition	3093	0.3534	0.4781	0.0000	1.0000

It shows a data set of the returns and interest changes with a low standard deviation. The mean of the returns is positive which is intuitive since stock markets grow over time. The mean of the interest rate changes is negative which indicates more decreases than increases in the interest rate. The inflation, change in the market value and lagged returns have a positive mean. The mean of the economic condition dummy variable indicates that there were more expansive than recessive months during the sample period.

The following table shows the correlation of all variables.

Table 11: Correlation of all variables

	$R_{i,t}$	$\Delta i^{u}_{i,t}$	Economic condition	Inflation	Change market value	Lagged returns
$R_{i,t}$	1.0000 (N=3120)					
$\Delta i^{u}_{i,t}$	-0.0699*** (0.0001) (N=3118)	1.0000 (N=3118)				
Economic condition	-0.1159*** (0.0000) (N=3093)	-0.0013 (0.9410) (N=3091)	1.0000 (N=3093)			
Inflation	-0.0125 (0.4878) (N=3071)	0.0688*** (0.0001) (N=3071)	0.0288 (0.1121) (N=3044)	1.0000 (N=3071)		
Change market value	0.0602*** (0.0009) (N=3062)	-0.0705*** (0.0001) (N=3060)	-0.1118*** (0.0000) (N=3035)	0.0373** (0.0406) (N=3013)	1.0000 (N=3062)	
Lagged returns	0.0932*** (0.0000) (N=3120)	-0.0471*** (0.0086) (N=3118)	-0.1390*** (0.0000) (N=3093)	0.0378** (0.0361) (N=3071)	0.8757*** (0.0000) (N=3062)	1.0000 (N=3120)

*, **, *** indicate that the correlation is statistically significant at 10%, 5% and 1% levels, respectively. The numbers in parentheses indicate the p-values.

The stock returns are significantly negative correlated with the unexpected interest rate changes which is in accordance with the first hypothesis. In addition, the inflation and economic condition are negatively and the lagged returns are positively related to the stock returns which is intuitively. The change in market value which stands for market size is positively correlated with the returns. This can be explained by the fact that an increase in the market value indicates a rising demand of stocks and hence higher returns. Table 11 points out that the three control variables are only slightly correlated with each other. The change in market value is negatively correlated with the unexpected interest change because investors tend to buy more stocks if interest rates are decreased which leads to a rise in the market value. The lagged returns are also negatively correlated with the unexpected interest change but less than the current returns which is logical because if the current interest rates decrease, the returns should increase. This is also valid for the returns of the previous month. The inflation is positively related to the change in market value and to the lagged returns because people tend to invest more in the stock market when they fear increasing inflation which will reduce their savings in bank accounts and bonds. Hence, they substitute bank deposits and bonds with stock investments which results in a rising market value. Consequently, lagged returns also increase. The inflation is positively correlated with the unexpected interest change because central banks might increase interest rates to counteract growing inflation.

The next table presents the summary statistics of all countries individually. The data consist of 156 observations of monthly returns as well as of monthly unexpected interest rate changes for each country except for Turkey which consists of 154 observations of the unexpected interest changes.

Table 12: Descriptive statistics of all individual countries

Country	Variable	Mean	Standard deviation	Minimum	Maximum	Correlation with $R_{i,t}$
US	$R_{i,t}$	0.0018	0.0490	-0.1600	0.1377	1
	$\Delta i_{i,t}^{u}$	-0.0009	0.0017	-0.0126	0.0009	0.2511***
Germany	$R_{i,t}$	0.0012	0.0690	-0.2309	0.1829	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0011	-0.0059	0.0029	0.1931**
UK	$R_{i,t}$	-0.0003	0.0456	-0.1472	0.1161	1
	$\Delta i_{i,t}^{u}$	-0.0003	0.0018	-0.0160	0.0044	0.0608
France	$R_{i,t}$	-0.0013	0.0589	-0.1845	0.1164	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0011	-0.0059	0.0029	0.2196***
India	$R_{i,t}$	0.0113	0.0912	-0.2604	0.2903	1
	$\Delta i_{i,t}^{u}$	-0.0004	0.0037	-0.0147	0.0091	-0.0293
Brazil	$R_{i,t}$	0.0137	0.0826	-0.2639	0.2705	1
	$\Delta i_{i,t}^{u}$	-0.0005	0.0070	-0.0514	0.0373	0.0775
South Africa	$R_{i,t}$	0.0119	0.0557	-0.1416	0.1433	1
	$\Delta i_{i,t}^{u}$	-0.0004	0.0023	-0.0097	0.0046	-0.0557
Spain	$R_{i,t}$	-0.0008	0.0616	-0.1917	0.1660	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0011	-0.0059	0.0029	0.1090
New Zealand	$R_{i,t}$	0.0001	0.0369	-0.1229	0.0848	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0015	-0.0089	0.0035	0.0980
Italy	$R_{i,t}$	-0.0053	0.0637	-0.1957	0.1782	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0011	-0.0059	0.0029	0.1809**
Greece	$R_{i,t}$	-0.0092	0.0870	-0.2920	0.2184	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0011	-0.0059	0.0029	0.1015
Argentina	$R_{i,t}$	0.0112	0.1093	-0.4175	0.4096	1
	$\Delta i_{i,t}^{u}$	0.0007	0.0461	-0.2150	0.2766	-0.2852***
Indonesia	$R_{i,t}$	0.0145	0.0759	-0.3036	0.2828	1
	$\Delta i_{i,t}^{u}$	-0.0010	0.0060	-0.0366	0.0236	-0.1580**

*, **, *** indicate that the correlation is statistically significant at 10%, 5% and 1% levels, respectively.

Table 12: Descriptive statistics of all individual countries (continued)

Country	Variable	Mean	Standard deviation	Minimum	Maximum	Correlation with $R_{i,t}$
Peru	$R_{i,t}$	0.0172	0.0863	-0.3695	0.3671	1
	$\Delta i_{i,t}^{u}$	0.0001	0.0220	-0.0901	0.1010	-0.0455
Mexico	$R_{i,t}$	0.0144	0.0671	-0.1977	0.1769	1
	$\Delta i_{i,t}^{u}$	-0.0014	0.0066	-0.0381	0.0209	-0.1478*
Philippines	$R_{i,t}$	0.0052	0.0671	-0.2379	0.1876	1
	$\Delta i_{i,t}^{u}$	-0.0004	0.0033	-0.0111	0.0255	-0.1837**
Turkey	$R_{i,t}$	0.0191	0.1347	-0.5680	0.6728	1
	$\Delta i_{i,t}^{u}$	-0.0251	0.0981	-0.7294	0.1410	-0.0543
Netherlands	$R_{i,t}$	-0.0034	0.0656	-0.2494	0.1142	1
	$\Delta i_{i,t}^{u}$	-0.0001	0.0011	-0.0059	0.0029	0.1691**
Malaysia	$R_{i,t}$	0.0062	0.0547	-0.1304	0.2508	1
	$\Delta i_{i,t}^{u}$	-0.0002	0.0015	-0.0126	0.0036	-0.2109***
Sri Lanka	$R_{i,t}$	0.0149	0.0729	-0.1809	0.2280	1
	$\Delta i_{i,t}^{u}$	-0.0003	0.0100	-0.0372	0.0307	-0.0655

*, **, *** indicate that the correlation is statistically significant at 10%, 5% and 1% levels, respectively.

It shows a negative mean of the unexpected interest change for all countries except Argentina and Peru and a positive mean of the monthly returns for all countries except UK, France, Spain, Italy, Greece and Netherlands. The correlation between the unexpected interest changes and the monthly returns is important and is negative for all countries except US, UK, Brazil, New Zealand and all Euro zone countries which use the EURIBOR 3 month interest rate. When looking only at the significant correlations, five countries, which are developed countries, show a positive and five countries, which are developing countries, a negative correlation between stock returns and unexpected interest changes. These five countries are all financially developed countries with a high liberalization degree and a medium or high stock market development degree. The positive correlation in the five countries is also persistent when observing the countries separately for expansions and recessions. Some countries present a positive correlation because the returns and interest changes moved surprisingly in the same way. This might be due to the fact that a decrease in the interest rate does not increase returns because also an unexpected monetary policy change does not influence investors' behavior in some countries. The interest rates in these countries are low and as a consequence the unexpected changes as well and hence the unexpected interest changes are so small that they do not affect the behavior of investors. The stock returns are

positively correlated with the unexpected interest changes mostly in countries which have on average a stock return of approximately zero percent. These small positive or negative returns, together with the on average slightly negative interest change, lead to a positive correlation in these countries. Countries with a clearly positive mean of the stock returns show a negative correlation. Furthermore, there might be a positive correlation in the developed countries because interest rates are already low and thus the unanticipated interest changes are also small. Therefore, the small negative average stock returns together with the small negative unexpected interest changes cause a positive correlation. There are more unexpected interest rate decreases in the developed countries in order to stimulate the slowing economies. These negative interest changes and the many negative monthly returns lead to a positive correlation. Only financially developed countries with a high liberalization degree and a high or medium stock market development degree show a positive correlation between the stock returns and the unexpected interest changes. Firms in these countries face only small financial constraints and are affected by unexpected interest rate changes only to a small extent because they can easily substitute domestic loans and bonds by other financial instruments. Therefore, the stock returns do not increase (decrease) if there are unanticipated interest rate cuts (rises). It is likely that there are interest rate decreases when the economy is weak in order to stimulate the economy and stock returns are negative. Then, stock returns and interest change surprises are positively related because the surprises do not have such a large effect on firms in these developed countries compared to developing countries. Investors and firms are not much affected by unexpected interest changes and thus stock returns are not negatively correlated with the unexpected monetary policy changes. In developing countries with more financial constraints where firms are unable to substitute domestic loans and bonds, firms are more affected by unexpected interest changes where an interest rate cut decreases borrowing costs and hence increases stock returns. In addition, an unexpected interest rate decrease can also be bad news for stocks. An unexpected interest decrease might create inflation fears and signals investors that there might be interest rate increases in the near future. Therefore, investors are reluctant to buy stocks and stock returns do not increase. The correlations in the US, Germany, France, Italy and the Netherlands are positive over the whole sample period (1999 to 2011) and also positive in the period before the financial crisis (1999 to 2006) and afterwards (2007 to 2011).

The following table presents how many months of the sample period were expansive and recessive.

Table 13: Number of expansive and recessive months

Country	Expansive months	Recessive months	Total months
All countries	2000	1093	3093
US	130	26	156
Germany	90	66	156
UK	94	62	156
France	109	47	156
India	94	62	156
Brazil	74	82	156
South Africa	95	61	156
Spain	83	73	156
New Zealand	98	58	156
Italy	103	53	156
Greece	100	56	156
Argentina	102	54	156
Indonesia	109	47	156
Peru	136	20	156
Mexico	99	57	156
Philippines	93	63	156
Turkey	92	64	156
Netherlands	94	62	156
Malaysia	130	26	156
Sri Lanka	75	54	129

Table 13 points out that there were clearly more expansive than recessive months and that there are nevertheless enough recession periods for a meaningful analysis.

The next table presents the descriptive statistics of the aggregate sample for expansions and recessions.

Table 14: Summary statistics of the monthly returns and unexpected interest rate changes separated by the economic condition, financial system, liberalization degree and stock market development degree

Characteristic	Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum	Correlation with $R_{i,t}$
Expansions	$R_{i,t}$	2000	0.0127	0.0636	-0.3695	0.6728	1
	$\Delta i_{i,t}^{u}$	2000	-0.0016	0.0219	-0.4978	0.1410	0.0035
Recessions	$R_{i,t}$	1093	-0.0055	0.0921	-0.5680	0.4314	1
	$\Delta i_{i,t}^{u}$	1091	-0.0016	0.0309	-0.7294	0.2766	-0.1361***
Market-based	$R_{i,t}$	1716	0.0064	0.0738	-0.5680	0.6728	1
	$\Delta i_{i,t}^{u}$	1714	-0.0027	0.0303	-0.7294	0.1410	-0.0416*
Bank-based	$R_{i,t}$	1404	0.0057	0.0770	-0.4175	0.4096	1
	$\Delta i_{i,t}^{u}$	1404	-0.0002	0.0175	-0.2150	0.2766	-0.1352***
Low liberalization	$R_{i,t}$	468	0.0141	0.0991	-0.5680	0.6728	1
	$\Delta i_{i,t}^{u}$	466	-0.0086	0.0575	-0.7294	0.1410	-0.0497
Medium liberalization	$R_{i,t}$	1092	0.0114	0.0772	-0.4175	0.4096	1
	$\Delta i_{i,t}^{u}$	1092	-0.0004	0.0183	-0.2150	0.2766	-0.1647***
High liberalization	$R_{i,t}$	1560	3.10e-07	0.0644	-0.3695	0.3671	1
	$\Delta i_{i,t}^{u}$	1560	-0.0002	0.0071	-0.0901	0.1010	0.0036
Low development	$R_{i,t}$	936	0.0124	0.0885	-0.5680	0.6728	1
	$\Delta i_{i,t}^{u}$	934	-0.0045	0.0452	-0.7294	0.2766	-0.1038***
Medium development	$R_{i,t}$	1092	0.0049	0.0791	-0.3695	0.3671	1
	$\Delta i_{i,t}^{u}$	1092	-0.0002	0.0089	-0.0901	0.1010	-0.0118
High development	$R_{i,t}$	1092	0.0020	0.0563	-0.2494	0.2508	1
	$\Delta i_{i,t}^{u}$	1092	-0.0003	0.0016	-0.0160	0.0046	0.0507*

*, **, *** indicate that the correlation is statistically significant at 10%, 5% and 1% levels, respectively.

It indicates that the mean of the returns is negative during recessions and positive during expansions which is intuitively. The mean of the monthly unexpected interest changes is during expansions and recessions negative. The interest changes are more negatively correlated with the stock returns during recessions which supports the second hypothesis. However, the correlation during expansions is not significant. The descriptive statistics also evidence the third hypothesis because the correlation between stock returns and unexpected interest changes is more negative in bank-based countries. Furthermore, the correlation shows some evidence for the fourth hypothesis since the correlation coefficient is more negative in a

medium liberalization environment compared to a high liberalization. The descriptive statistics also show a first proof of the fifth hypothesis. Stock returns are more negative correlated with unexpected interest changes in countries with a low stock market development degree than in countries with a medium or high degree. Countries with a high liberalization and a high stock market development degree show a positive correlation which is consistent with the findings in table 12. This might be due to the fact that the monthly stock returns are very low or even negative in these countries and the unexpected interest changes are also slightly negative. The stock market in these countries might response not much to an interest rate decrease because rates are very low already. Investors might not react much and do not change their trading strategy because of an unexpected interest rate increase or decrease in these countries. Further, their markets might be more efficient and thus an unanticipated interest decrease (increase) does not affect the stock market positively (negatively). The stock markets are more advanced and do not react to unexpected monetary policy changes to such a large extent because investors take much more factors into account besides the monetary policy and are not much influenced by unanticipated interest changes compared to developing markets. Additionally, firms in countries with a high liberalization and stock market development degree face only small financial constraints. Hence, they are less affected by unexpected interest changes, because they have more alternatives to raise funds, and their stock returns do not change much because of unexpected policy changes. Instead, the stock returns move in the same direction as the overall economy independently of unexpected interest changes. However, only one positive correlation is significant and only to a 10% significance level.

In order to test the first hypothesis, which states that stock returns are negatively related to unexpected interest rate changes, I apply equation (6). When pooling all countries together, stock returns are significantly negative correlated with interest rate changes. I use regressions with fixed or random effects because the intercepts of the regressions for individual countries are different from each other. The Hausman test indicates to use random effects for the aggregate sample.[10] In general, the Hausman test designates whether to use random or fixed effects by analyzing whether the unobserved effects and the explanatory variables are correlated. If the unobserved effects are uncorrelated with all explanatory variables, the random effects method is appropriate. However, if the unobserved effects are correlated with some explanatory variables, the fixed effects method is necessary. If the random effects model is used, the estimators are generally inconsistent. Further, I use robust standard errors for all regressions, except for the countries individually for which I use OLS regressions. The numbers in parentheses in all following tables indicate the t/ z-values.

[10] (Chi2 (1) = 1.36, Prob>chi2 = 0.2440)

Table 15: Regressions of monthly stock returns against monthly unexpected interest rate changes for the aggregated data set and all countries individually

Regression	Sample size	Intercept	$\Delta i_{i,t}^{u}$	R^2 (overall)
All countries	3118	0.0058***	-0.1997*	0.0049
		(3.21)	(-1.67)	
US	156	0.0082*	7.2666***	0.0630
		(1.91)	(3.22)	
Germany	156	0.0025	12.4670**	0.0373
		(0.46)	(2.44)	
UK	156	0.0002	1.5614	0.0037
		(0.04)	(0.76)	
France	156	-0.00004	12.0962***	0.0482
		(-0.01)	(2.79)	
India	156	0.0110	-0.7288	0.0009
		(1.50)	(-0.36)	
Brazil	156	0.0142**	0.9159	0.0060
		(2.14)	(0.96)	
South Africa	156	0.0113**	-1.3578	0.0031
		(2.49)	(-0.69)	
Spain	156	-0.0001	6.2869	0.0119
		(-0.02)	(1.36)	
New Zealand	156	0.0004	2.4005	0.0096
		(0.13)	(1.22)	
Italy	156	-0.0042	10.7760**	0.0327
		(-0.83)	(2.28)	
Greece	156	-0.0084	8.2641	0.0103
		(-1.20)	(1.27)	
Argentina	156	0.0116	-0.6769***	0.0814
		(1.38)	(-3.69)	
Indonesia	156	0.0125**	-2.0018**	0.0250
		(2.04)	(-1.99)	
Peru	156	0.0172**	-0.1782	0.0021
		(2.49)	(-0.56)	
Mexico	156	0.0123**	-1.4964*	0.0218
		(2.27)	(-1.85)	
Philippines	156	0.0038	-3.6903**	0.0337
		(0.70)	(-2.32)	

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

Table 15: Regressions of monthly stock returns against monthly unexpected interest rate changes for the aggregated data set and all countries individually (continued)

Regression	Sample size	Intercept	$\Delta i_{i,t}^{u}$	R^2 (overall)
Turkey	154	0.0172	-0.0745	0.0029
		(1.53)	(-0.67)	
Netherlands	156	-0.0023	10.3807**	0.0286
		(-0.45)	(2.13)	
Malaysia	156	0.0044	-7.7846***	0.0445
		(1.01)	(-2.68)	
Sri Lanka	156	0.0147**	-0.4767	0.0043
		(2.52)	(-0.82)	

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The aggregated data of all 20 countries show a significantly negative correlation between stock returns and unexpected interest rate changes. The interest changes can explain 0.49% of changes in stock returns. These findings support hypothesis one.

By observing the countries individually, it turns out that the stock returns of ten countries out of twenty are negatively correlated to the interest changes. The data of five countries indicate a negative correlation and of five countries a positive correlation when taking only the significant results into account. Thus, the countries which show a negative relation support hypothesis one. It can be seen that the stock returns of countries with a high liberalization and a high stock market development degree are likely to be positively related with the unexpected interest changes and that the returns of less liberalized and less financially developed countries with more financial constraints are more likely to show a negative correlation. Bank-based countries show a more negative relation between stock returns and unexpected interest changes than market-based countries. Interestingly, only the unexpected interest change can explain already more than three percent of the stock return variations in seven countries; in Argentina even more than eight percent. Surprisingly, the stock returns of five countries are significantly positive correlated with unexpected interest rate changes. These countries are all developed countries. The explanations for these unexpected findings can be seen above, under table 12.

Next, I include the control variables by applying equation (7). The Hausman test implies to use fixed effects.[11]

[11] (Chi2 (4) = 70.54, Prob>chi2 = 0.0000)

Table 16: Regression of monthly stock returns against the interest rate change, inflation, change in market value and lagged return for the aggregated data set

Regression	**Sample size**	**Intercept**	$\Delta i_{i,t}^{u}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
All countries	3013	0.0063***	-0.5343***	-0.3376	-0.0809	0.1687***	0.0223
		(7.47)	(-4.57)	(-1.55)	(-1.50)	(3.05)	

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The effect of the unexpected interest change on the stock returns increased with the control variables and is still significant and negative. The lagged returns are positively and the inflation and change in market value are negatively correlated with the stock returns same as derived in chapter five. These results support hypothesis one.

In order to test the second hypothesis, whether the returns react more sensitive to unexpected interest rate changes during recessions than during expansions, I divide the sample in recessions and expansions. The results of the Hausman test indicate to use fixed effects for the regression of expansion data[12] and random effects for recession data.[13]

Table 17: Regressions of monthly stock returns against the interest rate change for the aggregated data set during expansions and recessions

	Expansion				**Recession**			
Regression	**Sample size**	**Intercept**	$\Delta i_{i,t}^{u}$	**R^2 (overall)**	**Sample size**	**Intercept**	$\Delta i_{i,t}^{u}$	**R^2 (overall)**
All countries	2000	0.0128***	0.0602	0.0000	1091	-0.0058	-0.4058***	0.0185
		(111.46)	(0.81)			(-1.46)	(-3.56)	
$\Delta i_{recession}^{u} - \Delta i_{expansion}^{u}$		-0.4660***						
		(-6.92)						

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The interest rate change coefficient is more negative for recessive periods which supports the second hypothesis. This is due to the fact that firms face more financial constraints during recessions than during expansions and therefore are more affected by unexpected interest changes. The coefficient for expansive periods is positive but insignificant. However, the 95%

[12] (Chi2 (1) = 5.68, Prob>chi2 = 0.0171)
[13] (Chi2 (1) = 0.01, Prob>chi2 = 0.9346)

confidence intervals support the second hypothesis. It lies between -0.0697 and 0.1902 for expansions and between -0.5818 and -0.2298 for recessions which is more negative. I test whether the interest change coefficients are significantly different from each other, i.e. the null hypothesis: $H_0: \beta_{expansion} = \beta_{recession}$. The results indicate that the regression coefficients are significantly different from each other. The interest change coefficient might be positive during expansions because naturally monthly stock returns are positive during economic expansions and central banks rather increase interest rates due to the economic upswing and hence inflation pressure. There is not such a large necessity to boost the economy by decreasing interest rates during expansions. Thus, interest changes and stock returns are likely to move in the same direction.

Moreover, I include control variables by applying equation (7). The Hausman test suggests using fixed effects for expansions[14] and for recessions.[15]

Table 18: Regressions of monthly stock returns against the interest rate change, inflation, change market value and lagged return for the aggregated data set during expansions and recessions

Regression	**Sample size**	**Intercept**	$\Delta i^u_{i,t}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
All countries, expansion	1940	0.0136***	-0.3048**	-0.6553**	-0.0486	0.1047	0.0100
		(12.69)	(-2.30)	(-2.36)	(-0.67)	(1.07)	
All countries, recession	1046	-0.0051***	-0.6705***	-0.0380	-0.1264*	0.1792***	0.0283
		(-5.34)	(-9.20)	(-0.15)	(-2.05)	(3.13)	

$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

In this setup, the interest rate change coefficient is for the expansive months as well as for the recessive months significant and negative. It is more negative during recessions which supports hypothesis two and negative which is consistent with hypothesis one. The results illustrate that stock returns respond more sensitive to unexpected interest rate changes during recessions than during expansions. Firms are more affected in recessions due to the fact that they face more financial constraints and problems to raise internal funds. Hence it is more difficult for them during recessions to substitute bonds and loans. Additionally, table 17 and

[14] (Chi2 (4) = 113.32, Prob>chi2 = 0.0000)
[15] (Chi2 (4) = 13.92, Prob>chi2 = 0.0075)

18 show that interest changes can explain more of the stock return variations during recessions, i.e. a higher R^2. The inflation and change in market value are negatively related to the returns and the lagged returns positively related during expansions and recessions which is consistent with my expectations in chapter five.

To test hypothesis three, whether monetary policy effects on stock returns are greater in bank-based than in market-based countries, I divide the data set in bank-based and market-based economies according to the classification of chapter four and run equation (5) and (6) again. The Hausman test indicates to use random effects for market-based[16] and bank-based economies[17] without control variables and fixed effects for market-based[18] and bank-based economies[19] with control variables.

Table 19: Regressions of monthly stock returns against the interest rate change, inflation, change market value and lagged return for market- and bank-based countries

Regression	**Sample size**	**Intercept**	$\Delta i^u_{i,t}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
Market-based countries	1714	0.0062*** (2.66)	-0.0928*** (-10.29)	-	-	-	0.0017
Bank-based countries	1404	0.0056* (1.84)	-0.5954*** (-5.64)	-	-	-	0.0183
Market-based countries	1624	0.0069*** (4.26)	-0.3665 (-0.45)	-0.6642 (-1.42)	0.0549 (1.18)	0.0076 (0.16)	0.0056
Bank-based countries	1389	0.0060*** (8.15)	-0.5341*** (-4.39)	-0.2023 (-1.10)	-0.1220** (-2.34)	0.2378*** (4.32)	0.0428
$\Delta i^u_{market-b} - \Delta i^u_{bank-b}$ **(without control var.)**		0.5026*** (4.95)					

$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

It shows support for the third hypothesis because the effect of an unexpected interest rate change on the stock returns is greater in bank-based countries without and with control variables. Firms in bank-based countries raise their funds mainly through bank loans and are

[16] (Chi2 (1) = 2.90, Prob>chi2 = 0.0888)
[17] (Chi2 (1) = 0.00, Prob>chi2 = 0.9443)
[18] (Chi2 (4) = 11.22, Prob>chi2 = 0.0242)
[19] (Chi2 (4) = 37.42, Prob>chi2 = 0.0000)

more affected by a monetary policy change because a restrictive monetary policy will lead to a decline in the availability of bank loans and will make loans more expensive. Firms in market-based countries are more able to mitigate the lower availability of loans with other sources and are therefore less affected. The interest rate change alone can explain 1.83% of the return variations in bank-based countries. I test for the difference of the coefficients and the results indicate that the regression coefficients are significantly different from each other (z-value = 4.95).

Next, I include the economic condition without and with control variables. The Hausman test indicates to use random effects for market-based[20] and bank-based countries[21] in an expansion without control variables, random effects for market-based[22] and bank-based countries[23] in a recession without control variables, fixed (random) effects for market-based countries in an expansion[24] (recession)[25] with control variables and fixed effects for bank-based countries in an expansion[26] as well as recession[27] with control variables.

[20] (Chi2 (1) = 3.24, Prob>chi2 = 0.0720)
[21] (Chi2 (1) = 3.67, Prob>chi2 = 0.0555)
[22] (Chi2 (1) = 0.24, Prob>chi2 = 0.6219)
[23] (Chi2 (1) = 0.37, Prob>chi2 = 0.5418)
[24] (Chi2 (4) = 58.66, Prob>chi2 = 0.0000)
[25] (Chi2 (1) = 9.39, Prob>chi2 = 0.0520)
[26] (Chi2 (4) = 20.50, Prob>chi2 = 0.0004)
[27] (Chi2 (4) = 27.74, Prob>chi2 = 0.0000)

Table 20: Regressions of monthly stock returns against the interest rate change, inflation, change market value and lagged return for market- and bank-based countries during expansions and recessions

Regression		**Sample size**	**Intercept**	$\Delta i^u_{i,t}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
Market-based countries	Expansion	1103	0.0159*** (4.55)	0.1070*** (6.69)	-	-	-	0.0011
	Recession	611	-0.0104*** (-2.86)	-0.3019*** (-12.36)	-	-	-	0.0139
Bank-based countries	Expansion	897	0.0096*** (3.93)	-0.3115** (-2.39)	-	-	-	0.0036
	Recession	480	0.0023 (0.30)	-0.7235*** (-18.86)	-	-	-	0.0350
Market-based countries	Expansion	1056	0.0166*** (10.66)	-1.4060 (-1.53)	-0.7890 (-1.43)	0.0597 (1.32)	-0.0778 (-1.24)	0.0038
	Recession	568	-0.0113*** (-4.23)	-0.6113 (-0.49)	-0.0530 (-0.09)	0.0589 (0.58)	-0.0126 (-0.14)	0.0040
Bank-based countries	Expansion	884	0.0101*** (7.77)	-0.2602* (-1.91)	-0.5548* (-1.94)	-0.0742 (-0.95)	0.1818 (1.60)	0.0257
	Recession	478	0.0011 (0.97)	-0.6595*** (-12.94)	0.1050 (0.43)	-0.1992*** (-3.66)	0.2873*** (5.16)	0.0631
$\Delta i^u_{market-b,rec} - \Delta i^u_{bank-b,rec}$ (without control variables)			0.4216*** (10.28)					

$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The setup without control variables supports hypotheses one, two and three. The significant interest rate change coefficients are negative, more negative for recessive periods and more negative for bank-based countries. The 95% confidence interval of market-based countries during expansions lies between -0.0263 and 0.2403. Thus, even the smallest value of the 95% confidence interval is less negative than the significant coefficient of the market-based countries during recessions (-0.3019) and of the bank-based countries during expansions (-0.3115) which is consistent with the second and third hypotheses. When including control variables, the results mostly evidence the first, second and third hypotheses. However, the coefficients for expansive months with control variables are contrary to hypothesis three. In market-based countries during expansions, the mean of the returns is higher (0.0152) and of the interest changes lower (-0.0023) compared to bank-based countries (0.0098 and -0.0007). This gives a more negative relation in market-based economies during expansions. The

returns in market-based countries are higher than in bank-based countries during expansions. At the same time the unexpected interest changes are lower in market-based countries. Interestingly, the change in market value and lagged returns are significant in bank-based but not in market-based countries. Market-based countries have a more advanced and better developed stock market and therefore simple measures such as the market value change or the lagged returns seem to influence stock returns not significantly. I test for the difference of the coefficients for market- and bank-based countries in a recession and the results indicate that the regression coefficients are significantly different from each other (z-value = 10.28). The response of the stock returns to unexpected interest changes in market-based countries during expansions with control variables is especially low, i.e. more negative than in bank-based countries. That result is kind of unexpected and can be explained by the observation that the average monthly returns are higher in market-based countries during expansions with an on average lower unexpected interest change than in bank-based countries. That leads to the high negative correlation.

To test hypothesis four, whether stock returns in countries with a high liberalization degree respond less sensitive to unanticipated interest rate changes than in countries with a lower liberalization degree, I divide the data set in a low, medium and high liberalization degree according to the classification of chapter four and run equation (6) and (7) again. The Hausman test indicates to use random effects for a low[28], medium[29] and high liberalization degree[30] without control variables, random effects for a low[31] and medium liberalization degree[32] with control variables and fixed effects for a high liberalization degree[33] with control variables.

[28] (Chi2 (1) = 0.29, Prob>chi2 = 0.5884)
[29] (Chi2 (1) = 0.05, Prob>chi2 = 0.8228)
[30] (Chi2 (1) = 0.14, Prob>chi2 = 0.7090)
[31] (Chi2 (4) = 0.18, Prob>chi2 = 0.9962)
[32] (Chi2 (4) = 1.34, Prob>chi2 = 0.8551)
[33] (Chi2 (4) = 24.21, Prob>chi2 = 0.0001)

Table 21: Regressions of monthly stock returns against the interest rate change, inflation, change market value and lagged return for countries with a low, medium and high liberalization degree

Regression	Sample size	Intercept	$\Delta i^u_{i,t}$	Inflation	Change market value	Lagged returns	R^2 (overall)
Low liberalization	466	0.0133***	-0.0854***	-	-	-	0.0025
		(7.19)	(-12.62)				
Medium liberalization	1092	0.0111***	-0.6934***	-	-	-	0.0271
		(7.33)	(-13.27)				
High liberalization	1560	5.78e-06	0.0302	-	-	-	0.0000
		(0.00)	(0.14)				
Low liberalization	376	0.0198***	-2.0275***	-1.6309***	-0.1627	0.1930	0.0371
		(5.73)	(-2.60)	(-9.28)	(-0.40)	(0.47)	
Medium liberalization	1092	0.0098***	-0.6524***	0.0930	-0.0464	0.1469***	0.0387
		(6.29)	(-15.45)	(0.58)	(-0.86)	(3.55)	
High liberalization	1545	0.0006	0.0933	-0.2844	-0.1083	0.1989*	0.0178
		(0.83)	(0.51)	(-0.98)	(-1.28)	(2.18)	
$\Delta i^u_{low} - \Delta i^u_{medium}$ **(without control variables)**		0.6080***					
		(11.84)					

$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The results are mostly consistent with hypothesis four. An unexpected interest rate increase is associated with a greater decrease of the stock returns in countries with a medium liberalization degree than in countries with a low liberalization degree when running the regressions without control variables. This is contrary to the fourth hypothesis. However, the interest change coefficient for a high liberalization degree is insignificant but the 95% confidence interval lies between -0.4219 and 0.4823 which is less negative than the interest change coefficient for medium liberalization. This supports hypothesis four. Furthermore, when including the control variables, the returns are stronger affected by an interest change in a low liberalization than in a medium liberalization environment and the 95% confidence interval for a high liberalization lies between -0.3539 and 0.5404 which is less negative than the interest change coefficient for a medium liberalization environment. This gives additional support for the fourth hypothesis. The only interest change coefficient, which is contrary to hypothesis four, is the coefficient for countries with a low liberalization degree without control variables. This coefficient should be more negative. I test for the difference of the coefficients for countries with a low and medium liberalization degree and the results indicate

that the regression coefficients are significantly different from each other (z-value = 11.84). Hence, stock returns react more sensitive to unexpected interest changes the lower the countries' liberalization degree.

Further, I include the economic condition without and with control variables by using fixed effects.

Table 22: Regressions of monthly stock returns against the interest rate change, inflation, change in market value and lagged return for countries with a low, medium and high liberalization degree during expansions and recessions

Regression		**Sample size**	**Intercept**	$\Delta i^u_{i,t}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
Low liberalization	Expansion	281	0.0299*** (370.64)	0.1298*** (13.04)	-	-	-	0.0060
	Recession	185	-0.0112*** (-646.85)	-0.3002*** (-161.68)	-	-	-	0.0296
Medium liberalization	Expansion	682	0.0148*** (75.58)	-0.4461** (-3.28)	-	-	-	0.0073
	Recession	383	0.0067*** (104.96)	-0.7301*** (-11.51)	-	-	-	0.0426
High liberalization	Expansion	1037	0.0066*** (2105.97)	-0.0424* (-2.01)	-	-	-	0.0000
	Recession	523	-0.0130*** (-27.37)	0.1145 (0.20)	-	-	-	0.0001
Low liberalization	Expansion	234	0.0368*** (23.91)	-2.4786 (-2.19)	-1.6123** (-4.96)	-0.1268 (-1.57)	0.1306 (1.06)	0.0433
	Recession	142	-0.0118 (-1.14)	-2.8070 (-1.93)	-2.0219* (-3.72)	0.1419 (0.24)	-0.2396 (-0.45)	0.0602
Medium liberalization	Expansion	682	0.0138*** (7.68)	-0.4142*** (-3.74)	-0.1184 (-0.34)	0.0606 (0.77)	0.0164 (0.16)	0.0154
	Recession	383	0.0065*** (4.33)	-0.6900*** (-13.51)	0.2034 (0.76)	-0.1398** (-2.83)	0.2217** (3.44)	0.0610
High liberalization	Expansion	1024	0.0074*** (16.43)	0.0393 (0.94)	-0.6646** (-2.55)	-0.1074 (-1.47)	0.1476 (1.12)	0.0160
	Recession	521	-0.0116*** (-9.90)	0.1466 (0.30)	0.1964 (0.45)	-0.1233 (-0.88)	0.2034* (1.83)	0.0156
$\Delta i^u_{low,exp} - \Delta i^u_{medium,exp}$ **(without control variables)**			0.5759*** (4.33)					
$\Delta i^u_{low,rec} - \Delta i^u_{medium,rec}$ **(without control variables)**			0.4299*** (6.94)					

$R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i^u_{i,t} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

Table 22 shows evidence for the first, second and fourth hypothesis. The interest change coefficient is more negative for recessive periods in most cases which supports hypothesis two. The results without control variables are mostly in accordance with the fourth

hypothesis. Since one interest change coefficient of a high liberalization is insignificant, I look at the lowest value of the 95% confidence interval. The value for expansions (-0.4932) and for recessions (-0.9919) are less negative than of a medium liberalization environment (-0.8645 and -1.0906) which proves hypothesis four. Moreover, by incorporating the control variables, the results exactly comply with hypothesis four, i.e. the lower the liberalization degree the more sensitive stock returns respond to unexpected interest rate changes for both expansions and recessions. Since the interest change coefficients of a high liberalization are insignificant, I compare the lowest value of the 95% confidence interval for expansions (-0.8346) and recessions (-1.0575) in a medium liberalization environment with the high liberalization countries (-0.4017 and -0.9600). This proves the fourth hypothesis because the returns respond more sensitive to unanticipated interest changes in countries with a medium liberalization degree than in countries with a high degree. Three interest change coefficients for a high liberalization environment are insignificant and three out of four are positive. The interest rate change can always explain more over the total stock return variations in recessions, i.e. a higher R^2. I test for the difference of the coefficients for countries with a low and medium liberalization degree for expansions and recessions and the results indicate that the regression coefficients are significantly different from each other (t-value = 4.33 for expansions and t-value = 6.94 for recessions).

In order to test hypothesis five, whether stock returns in countries with a high stock market development degree respond less sensitive to unanticipated interest rate changes than in countries with a lower stock market development degree, I divide the data set in a low, medium and high development degree according to the classification of chapter four and run equation (6) and (7) again. The Hausman test indicates to use random effects for a low[34], medium[35] and high[36] stock market development degree without control variables, random effects for a low development degree with control variables[37] and fixed effects for a medium[38] and high development degree[39] with control variables.

[34] (Chi2 (1) = 0.20, Prob>chi2 = 0.6583)
[35] (Chi2 (1) = 0.03, Prob>chi2 = 0.8537)
[36] (Chi2 (1) = 1.06, Prob>chi2 = 0.3041)
[37] (Chi2 (4) = 3.04, Prob>chi2 = 0.5516)
[38] (Chi2 (4) = 47.79, Prob>chi2 = 0.0000)
[39] (Chi2 (4) = 9.88, Prob>chi2 = 0.0426)

Table 23: Regressions of monthly stock returns against the interest rate change, inflation, change in market value and lagged return for countries with a low, medium and high stock market development degree

Regression	**Sample size**	**Intercept**	$\Delta i_{i,t}^{u}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
Low development	934	0.0114***	-0.2029	-	-	-	0.0108
		(4.54)	(-1.48)				
Medium development	1092	0.0049	-0.1021	-	-	-	0.0001
		(1.30)	(-0.70)				
High development	1092	0.0026	1.8905	-	-	-	0.0026
		(1.59)	(0.87)				
Low development	887	0.0100***	-0.6927***	-0.0015	-0.0394	0.1371***	0.0465
		(3.14)	(-12.08)	(-0.01)	(-0.65)	(2.64)	
Medium development	1077	0.0073***	0.0203	-0.7206*	-0.1733**	0.2629***	0.0238
		(5.19)	(0.14)	(-1.94)	(-2.80)	(4.13)	
High development	1049	0.0032	2.8556	-0.6224	0.0929***	-0.0327	0.0105
		(1.88)	(1.17)	(-1.07)	(4.91)	(-1.17)	
$\Delta i_{low}^{u} - \Delta i_{high}^{u}$ **(without control var.)**		-2.0934 (-0.97)					

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The results without control variables show evidence for the fifth hypothesis, i.e. the interest change coefficients are more negative related with the stock returns the lower the stock market development degree. The stock returns respond more to unexpected interest changes in countries with a low development degree. Moreover, stock returns of countries with a low development degree react highly negative to unexpected interest changes when including the control variables. The fact that the 95% confidence interval for the medium development with control variables lies between -0.4975 and 0.5381 provides evidence for the fifth hypothesis because it is less negative than the 1% significant interest change coefficient of the low development with control variables. I test for the difference of the coefficients for countries with a low and high development degree and the results indicate that the regression coefficients are not significantly different from each other (z-value = -0.97). The unexpected interest change coefficients for countries with a high stock market development degree are positive because these countries show low monthly returns (mean = 0.0020) and at the same time only slightly negative unexpected interest changes (mean = -0.0003). On the other hand, countries with a low stock market development degree show higher monthly returns (mean =

0.0124) and more negative unanticipated interest rate changes (mean = -0.0045). Thus, returns and interest changes of countries with a low stock market development degree can move more in the opposite direction than of countries with a high development degree, where returns and unexpected interest changes are nearly zero. In countries with a high development degree, the unexpected interest changes are so small that interest cuts (raises) do not increase (decrease) stock returns. Investors do not change their trading because of these small unexpected interest rate changes. Furthermore, firms in countries with a high stock market development degree face low financial constraints. Hence, they react less to unexpected monetary policy changes because they can replace bonds and loans with other financial instruments. Firms are not influenced by unexpected interest changes to a large extent because they face low financial constraints and investors also do not response much to the unexpected interest changes because the changes are so small in the developed countries. Thus, stock returns and unexpected interest changes are positively correlated, i.e. a surprise interest decline does not lead to increasing stock returns and a surprise interest rise does not result in decreasing returns. The returns simply follow the economic and firm conditions, independently of the unexpected policy changes.

Furthermore, I include the economic condition without and with control variables by using fixed effects.

Table 24: Regressions of monthly stock returns against the interest rate change, inflation, change in market value and lagged return for countries with a low, medium and high stock market development degree during expansions and recessions

Regression		**Sample size**	**Intercept**	$\Delta i_{i,t}^{u}$	**Inflation**	**Change market value**	**Lagged returns**	**R^2 (overall)**
Low development	Expansion	575	0.0174***	0.0748	-	-	-	0.0004
			(45.78)	(1.02)				
nt	Recession	332	0.0045***	-0.4193**	-	-	-	0.0412
			(8.76)	(-3.22)				
Medium development	Expansion	690	0.0126***	-0.0748	-	-	-	0.0002
			(4217.28)	(-1.03)				
nt	Recession	402	-0.0085***	-0.0731	-	-	-	0.0003
			(-31.99)	(-0.13)				
High development	Expansion	735	0.0090***	-3.8169	-	-	-	0.0101
			(39.96)	(-1.75)				
nt	Recession	357	-0.0105***	3.8578	-	-	-	0.0114
			(-7.05)	(1.86)				
Low development	Expansion	550	0.0149***	-0.4328**	-0.1989	0.0601	0.0177	0.0187
			(6.14)	(-3.54)	(-0.50)	(0.76)	(0.16)	
nt	Recession	310	0.0061**	-0.7551***	0.0701	-0.1342*	0.1986*	0.0707
			(3.93)	(-9.60)	(0.24)	(-2.13)	(2.30)	
Medium development	Expansion	677	0.0156***	0.0518	-1.2637***	-0.1757***	0.2565**	0.0351
			(12.14)	(0.69)	(-3.73)	(-6.25)	(3.65)	
nt	Recession	400	-0.0073**	-0.0286	0.0656	-0.1505	0.1807	0.0095
			(-3.22)	(-0.05)	(0.10)	(-1.12)	(1.71)	
High development	Expansion	713	0.0097***	-4.2243	-0.1980	0.0881*	-0.1562*	0.0126
			(7.92)	(-1.56)	(-0.49)	(2.36)	(-2.16)	
nt	Recession	336	-0.0078**	4.0733	-1.1530	0.0881	-0.0009	0.0202
			(-2.54)	(1.70)	(-1.54)	(0.65)	(-0.01)	
$\Delta i_{low,exp}^{u} - \Delta i_{high,exp}^{u}$ **(without control variables)**			3.8917* (1.85)					
$\Delta i_{low,rec}^{u} - \Delta i_{high,rec}^{u}$ **(without control variables)**			-4.2771* (-2.14)					

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The results support hypotheses one and two because the interest change coefficients are negative and more negative during recessions despite a few exceptions. The setup without

control variables provides little evidence for the fifth hypothesis. In addition, the setup with control variables slightly evidences hypothesis five because the interest change coefficients are more negative for countries with a low stock market development degree, although two coefficients are positive. Interestingly, stock returns of countries with a high stock market development level respond highly negative during expansions and highly positive during recessions to unexpected interest changes. The mean of the monthly unexpected interest changes of countries with a high stock market development degree is for both expansions and recessions negative (-0.0001 and -0.0007) but the mean of the stock returns is positive during expansions (0.0094) and negative during recessions (-0.0133). Therefore, the interest rate change coefficient is highly negative for expansions and highly positive for recessions. Central banks tend to decrease interest rates during recessions in order to boost the economy. During the recessive periods, stock returns are likely to be negative and the negative stock returns together with the negative unexpected interest changes result in a positive correlation. The small interest rate cuts during recessions do not increase stock returns in countries with a high stock market development degree. The interest rate decreases do not compensate the weak economic condition and thus stock returns are still negative. During expansions, central banks tend to increase interest rates in order to counteract inflation. This has a negative effect on firms because it makes fundraising more expensive. Therefore, firms' stock returns decrease if there are unexpected interest increases. I test for the difference of the coefficients for countries with a low and high development degree for expansions and recessions and the results indicate that the regression coefficients are significantly different from each other (t-value = 1.85 and t-value = -2.14).

I also verify that my results are consistent when using another control variable and interaction terms. I use the MSCI world index returns instead of the change in market value as a control variable and find support for all hypotheses (see Appendix G). Furthermore, I apply interaction terms for the economic condition and discover evidence for the second hypothesis, i.e. stock returns respond more sensitive to unexpected interest changes during recessions than during expansions (see Appendix H). Moreover, I run all regressions by removing the financial crisis period, i.e. I run the regression for the period from January 1999 until December 2006. This adjustment does not change the findings and the empirical results are very similar.[40]

[40] The results are available upon request.

CHAPTER VII

CONCLUSION

Using cross-country panel data, I document statistically significant evidence of an impact of unexpected interest rate changes on stock returns. This paper shows that stock returns are negatively related to an unexpected interest change which is also true for the most individual countries. This negative relation can be explained by the theory which predicts that lower interest rates lead to higher stock prices because they equal the present value of future expected dividends discounted by the interest rates. Second, I find evidence that stock returns respond more sensitive to unexpected interest changes during recessions than during expansions. Firms face more credit restrictions during recessions due to weaker balance sheets, lower cash flows and less available credits. These credit restrictions and the general low economic activity lead to a higher sensitivity to interest rate increases compared to expansions because of the low credit availability. This finding also supports the credit channels, in particular the balance sheet and cash flow channel. In a recession firms have a lower net worth and cash flows and thus less collateral for lenders. This can lead to rising adverse selection between lenders and borrowers and therefore decreased lending. Additionally, firms face problems to generate internal funds during recessions and have to borrow through banks and financial markets. Then, a negative shock such as an interest rate increase will affect firms and their stock returns more than during expansions. Furthermore, this paper proves that the effect of an interest change on stock returns varies for different country characteristics which indicate diverse financial structures. I find evidence for a higher sensitivity of the stock returns' response to interest changes in bank-based than in market-based economies. The reason behind this is that firms in bank-based countries are especially affected by a tightening monetary policy which decreases the availability of bank loans because they highly depend on bank loans and are unable to compensate the lower supply of bank loans. That also supports the validity of the bank lending channel which states that an expansionary monetary policy increases bank reserves and bank deposits and hence raises the available number of bank loans. The findings show that stock returns react more to interest changes in countries where firms highly depend on bank loans which is consistent with the bank lending channel. Fourth, I find that stock returns in countries with a low liberalization degree react more to unexpected interest changes than in countries with a higher liberalization degree. Financial unconstrained firms react less to an unanticipated interest change because they can use internal funds instead of loans and bonds which get more expensive when interest rates increase and they profit less from lower adverse selection due to an interest rate cut compared to constrained firms. The level of financial constraints is negatively related to the liberalization degree and therefore stock returns in countries with a high liberalization

degree response less to interest changes. Further, firms in countries with a high liberalization level can easily raise funds abroad and therefore are less influenced by a domestic interest change. Fifth, I find evidence that stock returns in countries with a low stock market development degree react more sensitive to unexpected interest rate changes than in countries with a higher stock market development degree. This is due to the negative correlation of the stock market development degree and the financial constraints and due to the fact that firm in countries with a high development degree can substitute bank loans and bonds more easily with stocks and thus are less affected by an interest change.

These findings have implications for existing theories and practioners. The strength of the effect of monetary policy on stock returns depends on country characteristics and their degree across countries. Thus, monetary policy influences stock returns of countries differently and therefore an individual monetary policy of each country is essential in order to perform the right policy which is optimal for the country. This paper shows that not only the strength of the monetary policy influences the magnitude of the stock returns' reaction but also the country characteristics. Hence, the central banks in bank-based countries with a low liberalization degree and a low stock market development degree might use monetary policy instruments such as interest rate changes more carefully and to a smaller extent when stimulating the stock market because interest changes have a larger impact on stock returns and consequently on the overall economy compared to market-based countries with a higher liberalization and stock market development degree. Investors might observe central banks' actions more carefully and can expect more volatile returns, i.e. higher (lower) returns if the central bank decreases (increases) the interest rate than in market-based countries with a higher liberalization and stock market development degree.

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Appendices

Appendix A: Time consistency of the liberalization degree (Mexico, US, Germany)

Year	Kaopen	Country	Category
1999	1.1323	Mexico	Medium
2000	1.1323	Mexico	Medium
2001	1.1323	Mexico	Medium
2002	0.0793	Mexico	Medium
2003	0.0793	Mexico	Medium
2004	1.1323	Mexico	Medium
2005	1.1323	Mexico	Medium
2006	1.1323	Mexico	Medium
2007	1.1323	Mexico	Medium
2008	1.1323	Mexico	Medium
2009	1.1323	Mexico	Medium
2010	1.1323	Mexico	Medium
1999	2.4557	United States	High
2000	2.4557	United States	High
2001	2.4557	United States	High
2002	2.4557	United States	High
2003	2.4557	United States	High
2004	2.4557	United States	High
2005	2.4557	United States	High
2006	2.4557	United States	High
2007	2.4557	United States	High
2008	2.4557	United States	High
2009	2.4557	United States	High
2010	2.4557	United States	High
1999	2.4557	Germany	High
2000	2.4557	Germany	High
2001	2.4557	Germany	High
2002	2.4557	Germany	High
2003	2.4557	Germany	High
2004	2.4557	Germany	High
2005	2.4557	Germany	High
2006	2.4557	Germany	High
2007	2.4557	Germany	High
2008	2.4557	Germany	High
2009	2.4557	Germany	High
2010	2.4557	Germany	High

Countries are categorized as having a low, medium and high liberalization degree according to the KAOPEN index which measures the extent and intensity of capital controls. Countries are classified as high liberalization degree if they rank 1 to 55 of all countries of the KAOPEN index (KAOPEN >= 1.93), medium liberalization degree for rank 56 to 109 (KAOPEN = -1.15 to 1.92) and low liberalization degree for 110 to 165 (KAOPEN < -1.15).

Appendix B: Time consistency of the stock market development degree (market capitalization of listed companies in percent of GDP)

Country Code	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean
DEU	67.206	67.337	56.981	34.443	44.518	43.814	44.148	56.423	63.346	30.575	39.336	43.529	32.894	48.042
FRA	101.306	109.070	87.755	66.594	75.656	75.844	82.316	107.664	107.312	52.699	75.278	75.577	56.571	82.588
TUR	45.131	26.132	24.055	14.603	22.567	25.066	33.446	30.589	44.282	16.147	36.732	41.943	26.042	29.749
GBR	195.064	174.628	147.458	116.399	132.570	128.180	133.205	154.682	136.559	69.913	128.050	137.707	118.720	136.395
USA	178.853	152.585	135.380	104.796	128.649	138.362	135.072	145.900	142.870	82.547	108.483	118.861	104.332	128.976
IND	39.756	31.192	22.421	25.060	45.192	53.750	66.299	86.278	146.856	52.731	86.641	95.936	54.945	62.081
IDN	45.776	16.261	14.338	15.328	23.282	28.520	28.484	38.096	48.978	19.356	33.024	50.900	46.067	31.416
BRA	38.844	35.079	33.642	24.554	42.457	49.769	53.804	65.303	100.322	35.659	71.984	72.120	49.622	51.781
ZAF	197.080	154.241	117.953	166.175	159.164	207.919	228.862	273.949	291.275	179.385	249.043	278.535	209.612	208.707
ESP	69.863	86.883	76.899	67.755	82.169	90.050	84.898	107.016	124.883	59.376	89.098	84.893	69.806	84.122
NZL	48.713	36.561	33.626	33.217	38.106	42.786	38.388	41.033	35.409	18.493	57.133	25.642	44.868	37.998
ITA	60.279	69.598	46.934	39.229	40.597	45.494	44.683	54.813	50.428	22.574	15.031	15.568	19.666	40.376
GRC	153.327	89.085	66.649	47.066	55.403	54.942	60.403	79.585	86.743	26.463	17.045	24.850	11.618	59.475
ARG	29.588	58.433	71.642	101.366	30.037	30.322	33.559	37.246	33.242	16.017	15.931	17.332	9.770	37.268
LKA	10.117	6.577	8.456	9.829	14.358	17.699	23.437	27.483	23.347	10.624	19.333	40.195	32.848	18.793
PER	25.999	19.820	20.642	23.538	26.170	28.849	45.342	64.632	98.555	43.838	54.957	64.987	44.838	43.244
MYS	183.762	124.678	129.341	122.834	152.788	152.314	126.268	144.662	168.257	80.985	126.551	166.329	137.212	139.691
MEX	32.012	21.534	20.296	15.890	17.496	22.630	28.168	36.580	38.393	21.250	38.714	43.886	35.435	28.637
PHL	50.785	32.036	54.448	47.963	28.084	31.682	38.959	55.954	69.111	30.011	47.603	78.822	73.583	49.157
NLD	168.963	166.320	114.368	91.699	90.774	88.321	92.863	115.044	122.222	44.545	68.129	85.354	71.134	101.518

DEU=Germany, FRA=France, TUR=Turkey, GBR=United Kingdom, USA=United States, IND=India, IDN=Indonesia, BRA=Brazil, ZAF=South Africa, ESP=Spain, NZL=New Zealand, ITA=Italy, GRC=Greece, ARG=Argentina, LKA=Sri Lanka, PER=Peru, MYS=Malaysia, MEX=Mexico, PHL=Philippines, NLD=Netherlands

Appendix C: Percentiles for the classification of the stock market development degree

Percentile		Category
6.5773	Min	Low (<= 33% percentile)
38.3897	33%	Medium (> 33% to < 66% percentile)
78.1809	66%	High (>= 66% percentile)
291.2753	Max	

The percentiles are calculated based on the data of all 20 countries from 1999 to 2011. The countries are classified as having a low, medium or high stock market development degree depending on the mean of a country. A country is classified as having a low stock market development degree if its mean is smaller or equal to the 33% percentile (i.e. <= 38.3897), as having a medium stock market development if its mean is greater than the 33% percentile and lower than the 66% percentile and as having a high stock market development degree if its mean is greater or equal to the 66% percentile.

Appendix D: Time consistency of the type of financial system based on size (US, Germany, Mexico)

Country Code	Year	Deposit Money Bank Assets / GDP	Stock Market Capitalization / GDP	Bank Assets / Market Capitalization	Mean All Countries	Classification
USA	1999	54.7721	162.0010	0.3381	1.3312	market-based
USA	2000	55.4242	161.4760	0.3432	1.3612	market-based
USA	2001	57.3503	142.9250	0.4013	1.6593	market-based
USA	2002	57.6989	118.6890	0.4861	1.7810	market-based
USA	2003	57.8339	115.0910	0.5025	1.7027	market-based
USA	2004	58.2891	130.5550	0.4465	1.5221	market-based
USA	2005	59.9884	133.6830	0.4487	1.4373	market-based
USA	2006	62.1958	138.1310	0.4503	1.3008	market-based
USA	2007	64.9459	141.9440	0.4575	1.1941	market-based
USA	2008	70.2714	113.9500	0.6167	1.6886	market-based
USA	2009	69.8067	96.8873	0.7205	2.3027	market-based
USA	2010	64.6301	111.8930	0.5776	2.1210	market-based
DEU	1999		58.1581		1.3312	
DEU	2000	147.0000	66.3954	2.2140	1.3612	bank-based
DEU	2001	146.3820	61.3092	2.3876	1.6593	bank-based
DEU	2002	145.0180	45.3707	3.1963	1.7810	bank-based
DEU	2003	143.8660	39.3117	3.6596	1.7027	bank-based
DEU	2004	140.4720	43.6663	3.2169	1.5221	bank-based
DEU	2005	138.1690	43.5667	3.1714	1.4373	bank-based
DEU	2006	133.1660	49.3254	2.6997	1.3008	bank-based
DEU	2007	126.6400	58.4373	2.1671	1.1941	bank-based
DEU	2008	126.4670	46.6612	2.7103	1.6886	bank-based
DEU	2009	133.3190	35.4681	3.7588	2.3027	bank-based
DEU	2010	130.3620	40.5745	3.2129	2.1210	bank-based

The ratio deposit money bank assets over GDP divided by stock market capitalization over GDP measures the size of banks relative to the size of the stock market. This ratio of each country in each year is compared to the mean of all countries in each year. If the ratio is greater than the mean, a country is classified as bank-based and otherwise as market-based.

Appendix D: Time consistency of the type of financial system based on size (US, Germany, Mexico) (continued)

Country Code	Year	Deposit Money Bank Assets / GDP	Stock Market Capitalization / GDP	Bank Assets / Market Capitalization	Mean All Countries	Classification
MEX	1999	35.1210	25.1202	1.3981	1.3312	bank-based
MEX	2000	32.6169	24.4014	1.3367	1.3612	market-based
MEX	2001	31.3882	20.3714	1.5408	1.6593	market-based
MEX	2002	29.2876	17.4262	1.6807	1.7810	market-based
MEX	2003	26.3330	15.2777	1.7236	1.7027	bank-based
MEX	2004	24.8036	18.9309	1.3102	1.5221	market-based
MEX	2005	24.8331	24.4425	1.0160	1.4373	market-based
MEX	2006	26.1950	30.6254	0.8553	1.3008	market-based
MEX	2007	29.2580	35.8185	0.8168	1.1941	market-based
MEX	2008	30.3355	28.6201	1.0599	1.6886	market-based
MEX	2009	33.9947	29.9903	1.1335	2.3027	market-based
MEX	2010	34.0253	39.4648	0.8622	2.1210	market-based

The ratio deposit money bank assets over GDP divided by stock market capitalization over GDP measures the size of banks relative to the size of the stock market. This ratio of each country in each year is compared to the mean of all countries in each year. If the ratio is greater than the mean, a country is classified as bank-based and otherwise as market-based.

Appendix E: Time consistency of the type of financial system based on activity (US, Germany, Mexico)

Country Code	Year	Private Credit By Deposit Money Banks / GDP	Stock Market Total Value Traded / GDP	Private Credit / Total Value Traded	Mean All Countries	Classification
USA	1999	47.6460	170.6630	0.2792	3.5372	market-based
USA	2000	48.6611	255.2700	0.1906	3.4749	market-based
USA	2001	50.9556	300.5940	0.1695	4.3724	market-based
USA	2002	51.3411	258.6830	0.1985	4.3172	market-based
USA	2003	51.7713	186.3010	0.2779	3.6300	market-based
USA	2004	52.9879	148.8630	0.3560	3.2670	market-based
USA	2005	55.0716	163.9880	0.3358	2.6982	market-based
USA	2006	57.3163	207.5110	0.2762	2.2986	market-based
USA	2007	59.4366	272.9680	0.2177	2.1817	market-based
USA	2008	62.5644	383.6590	0.1631	2.2553	market-based
USA	2009	60.9604	401.2330	0.1519	3.1230	market-based
USA	2010	56.4465	268.7770	0.2100	3.9103	market-based
DEU	1999		36.2411		3.5372	
DEU	2000	116.5370	46.8467	2.4876	3.4749	market-based
DEU	2001	117.7170	65.2474	1.8042	4.3724	market-based
DEU	2002	117.4870	67.9651	1.7286	4.3172	market-based
DEU	2003	116.5910	54.1804	2.1519	3.6300	market-based
DEU	2004	113.3840	48.8924	2.3191	3.2670	market-based
DEU	2005	111.6080	57.1095	1.9543	2.6982	market-based
DEU	2006	108.7720	73.2986	1.4840	2.2986	market-based
DEU	2007	104.9210	91.1861	1.1506	2.1817	market-based
DEU	2008	106.5340	92.9307	1.1464	2.2553	market-based
DEU	2009	112.9380	64.0939	1.7621	3.1230	market-based
DEU	2010	107.7010	40.0740	2.6876	3.9103	market-based

The ratio private credit by deposit money banks over GDP divided by stock market total value traded over GDP measures the activity of banks relative to the activity of the stock market. This ratio of each country in each year is compared to the mean of all countries in each year. If the ratio is greater than the mean, a country is classified as bank-based and otherwise as market-based.

Appendix E: Time consistency of the type of financial system based on activity (US, Germany, Mexico) (continued)

Country Code	Year	Private Credit By Deposit Money Banks / GDP	Stock Market Total Value Traded / GDP	Private Credit / Total Value Traded	Mean All Countries	Classification
MEX	1999	19.3207	7.2333	2.6711	3.5372	market-based
MEX	2000	16.6710	7.0371	2.3690	3.4749	market-based
MEX	2001	15.2184	6.9297	2.1961	4.3724	market-based
MEX	2002	14.3730	5.1527	2.7894	4.3172	market-based
MEX	2003	13.4930	3.4463	3.9152	3.6300	bank-based
MEX	2004	12.7585	4.2626	2.9931	3.2670	market-based
MEX	2005	13.2394	5.6946	2.3249	2.6982	market-based
MEX	2006	14.6998	6.9218	2.1237	2.2986	market-based
MEX	2007	16.6664	9.3775	1.7773	2.1817	market-based
MEX	2008	16.9444	10.1108	1.6759	2.2553	market-based
MEX	2009	17.9312	9.4238	1.9027	3.1230	market-based
MEX	2010	17.7245	9.2004	1.9265	3.9103	market-based

The ratio private credit by deposit money banks over GDP divided by stock market total value traded over GDP measures the activity of banks relative to the activity of the stock market. This ratio of each country in each year is compared to the mean of all countries in each year. If the ratio is greater than the mean, a country is classified as bank-based and otherwise as market-based.

Appendix F: Time consistency of the type of financial system based on efficiency (US, Germany, Mexico)

Country Code	Year	Stock Market Total Value Traded / GDP	Bank Overhead Costs / Total Assets	Net Interest Margin	(Overhead Costs / Total Assets) * (Total Value Traded / GDP)	Net Interest Margin * (Total Value Traded / GDP)	Mean All Countries Overhead	Mean All Countries Net Interest Margin	Classification Overhead	Classification Net Int Margin
USA	1999	170.6630	3.4479	3.0888	588.4290	527.1388	104.6228	100.6377	market-based	market-based
USA	2000	255.2700	3.3510	2.9424	855.3996	751.1116	136.2155	148.7009	market-based	market-based
USA	2001	300.5940	3.2872	2.9990	988.1006	901.4784	168.7787	173.8496	market-based	market-based
USA	2002	258.6830	3.2062	3.1053	829.3765	803.2754	135.6980	120.3857	market-based	market-based
USA	2003	186.3010	3.1232	2.9356	581.8497	546.9034	114.1066	99.8721	market-based	market-based
USA	2004	148.8630	2.9643	2.7686	441.2716	412.1466	100.6367	94.2853	market-based	market-based
USA	2005	163.9880	2.9352	2.6972	481.3359	442.3035	103.6893	99.7067	market-based	market-based
USA	2006	207.5110	2.7577	2.4158	572.2427	501.2988	119.6180	128.3742	market-based	market-based
USA	2007	272.9680	2.7381	2.3846	747.4055	650.9058	146.1260	161.1024	market-based	market-based
USA	2008	383.6590	2.6325	2.5301	1009.9785	970.6841	147.1848	159.0145	market-based	market-based
USA	2009	401.2330	2.4715	2.7914	991.6594	1120.0178	127.8504	149.3432	market-based	market-based
USA	2010	268.7770	2.4663	2.7394	662.8928	736.2797	94.8143	112.6278	market-based	market-based
DEU	1999	36.2411	1.5193	1.3004	55.0618	47.1261	104.6228	100.6377	bank-based	bank-based
DEU	2000	46.8467	1.5777	1.2171	73.9077	57.0152	136.2155	148.7009	bank-based	bank-based
DEU	2001	65.2474	1.5808	1.1837	103.1450	77.2340	168.7787	173.8496	bank-based	bank-based
DEU	2002	67.9651	1.4307	1.1954	97.2383	81.2482	135.6980	120.3857	bank-based	bank-based
DEU	2003	54.1804	1.4658	1.1753	79.4182	63.6782	114.1066	99.8721	bank-based	bank-based
DEU	2004	48.8924	1.2363	1.1691	60.4452	57.1616	100.6367	94.2853	bank-based	bank-based
DEU	2005	57.1095	1.1101	1.1703	63.3955	66.8370	103.6893	99.7067	bank-based	bank-based
DEU	2006	73.2986	1.1096	1.1575	81.3299	84.8431	119.6180	128.3742	bank-based	bank-based
DEU	2007	91.1861	1.0146	1.1843	92.5211	107.9881	146.1260	161.1024	bank-based	bank-based
DEU	2008	92.9307	0.8871	1.2728	82.4418	118.2822	147.1848	159.0145	bank-based	bank-based
DEU	2009	64.0939	1.2535	1.3348	80.3423	85.5525	127.8504	149.3432	bank-based	bank-based
DEU	2010	40.0740	1.2625	1.2072	50.5938	48.3765	94.8143	112.6278	bank-based	bank-based

The product of stock market total value traded over GDP and bank overhead costs over total assets and the product of stock market total value traded over GDP and net interest margin measure the efficiency of the stock market and of the banks. These products of each country in each year are compared to the mean of all countries in each year. If the product is greater than the mean, a country is classified as market-based and otherwise as bank-based.

Appendix F: Time consistency of the type of financial system based on efficiency (US, Germany, Mexico) (continued)

Country Code	Year	Stock Market Total Value Traded / GDP	Bank Overhead Costs / Total Assets	Net Interest Margin	(Overhead Costs / Total Assets) * (Total Value Traded / GDP)	Net Interest Margin * (Total Value Traded / GDP)	Mean All Countries Overhead	Mean All Countries Net Interest Margin	Classification Overhead	Classification Net Int Margin
MEX	1999	7.2333	4.9015	5.7397	35.4538	41.5170	104.6228	100.6377	bank-based	bank-based
MEX	2000	7.0371	4.9182	5.9164	34.6094	41.6341	136.2155	148.7009	bank-based	bank-based
MEX	2001	6.9297	4.5194	5.6409	31.3176	39.0894	168.7787	173.8496	bank-based	bank-based
MEX	2002	5.1527	4.4988	4.9745	23.1811	25.6324	135.6980	120.3857	bank-based	bank-based
MEX	2003	3.4463	4.0471	4.5319	13.9475	15.6182	114.1066	99.8721	bank-based	bank-based
MEX	2004	4.2626	4.3869	5.6656	18.6995	24.1502	100.6367	94.2853	bank-based	bank-based
MEX	2005	5.6946	9.3092	6.7009	53.0118	38.1587	103.6893	99.7067	bank-based	bank-based
MEX	2006	6.9218	7.1544	7.6411	49.5212	52.8903	119.6180	128.3742	bank-based	bank-based
MEX	2007	9.3775	3.1018	6.0784	29.0870	57.0007	146.1260	161.1024	bank-based	bank-based
MEX	2008	10.1108	3.5428	5.3307	35.8209	53.8978	147.1848	159.0145	bank-based	bank-based
MEX	2009	9.4238	3.8248	5.2008	36.0439	49.0110	127.8504	149.3432	bank-based	bank-based
MEX	2010	9.2004	2.8083	5.1856	25.8375	47.7096	94.8143	112.6278	bank-based	bank-based

The product of stock market total value traded over GDP and bank overhead costs over total assets and the product of stock market total value traded over GDP and net interest margin measure the efficiency of the stock market and of the banks. These products of each country in each year are compared to the mean of all countries in each year. If the product is greater than the mean, a country is classified as market-based and otherwise as bank-based.

Appendix G: Regressions of monthly stock returns against the interest rate change, inflation, MSCI returns and lagged returns

Regression	Sample size	Intercept	$\Delta i_{i,t}^{u}$	Inflation	MSCI returns	Lagged returns	R^2 (overall)
All countries	3071	0.0064***	-0.5429***	-0.3611	0.8577***	0.0301*	0.4049
		(7.05)	(-6.30)	(-1.49)	(15.68)	(1.78)	
Expansion	1975	0.0081***	-0.3280***	-0.6055*	0.8247***	0.0551**	0.3187
		(7.64)	(-3.16)	(-1.80)	(16.90)	(2.14)	
Recession	1069	0.0035***	-0.6588***	-0.0452	0.8773***	-0.0182	0.4755
		(3.72)	(-8.43)	(-0.20)	(14.58)	(-0.87)	
Market-based	1667	0.0078***	-0.4893	-0.7978*	0.8961***	-0.0141	0.4885
		(5.74)	(-0.80)	(-1.87)	(15.46)	(-0.72)	
Bank-based	1404	0.0058***	-0.5416***	-0.1840	0.8139***	0.0705***	0.3351
		(6.39)	(-6.10)	(-0.79)	(8.10)	(3.49)	
Low liberalization	419	0.0188***	-1.2041	-1.5548**	0.9046***	-0.0223	0.3821
		(11.45)	(-1.88)	(-4.57)	(9.99)	(-0.70)	
Medium liberalization	1092	0.0093***	-0.6249***	0.1897	0.7849***	0.0612*	0.3162
		(24.69)	(-14.86)	(1.49)	(6.04)	(1.97)	
High liberalization	1560	0.0013***	-0.1569***	-0.7644***	0.8983***	0.0112	0.5290
		(3.43)	(-5.56)	(-3.92)	(15.46)	(0.55)	
Low development	887	0.0099***	-0.6614***	0.0034	0.7628***	0.0497	0.3040
		(6.99)	(-10.51)	(0.02)	(5.41)	(1.32)	
Medium development	1092	0.0078***	-0.0863	-1.0207**	0.9706***	0.0244	0.4139
		(8.82)	(-0.65)	(-3.66)	(14.35)	(1.57)	
High development	1092	0.0025**	-0.7745	-0.3844	0.8271***	-0.0037	0.5810
		(2.71)	(-0.71)	(-1.40)	(11.88)	(-0.11)	

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \epsilon_{i,t}$ and $R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u} + \beta_2 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

Appendix H: Regressions of monthly stock returns against the interest rate change and two interaction terms without and with control variables

Regression	Sample size	Intercept	$\Delta i_{i,t}^{u}*(Rec_t)$	$\Delta i_{i,t}^{u}*(1-Rec_t)$	Inflation	Change market value	Lagged returns	R^2 (overall)
All countries	3091	0.0061***	-0.3731**	0.0178	-	-	-	0.0087
		(40.49)	(-2.75)	(0.24)				
All countries	2986	0.0066***	-0.6378***	-0.3252**	-0.3643	-0.0802	0.1678***	0.0226
		(7.75)	(-7.00)	(-2.35)	(-1.65)	(-1.46)	(3.02)	

$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u}(Rec_t) + \beta_2 \Delta i_{i,t}^{u}(1 - Rec_t) + \epsilon_{i,t}$ and
$R_{i,t} = \alpha_i + \beta_1 \Delta i_{i,t}^{u}(Rec_t) + \beta_2 \Delta i_{i,t}^{u}(1 - Rec_t) + \beta_3 \sum_{z=1}^{3} CV_{z,t} + \epsilon_{i,t}$; *, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

Biography

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