Master thesis

What is the effect of the Basel III agreement on GDP growth?

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0 Summary

The 2008 financial crisis has been blamed on the 'regulatory failure to guard against excessive risk-taking in the financial system' (Strauss-Kahn, 2008). As a result, the Basel III agreement imposed a new set of even stricter regulatory rules on banks. However, literature shows that the Basel III requirements hamper GDP growth in the short run, while the effect on the long run GDP growth may or may not be positive.

This paper therefore attempts to research the relation between GDP growth and the Basel III agreement, which is measured through the capital buffer, leverage ratio and liquidity ratio. A distinction is made between the short run effects and the long run effects.

From the ordinary least squares analysis follows that GDP growth in the short term is for countries that participate in the Basel III agreement than for countries outside of the agreement. The outcomes for the long run GDP growth are not certain, since the results were ambiguous. After adjusting for differences between growth stages, the results show there is no significant effect of participating in the Basel III agreement on GDP growth in the short run, whereas in the long run there is a significant positive effect.

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1 Introduction

The 2008 financial crisis has been blamed on the 'regulatory failure to guard against excessive risk-taking in the financial system, especially in the US' (Strauss-Kahn, 2008). As a result, the Basel III agreement imposed a new set of even stricter regulatory rules on banks. However, stricter regulation does not only have benefits. It may also be the cause for a new crisis. For instance, Basel II was criticized because it obligated banks to increase their capital when risk rises, which in turn causes the banks to decrease lending when capital is scarce. This would only make the crisis worse (Gordy & Howells, 2006). Also, by agreements such as Basel, regulation of different countries may converge, which increases the market herding. This in turn increases systemic risk (Kaufman & Scott, 2003). On the other hand, the Basel III agreement may increase the resilience against shocks and increase the quality of bank capital (Caruana, 2010).

Next to the theoretical benefits and downsides of stronger regulation, there has also been some empirical research on the macroeconomic effects of Basel III, yet they show different results. For instance, the paper by Fender & Lewrick (2016) suggest that the reforms caused by Basel III will lead to macroeconomic benefits, even while they say to somewhat overestimate the costs. On the other hand, a paper by Slovik & Cournède (2011) suggests that the macroeconomic effect of Basel III is in fact negative, namely a GDP growth of -0.05 to -0.15 percentage point per year.

Until now, there have only been predictions about the macroeconomic effects of the implementation of the Basel III requirements, but there has not yet been a regression analysis. All while the implementation of Basel III is coming to an end and a new accord, Basel IV has been reached, which will be implemented 2027 (Schneider, Schiock, Koch & Schneider, 2017). This is a new set of even stricter regulation, while the impact of the current regulation is still unclear and researches about the impact of Basel III show different findings.

This paper therefore attempts to research the relation between Gross Domestic Product (GDP) growth and the Basel III agreement, which is measured through the capital buffer, leverage ratio and liquidity ratio. A distinction is made between the short run effects and the long run effects. The research question is:

What is the effect of the Basel III agreement on GDP growth for the short run and the long run?

First, in the theoretical framework, an explanation of the Basel III accord is given, followed by the possible effects of the accord on GDP growth in the short run and in the long run. Then, the effects are tested empirically through an ordinary least squares regression in two separate regression, one for the short run and one for the long run. The results implicate that in the short run, countries that participate in the Basel III agreement have a lower economic growth than countries that do not participate in the Basel III agreement. In the long run the results are ambiguous.

There is a possibility that GDP growth differences are caused by different growth stages between the two groups, therefore a robustness test is conducted in which the difference between the geometric mean of the GDP growth of the previous ten years and the GDP growth is taken and used as the dependent variable, instead of GDP growth. Now, the results implicate that participating in the Basel III agreement has no significant effect on GDP growth in the short run. In the long run, the results no longer are ambiguous, instead GDP growth is better for countries that participate in the Basel III agreement.

2 Theoretical framework

One of the core activities of banks is lending money they received from savers to businesses (Lamarque, 1999). Allowing credit comes with the risk of a business that defaults, in which case the bank loses the loaned money and may be unable to repay the savers money. Therefore, the bank should only loan money to businesses that have a low risk at defaulting. In order to ensure the financial health of banks at an international level, the Bank of International Settlements (BIS) was established in 1930.

Despite the by the BIS issued regulations, during the crisis in the seventies, banks were in trouble. As a consequence, the central banks from ten BIS countries created a new committee in 1974 in order to issue new rules and guidelines that would improve the capital position of banks. Since the committee meets in Basel, the official name became Basel Committee on Banking Supervision (BCBS). The committee formulates banking standards and best practices, which may be followed by its participants but may also be adapted to best fit a particular national situation. In 1988 the BCBS issued its first Basel Capital Accord, which included the 8 percent own capital rule over its risk weighted assets (website Basel III).

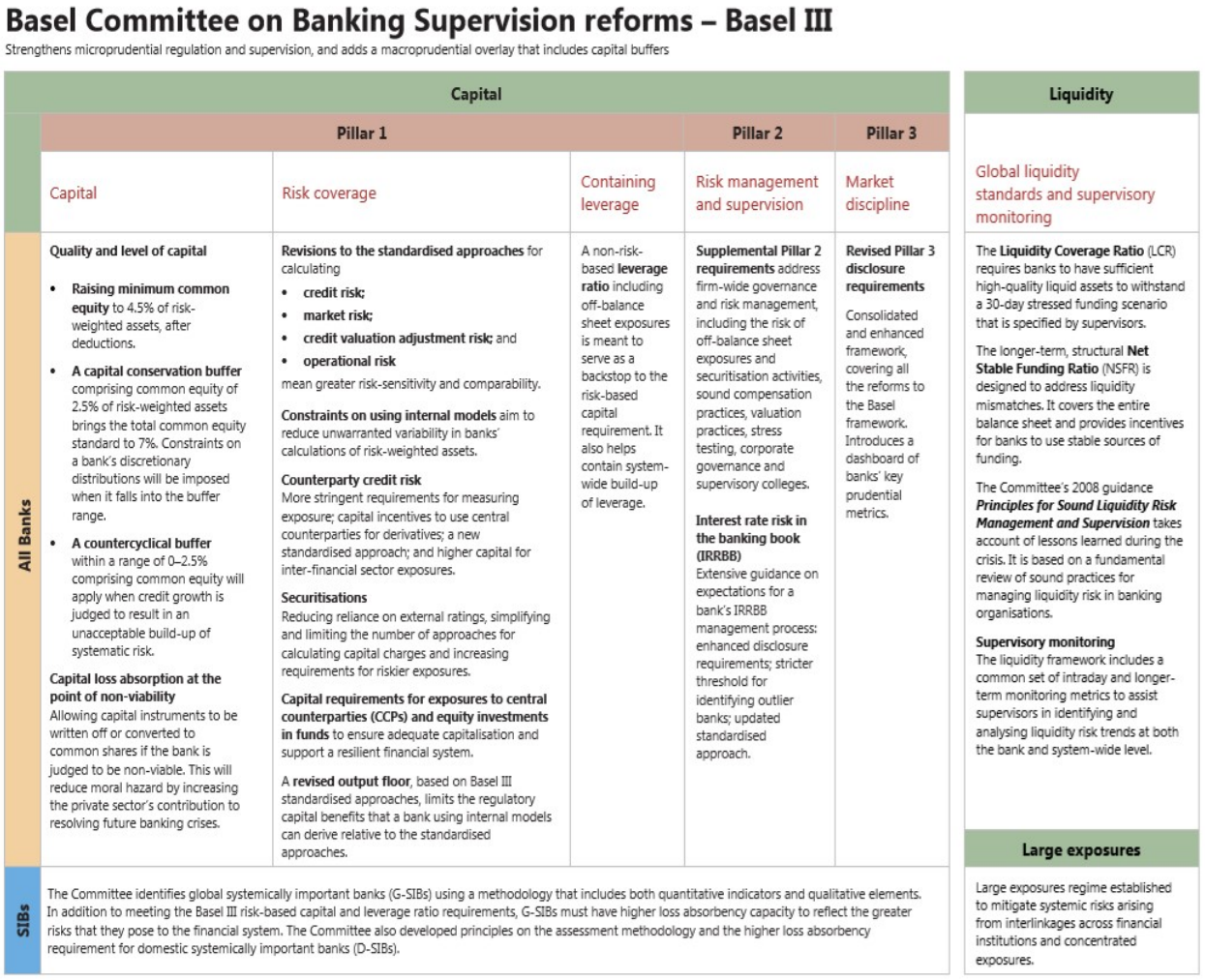
Basel II was created in 1999 to replace Basel I, because Basel I did not take the dynamic part of banking, involving risk, into account. Central banks from thirteen different countries participated. The Basel II accord involved standards and regulations regarding minimum capital requirements, supervision and market forces (website Basel III).

2.1 Basel III

After the credit crisis it became clear that the requirements of the Basel II accord were not enough, therefore in 2009 the Basel Committee created a new set of stricter and broader rules, the Basel III accord. The main goal of the implementation of Basel III is the ‘building of a safer financial system that ensures its resilience to periods of stress’ (Caruana, 2010).

The agreement is expected to have a large effect on the financial systems and economies of the world. Basel III adds multiple rules and regulations to the banks that participate (Elliott, 2010). The Basel III reforms can be divided into three main topics, namely capital, liquidity and exposures. Figure 1 on the next page summarizes the changes that the Basel Committee proposes.

Figure 1: summary of Basel III changes (retrieved from BA, 2019)



Basel Committee on Banking Supervision reforms – Basel III

Strengthens microprudential regulation and supervision, and adds a macroprudential overlay that includes capital buffers

	Capital					Liquidity
	Pillar 1			Pillar 2	Pillar 3	
	Capital	Risk coverage	Containing leverage	Risk management and supervision	Market discipline	Global liquidity standards and supervisory monitoring
All Banks	**Quality and level of capital** • **Raising minimum common equity** to 4.5% of risk-weighted assets, after deductions. • **A capital conservation buffer** comprising common equity of 2.5% of risk-weighted assets brings the total common equity standard to 7%. Constraints on a bank's discretionary distributions will be imposed when it falls into the buffer range. • **A countercyclical buffer** within a range of 0–2.5% comprising common equity will apply when credit growth is judged to result in an unacceptable build-up of systematic risk. **Capital loss absorption at the point of non-viability** Allowing capital instruments to be written off or converted to common shares if the bank is judged to be non-viable. This will reduce moral hazard by increasing the private sector's contribution to resolving future banking crises.	**Revisions to the standardised approaches** for calculating • **credit risk;** • **market risk;** • **credit valuation adjustment risk;** and • **operational risk** mean greater risk-sensitivity and comparability. **Constraints on using internal models** aim to reduce unwarranted variability in banks' calculations of risk-weighted assets. **Counterparty credit risk** More stringent requirements for measuring exposure; capital incentives to use central counterparties for derivatives; a new standardised approach; and higher capital for inter-financial sector exposures. **Securitisations** Reducing reliance on external ratings, simplifying and limiting the number of approaches for calculating capital charges and increasing requirements for riskier exposures. **Capital requirements for exposures to central counterparties (CCPs) and equity investments in funds** to ensure adequate capitalisation and support a resilient financial system. A **revised output floor**, based on Basel III standardised approaches, limits the regulatory capital benefits that a bank using internal models can derive relative to the standardised approaches.	A non-risk-based **leverage ratio** including off-balance sheet exposures is meant to serve as a backstop to the risk-based capital requirement. It also helps contain system-wide build-up of leverage.	**Supplemental Pillar 2 requirements** address firm-wide governance and risk management, including the risk of off-balance sheet exposures and securitisation activities, sound compensation practices, valuation practices, stress testing, corporate governance and supervisory colleges. **Interest rate risk in the banking book (IRRBB)** Extensive guidance on expectations for a bank's IRRBB management process: enhanced disclosure requirements; stricter threshold for identifying outlier banks; updated standardised approach.	**Revised Pillar 3 disclosure requirements** Consolidated and enhanced framework, covering all the reforms to the Basel framework. Introduces a dashboard of banks' key prudential metrics.	The **Liquidity Coverage Ratio** (LCR) requires banks to have sufficient high-quality liquid assets to withstand a 30-day stressed funding scenario that is specified by supervisors. The longer-term, structural **Net Stable Funding Ratio** (NSFR) is designed to address liquidity mismatches. It covers the entire balance sheet and provides incentives for banks to use stable sources of funding. The Committee's 2008 guidance ***Principles for Sound Liquidity Risk Management and Supervision*** takes account of lessons learned during the crisis. It is based on a fundamental review of sound practices for managing liquidity risk in banking organisations. **Supervisory monitoring** The liquidity framework includes a common set of intraday and longer-term monitoring metrics to assist supervisors in identifying and analysing liquidity risk trends at both the bank and system-wide level.
SIBs	The Committee identifies global systemically important banks (G-SIBs) using a methodology that includes both quantitative indicators and qualitative elements. In addition to meeting the Basel III risk-based capital and leverage ratio requirements, G-SIBs must have higher loss absorbency capacity to reflect the greater risks that they pose to the financial system. The Committee also developed principles on the assessment methodology and the higher loss absorbency requirement for domestic systemically important banks (D-SIBs).					**Large exposures** Large exposures regime established to mitigate systemic risks arising from interlinkages across financial institutions and concentrated exposures.

The aim of this paper is to research the effects of the Basel III reforms on GDP growth. Not all above mentioned regulations are suited for researching this relation. For instance, the risk coverage in pillar 1 is mainly about how the risk for the risk-weighted assets capital buffer is calculated. Therefore, it should not be measured on its own; it is expected to be incorporated in the capital buffers of countries that participate in the Basel III agreement. Pillar 2 involves risk management, for instance by stress testing, banks must have enough liquidity for 30 stress days. This phenome is also measured through the liquidity channel, by the Liquidity Coverage Ratio (LCR). The stricter supervision of pillar 2 and the stricter market discipline of pillar 3 are not measurable. Also, the large exposures regime is mainly a theoretical view on the impact of interlinkages and is thereby not something that can be directly measured.

Therefore, this paper will focus on researching the effect of the Basel III reforms on GDP growth through the three channels capital buffer, leverage rate and liquidity rate. A previous study by Slovic & Cournède (2011) on the effect of the Basel III agreement also focused on

these three pillars. Fender & Lewrick (2016) used the required capital for banks in combination with the leverage ratio for this purpose. Below the three channels that are used in this research will be further explained.

Capital buffer

Capital is the broadest topic of the Basel III reforms, which in turn exists of three different pillars. The first pillar of capital is called capital. Capital can be described as the part of the assets a bank holds that has no claim on it; it does not have to be repaid but is the bank's property. It may therefore serve as a buffer, also called a cushion, in case the value of the assets declines or if liabilities rise (Elliott, 2010). Previous Basel agreements already had risk-weighted capital ratio requirements, which is the ratio of a bank's capital divided by its risk-weighted assets. Basel III simply raises those to 4.5% for common equity. However, it also adds a second capital conservation buffer of 2.5%, which totals into a buffer of 7% (Ba, 2019).

Leverage ratio

Risk-weighted asset calculation had failed to predict the rapid fall of asset value during the crisis, therefore the ratio of capital to total assets should provide a safety net, in case the risk-weighted method fails again. The leverage ratio is a different method of accountancy which calculates the capital measure divided by the exposure measure. The minimum requirement is a leverage ratio of 3% (Basel Committee, 2014).

Liquidity ratio

Banks must have enough liquidity for 30 stress days, in other words they must be able to pass a stress scenario test. Also, a net stable funding ratio test was created, which measures liquid assets to liabilities that matured within one year. The liquidity coverage ratio requires banks to have high quality liquid assets, which can be sold quickly without losses, that are equal to or more than the total net cash outflows over the next thirty calendar days. Therefore, the liquidity coverage ratio should equal 100 percent or more (Ba, 2019).

The impact of the Basel III agreement on GDP growth is expected to be different for the short run and the long run. Therefore, this paper will first discuss the possible effects in the short

run based on a literature review and resulting in a hypothesis. Then the effects in the long run will be examined and a hypothesis for the long run effect will be formulated.

2.2 Short term effects of regulation

The short term effects of the Basel III requirements on GDP growth can be found by applying two different economic models, namely the loanable funds framework and the IS-LM model. Both models predict a negative effect of participating in Basel III on GDP growth in the short run. In contrast, some papers predict there will be no significant effect on GDP growth in the short run.

The loanable funds framework

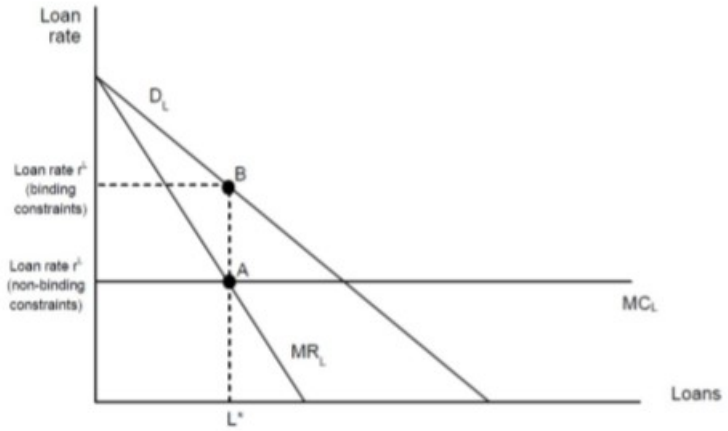
The demand for credit and the supply of deposit funds depend on the economic activity. Therefore, banks are inherently procyclical, which means they magnify the already existing up- and downturns of an economic cycly. Basel III adds to this, because the minimum capital depends on a bank's riskiness, increasing capital requirements during economic downturns. The stricter capital ratios of Basel III may also in the short run lead to a reduction in loan supply and thereby a reduction in total lending (VanHoose, 2008). Basel II was criticized because it obligated banks to increase their capital when risk rises, which in turn causes the banks to decrease lending when capital is scarce (Gordy & Howells, 2006).

The mechanism behind this could be explained through the loanable funds framework, which has the nature of a simultaneous equations model. It explains how banks choose the optimal level of capital, the call option. The model assumes a situation in which banks act oligopolistic, in other words they have some market power. According to the Bertrand competition, banks decide on a loan rate through a coordinated policy, so all banks set the same loan rate. Therefore the banks act as if they were in a monopoly situation, which is why they are able to change the loan rate. An individual bank will not benefit from undercutting the loan rate, because there is a total capital restraint due to the Basel III Accord (Chami & Cosimano, 2010).

In the equilibrium situation, the competitive loan rate equals the marginal costs, see situation A in figure 2. The amount of bank capital is set by the bank, based on its expectation of future optimal amount of loans, which depends on the future demand for loans (Sutorova & Teply,

2013). The marginal costs (MC) are determined by the cost of monitoring and screening loans, the cost of deposits and the interest rate on deposits. The demand for loans is positively affected by the economic activity and negatively affected by the loan interest rate (r).

Figure 2: the optimal level of capital choice (Sutorova & Teply, 2013)



When a binding capital constraint is implemented, the amount of bank capital is no longer set based on this expectation, instead it is based on the minimum capital requirements. As a result, the bank is forced to maintain higher capital buffers than would be optimal for the individual bank. This increases the financing costs of banks, which they in turn incorporate into their loan pricing. This causes the loan rate to shift upward, from point A to point B. An increase in the demand for loans no longer leads to an increase in the amount of loans but only to an increase in the loan rate. In other words, higher capital requirements lead to higher interest rates on loans (Sutorova & Teply, 2013).

The Basel III agreement also leads to a decrease in the money supply, because banks need to hold on to more capital, causing them to extracting money from the market which they otherwise could have loaned out. Higher lending rates thus reduce bank credit and thereby reduce the supply of credit, which leads to an increase in the interest rate. A higher interest rate leads to a lower level of consumption and investment, which decreases the aggregate demand. This in turn hampers GDP growth (Allen, Chan, Milne & Thomas, 2012).

The model above makes one particular assumption that may not be valid. It assumes the loan rate to be elastic, in which case the loan rate would increase based on the argumentation above. However, if the loan rates are not that elastic, raising the capital buffer with that increasing the financing costs for banks may not lead to a significantly higher loan rate, because the loan rate does not respond to such changes that strongly. In that case the loan rate

may not be affected, and the supply curve also does not shift (Sutorova & Teply, 2013). In other words, the stricter capital requirements may not lead to a higher loan rate.

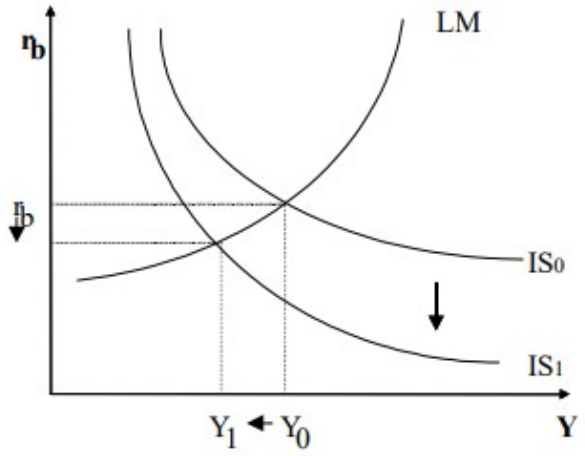
The IS-LM model for capital regulation

The effects of capital regulation can be analysed within the Investment Saving - Liquidity preference Money supply (IS-LM) framework. For the IS curve, the independent variable is the interest rate (r) on the vertical axis, while the dependent variable is income (Y) on the horizontal axis. The IS curve shows the relation between national income and interest rate for all the points in which the goods market is in equilibrium. For the LM curve, the independent variable is income and the dependent variable is interest rate. The LM curve shows all possible points for the relation between interest rate and income for which the money market is in equilibrium.

Tanaka (2002) alters the original IS-LM framework a little, so it can explain the relation between bank capital and lending. A first alteration is that the economy is considered to only have three assets, money deposits, bonds and loans. The general equilibrium now is not only in the money market and the goods market, but also in the loans market. Also, the only money supply consists of the bank's reserves. The demand for money exists of the demand for deposits of households. The LM curve is not affected by this change in assumptions, but the IS curve is. Instead of only depending on the interest rate of bonds, the IS curve now also depends on the interest rate of deposits and loans. This holds the assumption that bonds and deposits are substitutes in saving, while loans and bonds are substitutes in a firms liabilities. For the altered IS curve, a shock that impacts the loan supply, in the case of a given interest rate on bonds, now will shift the IS curve (Tanaka, 2002).

The effect of the capital requirements of the Basel III agreement is an alteration of the interest sensitivity and of the economy's investment relationship, in short, its position of the IS curve. This can be explained by the fact that banks will hold on to bonds as a consequence of the capital requirements of Basel III, and thereby they do not increase loans. As a consequence, the loan supply now is insensitive to monetary expansion, visible in the model as a reduction in r, and therefore the IS curve becomes steeper. This implies that monetary policy becomes ineffective and that GDP decreases (Tanaka, 2002). The effect is visible in figure 3. A decrease in GDP equals a negative GDP growth.

Figure 3: the effect of stricter capital regulation (Tanaka, 2002)



As visible in figure three, a downward shift of the IS curve leads to a new equilibrium between the IS and LM curve in which both the interest rate and the GDP (Y) have decreased compared to the previous situation.

Arguments predicting no significant effect

It is argued that monitoring banks can never be done effectively, because of information asymmetry (Pasiouras, Tanna, Zopounidis, 2009). In this situation, it means banks may not report all information or they may report incorrect information to the Basel Committee. As a result, the regulations of the Basel III agreement may not be implemented as well as the Committee intended. This would have a negative impact on the effectiveness of the Basel III agreement. Also, since countries that participate in the Basel III agreement already have started implementing stricter capital requirements under Basel II, the more extensive Basel III requirements may not have a significant effect on GDP growth in the short run.

According to the loanable funds framework, the Basel III agreement leads to an increase in the interest rate followed by a decrease in GDP growth. The IS-LM model shows that as a consequence of the capital requirements, the position of the IS curve shifts in such a way that the new equilibrium is at a lower GDP level. A decrease in GDP means the GDP growth is negative, because GDP growth is measured as the annual percent change in real GDP. Even though loan elasticity may nullify the first effect, the second IS-LM model still predicts a negative GDP growth. Therefore, the following hypothesis can be made.

Hypothesis 1: GDP growth on the short term will be lower for countries that participate in the Basel III agreement than for countries outside of the agreement.

2.3 Long term effects of regulation

This section discusses the long term effects of participating in the Basel III agreement on GDP growth. Most theories predict a positive effect on GDP growth. There are some negative effects of the Basel III agreement, but these do not influence GDP growth directly.

Resilience

As explained in 2.1, under Basel III banks will need to hold a capital reservation buffer of 2.5 percent common equity, in order to survive stress periods in which they may be unable to attract money. Also, next to the risk-based capital requirements, the non-risk-based leverage ratio will help contain the build-up of excessive leverage. It will serve as a backstop for the 'normal' risk-based capital requirements and it addresses model risk (Caruana, 2010). What Caruana calls a backstop, can be explained as a safety net measure. Risk-weighted asset calculation had failed to predict the rapid fall of asset value during the crisis, therefore the ratio of capital to total assets should provide a safety net, in case the risk-weighted method fails again. The leverage ratio is a different method of accountancy which calculates the capital measure divided by the exposure measure. Using a different accountancy method reduces the model risk, which is the possibility that the way the model calculates is faulty.

Both these measures will engineer a better resilience against external shocks, by having a better resistance to shocks and by returning to the pre-shock state quicker. The mainstream idea is that an economy in itself is self-equilibrating; it will always return to the pre-shock equilibrium. This may take a while, which leads to real GDP drops in the short run (Martin, 2011). However, sometimes there are factors that have a permanent effect on economic growth, which is why resilience against shocks is important; otherwise long-term GDP growth will be harmed (Dutt & Ros, 2007).

Factors positively influencing long run GDP growth

As explained in 2.2, banks are inherently procyclical. The Basel III agreement could reduce some of that procyclicality, because it stimulates banks to save up money in good times, that can serve as a buffer and be used during bad times, due to its common equity requirement of 7

percent. Also, a countercyclical capital buffer is implemented, which would reduce risk by the possibility of releasing that buffer on a downturn of the cycle Due to stricter capital requirements, the quality of capital will increase. Banks have to increase their common equity capital in order to meet the new requirements. This leads to an improvement in the loss-absorbing capacity of banks, which means the buffers that banks build up are enough to keep them from having to be rescued by government during bad times (Caruana, 2010).

Both the reduction of internal system risk and the increase in quality of capital cause the quality of the financial services increases. The paper by Rioja and Valev (2007) found that financial development has a positive influence on productivity growth in more developed countries. In contrast, in low-income countries finance has a positive effect on productivity growth through the accumulation of capital and not through the financial development. The countries that participate in the Basel III agreement are more developed countries, therefore an increase in the financial development leads to an increase in productivity growth. An increase in productivity growth in this case means banks will become more efficient and are able to provide more services for the same price, leading to a higher revenue. Higher revenues in turn lead to a higher GDP and have a positive effect on GDP growth.

External factors

By agreements such as Basel, regulations regarding the supply of money of different countries converge, which increases market herding. This means countries will use equal guidelines and requirements, which makes them vulnerable to threads outside of the model. This is considered an increase in systemic risk (Kaufman & Scott, 2003). Also, due to the Basel III agreement, financial institutions that become more interconnected may cause the risk-sharing mechanism to backfire and instead turn into a contagion transmission network (Kubinschi & Barnea, 2016). In other words, when one country may be negatively affected by an external shock, this effect carries through to other countries that participate in the Basel III agreement, because they are part of the same system.

The risks of herding and contagion do not have a direct effect on GDP or GDP growth, because they do not impact the efficiency of the financial services. Therefore these effects fall outside of the scope of this research.

In conclusion, if the effect of the Basel III agreement is thought of as a change in productivity of financial services, the effect on GDP growth would be positive. The Basel III requirements cause banks to make substantial differences regarding the way they provide their services, by being discouraged in loaning out money to risky borrowers and by having to maintain a financial buffer that can be used during bad times. I believe these alterations do not have a temporary nature, but in fact lead to financial development, which leads to an increase in productivity growth. An increase in productivity growth means banks will become more efficient and are able to provide more services for the same price, leading to a higher revenue and a higher GDP. Therefore the hypothesis for the long run is the following:

Hypothesis 2: In the long run, countries that participate in the Basel III agreement are expected to have a higher GDP growth than countries that do not participate.

3 Methodology

In order to test the hypothesizes, countries that participate in the Basel III agreement will be compared to industrialized countries that did not participate. The countries that participate in the Basel III agreement can be found in appendix 1; List of Basel Accord Countries, 2016.

The list of countries that are industrialized and did not participate in the Basel III agreement and for which data is available at the Worldbank can be found in appendix 2.

An ordinary least squares regression will be conducted in order to measure the relation between Basel III and GDP growth. Time series would limit the scale on which the research could be conducted. Therefore Gross Domestic Product (GDP) growth is used as the dependent variable, since it does not depend on the GDP growth level of the previous year and therefore the regression does not have to be a time series, as would have been the case if Gross Domestic Product were used as the dependent variable.

3.1 Data

All data that is used is retrieved from the website of the world bank. Appendix 3 contains the specific information about which data was used. Missings in the dataset were handled by filling in the average of that variable.

3.2 Short run and long run effects

Based on the literature, the expectation is that GDP growth on the short term will be lower for countries that participate in the Basel III agreement than for countries outside of the agreement. In the long run, countries that participate in the Basel III agreement are expected to have a higher GDP growth than countries that do not participate.

The division between short and long run will be made by splitting the data in half, where the first four years are combined to research the short run effects. The remaining five years are combined to research the effects on the long run. Most papers only discuss the short term or the long run effects. Previous studies that did include both the short- and long-term effects of multiple variables on different independent variables used what they called a median split of

duration, which means they split the data into half (Grayson & Ambler, 1999; Wangenheim, 2003; Victoria Bordonaba-Juste, Polo-Redondo, 2008).

In this case, the time period is 2009, the start of the implementation of Basel III, until 2017, which is the last year for which data of all variables is available. By using the concept of a median split, the short run will consist of the time period 2009-2012 and the long run consist of the time period 2013-2017.

3.3 Measuring Basel III

Earlier research by Slovic & Cournède (2011) uses the three variables required capital, leverage ratio and liquidity ratio in order to estimate the possible effect of Basel III on GDP growth in OECD countries for the period 2006-2009. The research by Fender & Lewrick (2016) uses the required capital for banks in combination with the leverage ratio to simulate the long term effects on GDP.

The variable Basel III agreement is included in the analysis as a dummy variable. However, no significant result is expected for this variable. Instead, the effect of the Basel III agreement on GDP growth will be measured through the three variables. In order to determine if the effect for countries within the Basel III agreement on the three variables is stronger, three interaction variables are made.

The three variables leverage, liquidity and capital do not have a perfectly linear relationship with GDP growth. In the short run, leverage is not linear and in the long run leverage and liquidity are not linear related with GDP growth, see appendix 4 for the separate ordinary least squares regressions. However, these are only the individual relationships between each of the variables and GDP growth, without controlling for other variables that influence GDP growth.

3.4 Control variables

The dependent variable is Gross Domestic Product (GDP) growth. The GDP growth is determined by several variables that either have a positive or a negative relation with GDP growth. In order to measure the effect of the Basel III agreement on GDP growth, these factors should be controlled for (Barro, 2003).

According to the literature, GDP growth is positively affected by the rule of law, because a government that better protects property and contractual rights enables markets to work more efficiently and thereby it has a positive effect on the GDP growth. The degree of international openness also has a positive effect on GDP growth, because more open countries trade more than less open countries, thereby open countries benefit more from their comparative advantage, which has a positive effect on GDP growth. Thirdly, a higher investment ratio, which is how much of a countries GDP is invested, has a positive effect on GDP growth (Barro, 2003).

On the other hand, the fertility rate has a negative relation with GDP growth, because there is a trade-off between monetary gain and producing offspring. The ratio of government consumption to GDP also has a negative effect on GDP growth for developed countries. Finally, a higher inflation rate leads to a decline in purchasing power of money, which lowers consumption and investments and thereby decreases GDP growth (Barro, 2003).

3.5 Models

Following from the theoretical chapter, there are two hypothesizes. These will be tested in two different models. Model 1 contains only short run effects, while model 2 contains only long run effects.

Model 1 Short run

The first hypothesis will be tested in the first model.

Hypothesis 1: GDP growth on the short term will be lower for countries that participate in the Basel III agreement than for countries outside of the agreement.

The first model refers to the controlled multivariate relationship on the short term run. This model includes the three independent variables, required capital, leverage ratio and liquidity rate and a dummy variable which distinguishes countries with and without the Basel agreement. It also includes the dependent variable, GDP growth, the control variables and the three interaction variables, in order to test if the differences between countries with and without Basel III agreement in GDP growth are significant.

The formula for the ordinary least squares regression is therefore as following:

$$GDPgrowth = \beta 0 + \beta 1 * capital + \beta 2 * leverage + \beta 3 * liquidity + \beta 4 * Basel3 + \beta 5 * openness + \beta 6 * investments + \beta 7 * fertility + \beta 8 * inflation + \beta 9 * governmentexpenditure + \beta 10(capital * Basel3) + \beta 11(leverage * Basel3) + \beta 12(liquidity * Basel3) + e$$

Model 2 Long run

The second hypothesis will be tested in the second model.

Hypothesis 2: In the long run, countries that participate in the Basel III agreement are expected to have a higher GDP growth than countries that do not participate.

The second model is the same as the first model, however only the data for the long run is used in the regression.

4 Results

This chapter contains the interpretation of the outcomes of both the short run and the long run model. A brief overview of the results is given, followed by the interpretation and either the acceptation or rejection of the hypothesis. An overview of the complete regression outcomes can be found in appendix 4.

4.1 Short run

Table 1 contains a summary of the results of the first regression model. The outcomes that are significant for at least the 5 percent level are highlighted in blue. Non-highlighted outcomes are not significant. The first model only considers the short run, measured over the time period 2009, 2010, 2011 and 2012. The bèta coefficient shows the strength of the relation between the dependent variable GDP growth and each of the individual independent variables.

Table 1

GDP growth	Bèta coefficient	Standard Error
Capital	0,728	0,216
Leverage	-0,702	0,324
Liquidity	0,574	0,141
Basel III	11,350	5,079
Openness	-0,007	0,005
Fertility	-0,616	1,275
Inflation	0,488	0,192
Rule of Law	1,490	0,936
Government Expenditure	-0,572	0,113
Capital Formation	0,097	0,091
Capital * Basel III	-0,669	0,326
Leverage * Basel III	0,395	0,415
Liquidity * Basel III	-0,534	0,199

The coefficient of capital is 0,728 for countries that do not participate in the Basel III agreement. The interaction of capital has a coefficient of -0,669, which means the coefficient of capital for countries within the Basel III agreement is 0,059. The relation between capital and GDP growth is negative for countries within Basel III whereas it is positive for countries outside of the agreement.

Leverage has a coefficient -0.702 for countries that do not participate in the Basel III agreement. The interaction of leverage is not significant. Therefore the effect of participating countries cannot be considered significant either.

The coefficient of liquidity for countries that do not participate in the Basel III agreement is 0,574. The interaction of liquidity has a coefficient of -0,534, which means the coefficient of liquidity for countries within the Basel III agreement is 0,04. The relation between liquidity and GDP growth is therefore stronger positive for countries that do not participate in the Basel III agreement.

Basel III is significant, which means there is a difference in GDP growth between countries that do and do not participate in the Basel III agreement. Since it is a dummy variable, the coefficient is meaningless.

In conclusion, the relations between both capital and GDP growth and liquidity and GDP growth are less positive for countries that participate in the Basel III agreement. Therefore hypothesis 1 (below) is accepted.

Hypothesis 1: GDP growth on the short term will be lower for countries that participate in the Basel III agreement than for countries outside of the agreement.

4.2 Long run

Table 2 contains a summary of the results of the second model. The outcomes that are significant at 5 percent are highlighted blue. Non-highlighted outcomes are not significant. The second model only considers the long run, measured over the time period 2013, 2014, 2015, 2016 and 2017. The bèta coefficient shows the strength of the relation between the dependent variable GDP growth and each of the individual independent variables.

Table 2

GDP growth	Bèta coefficient	Standard error
Capital	0,172	0,130
Leverage	-0,379	0,159
Liquidity	0,223	0,096
Basel III	-4,896	3,21
Openness	0,003	0,003
Fertility	-0,273	0,997
Inflation	-0,024	0,164
Rule of Law	0,738	0,457
Government Expenditure	-0,033	0,068
Capital Formation	0,019	0,044
Capital * Basel III	-0,011	0,160
Leverage * Basel III	1,012	0,241
Liquidity * Basel III	-0,285	0,121

The relation between capital and GDP growth and the relation between the interaction of capital are GDP growth are not significant.

For countries outside of the Basel III agreement, leverage has a coefficient of -0,379. The interaction of leverage has a coefficient of 1,01 and is highly significant. This means the coefficient of leverage for countries within the Basel III agreement is 0,631. The relation between leverage and GPD growth is therefore positive for countries that participate in the Basel III agreement.

The coefficient of liquidity is 0,223 for countries that do not participate in the Basel III agreement. The interaction of liquidity has a coefficient of -0,325, which means the coefficient of liquidity for countries participating in the Basel III agreement is -0,102. The relation between liquidity and GDP growth is therefore negative for countries that participate in the Basel III agreement.

In conclusion, for countries within the Basel III agreement, leverage has a more positive effect on GDP growth than for countries outside the Basel III agreement, which is as

expected. For countries within the Basel III agreement, liquidity however has more negative relation with GDP growth in the long run compared to countries outside of the agreement, which is not as expected. Therefore the results on the long run are ambiguous.

One might argue that the total effect on GDP growth for countries participating in the Basel III agreement is in fact positive in the long run, because the coefficient of leverage is much bigger positive than the coefficient of liquidity is negative. Since both leverage and liquidity are measured as a percentage of GDP, they might be somewhat comparable. However, the results still show two different effects, therefore the second hypothesis (below) must be rejected.

Hypothesis 2: In the long run, countries that participate in the Basel III agreement are expected to have a higher GDP growth than countries that do not participate.

4.3 Robustness Check

It is possible that the GDP growth of countries that do not participate in the Basel III agreement systematically differs from the GDP growth of countries that do participate in the Basel III agreement Even though all countries that are used in the regression analysis are industrialized, they may still be at different growth stage, which means some countries will have a higher GDP growth than other countries due to their different growth stages (Lau, 2003).

Also, there might be a selection bias, causing the sample of countries to no longer be random (Heckman, 1990). Instead, countries that are already focused on investing in finance and thereby increasing GDP growth to be more likely to participate in the Basel III agreement than countries that do not focus on finance as much. If this would be the case, the GDP growth of the participants in the Basel III agreement will be higher over the measured time period, but not as a consequence of the agreement, but due to the selection bias.

In order to take the possibility of these differences in growth rates and the possible selection bias into account, a new variable is created which I named GMD. This variable GMD is the geometric mean minus the GDP growth. Since it is about growth rates, the arithmetic mean cannot be used. The geometric mean is taken over the previous ten years, before the implementation of the Basel III agreement, 1999-2008.

The standard formula of the geometric mean is as following:

$$GM_{\bar{y}} = \sqrt[n]{y_1 y_2 y_3 \dots y_n}$$

GM stands for geometric mean. N for the number of cases, which is ten. Y1 is the year 1999, whereas Y10 is the year 2008. This new dependent variable is calculated per country per year, as the geometric mean of a countries previous ten years minus the GDP growth of that country.

By taking the geometric mean, the previous growth of a country will be taken into account when looking at the growth during the measured period 2009-2017. The difference between this average GDP growth and the GDP growth under Basel III will be used to measure the effect of Basel III. The regression formula as used in 4.1 and 4.2 changes, because GDP growth is replaced by GMD:

$$\begin{aligned} GMD = {} & \beta 0 + \beta 1 * capital + \beta 2 * leverage + \beta 3 * liquidity + \beta 4 * Basel3 + \beta 5 \\ & * openness + \beta 6 * investments + \beta 7 * fertility + \beta 8 * inflation + \beta 9 \\ & * governmentexpenditure + \beta 10(capital * Basel3) \\ & + \beta 11(leverage * Basel3) + \beta 12(liquidity * Basel3) + e \end{aligned}$$

If countries that participate in the Basel III agreement have a higher growth rate than countries that do not participate in the Basel III agreement, this leads to a different interpretation of the results of the previously explained regression. The results may turn out to not show the effect of Basel III on GDP growth, but it may simply mean one group has a higher GDP growth than the other group, regardless of Basel III. Therefore, by using GMD instead of GDP growth, a country with an already high growth rate will be corrected for by taking into account the previous growth rate and thereby only looking at the change in growth rate

Short run robustness

The complete regression outcomes can be found in appendix 4. Table 3 on the next page gives a brief overview of the results. None of the results are significant at the 5 percent level, and only leverage is significant at 10 percent. Even though the direction of the coefficient is similar, the lack of significance indicates that there is no real effect of participating in the Basel III agreement on GDP growth. Therefore it is likely that the results from the previous short run regression should be interpreted differently; GDP growth differences in the short run were not caused by whether or not a country participates in the Basel III agreement, but by

already existing differences between the growth rates of those countries. As a consequence, hypothesis 1 must be rejected.

Table 3

GDP growth	Bèta coefficient	Standard error
Capital	0,244	0,225
Leverage	-0,571	0,337
Liquidity	0,230	0,146
Basel III	2,229	5,283
Capital * Basel III	-0,062	0,340
Leverage * Basel III	0,480	0,432
Liquidity * Basel III	-0,273	0,207

Long run robustness

The complete regression outcomes can be found in appendix 4. Table 4 below gives a brief overview of the results. In the long run, leverage and the interaction effect of leverage are significant at the 5 percent level. This means in the long run, countries that participate in the Basel III agreement have a significantly higher GDP growth than countries that do not participate in the agreement. Liquidity no longer has a significant effect, as was the case in the original regression, therefore the results no longer are ambiguous. This leads to the acceptance of hypothesis 2.

Table 4

GDP growth	Bèta coefficient	Standard error
Capital	0,336	0,222
Leverage	-0,780	0,273
Liquidity	0,245	0,165
Basel III	0,251	5,501
Capital * Basel III	-0,415	0,274
Leverage * Basel III	1,555	0,413
Liquidity * Basel III	-0,276	0,208

5 Conclusion

The aim of this paper was to research the effects of the Basel III reforms on GDP growth, by looking at the capital ratio, the leverage ratio and the liquidity ratio in particular. According to the literature, in the short run the requirements of the Basel III agreement may lead to higher costs for banks. This leads to higher lending rates that reduce bank credit and thereby reduce the aggregate supply of credit, which in turn leads to a lower GDP and a lower GDP growth (Allen, Chan, Milne & Thomas, 2012). Another short run effect of the capital requirements of the Basel III agreement is an alteration of the interest sensitivity and of the economy's investment relationship, in short, its position of the IS curve (Tanaka, 2002). The downward shift of the IS curve leads to a new equilibrium in which both the interest rate and the GDP (Y) have decreased compared to the previous situation.

In the long run, the effect of the Basel III agreement may be positive if it is thought of as a change in productivity. The internal system risk seems to be lower, due to a better quality of the system, which may cause the long run aggregate supply to shift to the right, leading to an increase in GPD, which equals a positive GDP growth.

After conducting an ordinary least squares analysis, the first hypothesis was accepted; GDP growth on the short term will be lower for countries that participate in the Basel III agreement than for countries outside of the agreement. The second hypothesis however was rejected, since the results were ambiguous. Therefore it is not certain what the exact effect of the Basel III agreement is on the GDP growth in the long run. When taking into account possible differences in growth stages, the adjusted regression shows different results. They implicate that participating in the Basel III agreement has no significant effect on GDP growth in the short run. In the long run, the results no longer are ambiguous, instead GDP growth is better for countries that participate in the Basel III agreement.

5.1 Discussion

There are some side notes and limitations to the conducted regression. For instance, the period that is used to measure the long run may be too early, and therefore it may pick up some of the short run negative effect on GDP growth. Also, the Basel III requirements are implemented over a number of years, instead of at one point in time. Therefore it is difficult to separate the results on the short run and on the long run. Once more data is available for later years, the research could be done again.

Furthermore, there has not been made a distinction between market based and bank based economies, since both the group of countries participating in the Basel III agreement and the group of non-participating countries were a mixture of market based and bank based economies. Possibly, splitting the groups into bank based and market based economies may lead to different results, where the impact of Basel III is expected to be larger for bank based countries, since the Basel regulations and requirements apply only to banks. Another limitation of this research is that the monetary policy of the countries is not taken into account, but instead it is thought of as remaining unchanged.

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Appendix 1 list of Basel Accord countries

1. Australia
2. Austria
3. Belgium
4. Brazil
5. Canada
6. Denmark
7. Finland
8. France
9. Germany
10. Hong Kong SAR
11. Ireland
12. Italy
13. Japan
14. Luxembourg
15. Mexico
16. Netherlands
17. New Zealand
18. Singapore
19. Spain
20. Sweden
21. Switzerland
22. United Kingdom
23. United States

Appendix 2 List of Industrialised Countries without Basel agreement

List retrieved from the worldbank, countries for which no data was available are deleted from the list.

1. Antigua and Barbuda
2. Bahamas, The
3. Brunei
4. Cyprus
5. Greece
6. Iceland
7. Israel
8. Korea, Rep.
9. Kuwait
10. Macao, China
11. Malta
12. Monaco
13. Norway
14. Portugal
15. Qatar
16. San Marino
17. Slovenia

Appendix 3 Data sources

All data that is used is retrieved from the website of the world bank

GDP growth: GDP growth (annual %) World Bank national accounts data, and OECD National Accounts data files. License : CC BY-4.0

Capital: Bank Regulatory Capital To Risk-Weighted Assets (%) International Monetary Fund Code: GFDD.SI.05

Leverage ratio: Bank capital to assets ratio (%) International Monetary Fund, Global Financial Stability Report. License : CC BY-4.0

Liquidity ratio: Bank liquid reserves to bank assets ratio (%) International Monetary Fund, International Financial Statistics and data files. License : CC BY-4.0

Rule of law: Worldwide Governance Indicators. Rule of law estimate.

International openness: Trade (% of GDP) World Bank national accounts data, and OECD National Accounts data files. License : CC BY-4.0

Investment ratio: Gross capital formation (% of GDP)

Fertility rate: Fertility rate, total (births per woman) License : CC BY-4.0

Government consumption to GDP: General government final consumption expenditure (% of GDP) World Bank national accounts data, and OECD National Accounts data files. License : CC BY-4.0

Inflation rate: Inflation, consumer prices (annual %) International Monetary Fund, International Financial Statistics and data files. License : CC BY-4.0

Appendix 4 Regression outcomes

Separate regression capital short run

Source	SS	df	MS	Number of obs	=	160
				F(1, 158)	=	7.78
Model	211.144212	1	211.144212	Prob > F	=	0.0059
Residual	4288.52533	158	27.1425653	R-squared	=	0.0469
				Adj R-squared	=	0.0409
Total	4499.66954	159	28.2998084	Root MSE	=	5.2099

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Capital	.4335882	.1554581	2.79	0.006	.1265442	.7406321
_cons	-5.665821	2.37418	-2.39	0.018	-10.35505	-.9765965

Separate regression leverage short run

Source	SS	df	MS	Number of obs	=	160
				F(1, 158)	=	0.61
Model	17.1749398	1	17.1749398	Prob > F	=	0.4377
Residual	4482.4946	158	28.370219	R-squared	=	0.0038
				Adj R-squared	=	-0.0025
Total	4499.66954	159	28.2998084	Root MSE	=	5.3264

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Leverage	.1565399	.2011911	0.78	0.438	-.2408311	.5539109
_cons	-.2188378	1.443685	-0.15	0.880	-3.070248	2.632573

Separate regression liquidity short run

Source	SS	df	MS	Number of obs	=	160
				F(1, 158)	=	4.49
Model	124.28369	1	124.28369	Prob > F	=	0.0357
Residual	4375.38585	158	27.6923155	R-squared	=	0.0276
				Adj R-squared	=	0.0215
Total	4499.66954	159	28.2998084	Root MSE	=	5.2623

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Liquidity	.1943345	.0917323	2.12	0.036	.0131547	.3755143
_cons	-.6793383	.835487	-0.81	0.417	-2.329502	.9708254

Separate regression capital long run

Source	SS	df	MS	Number of obs	=	200
				F(1, 198)	=	6.16
Model	65.8790495	1	65.8790495	Prob > F	=	0.0139
Residual	2117.94086	198	10.696671	R-squared	=	0.0302
				Adj R-squared	=	0.0253
Total	2183.81991	199	10.9739694	Root MSE	=	3.2706

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Capital	.2003107	.0807151	2.48	0.014	.0411391	.3594823
_cons	-1.29061	1.40391	-0.92	0.359	-4.059146	1.477925

Separate regression leverage long run

Source	SS	df	MS	Number of obs	=	200
				F(1, 198)	=	1.04
Model	11.3775112	1	11.3775112	Prob > F	=	0.3098
Residual	2172.4424	198	10.9719313	R-squared	=	0.0052
				Adj R-squared	=	0.0002
Total	2183.81991	199	10.9739694	Root MSE	=	3.3124

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Leverage	.1110378	.1090408	1.02	0.310	-.1039924	.3260681
_cons	1.272916	.8886825	1.43	0.154	-.4795812	3.025413

Separate regression liquidity long run

Source	SS	df	MS	Number of obs	=	200
				F(1, 198)	=	0.00
Model	.007929997	1	.007929997	Prob > F	=	0.9786
Residual	2183.81198	198	11.0293534	R-squared	=	0.0000
				Adj R-squared	=	-0.0050
Total	2183.81991	199	10.9739694	Root MSE	=	3.321

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Liquidity	-.0011948	.0445587	-0.03	0.979	-.0890654	.0866758
_cons	2.157357	.4882921	4.42	0.000	1.194437	3.120278

Model 1: Short run

Source	SS	df	MS	Number of obs	=	160
				F(13, 146)	=	5.58
Model	1493.4671	13	114.882084	Prob > F	=	0.0000
Residual	3006.20244	146	20.5904277	R-squared	=	0.3319
				Adj R-squared	=	0.2724
Total	4499.66954	159	28.2998084	Root MSE	=	4.5377

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Capital	.7289282	.2164443	3.37	0.001	.3011595	1.156697
Leverage	-.7021657	.3248067	-2.16	0.032	-1.344096	-.0602354
Liquidity	.5748188	.1412085	4.07	0.000	.295742	.8538956
Basel3	11.35024	5.079466	2.23	0.027	1.311456	21.38902
openness	-.0079974	.0055951	-1.43	0.155	-.0190553	.0030605
Fertility	-.6167139	1.275982	-0.48	0.630	-3.138495	1.905067
inflation	.4885644	.1924423	2.54	0.012	.108232	.8688969
RuleLaw	1.490769	.9363456	1.59	0.114	-.3597737	3.341311
GovernExpen	-.5728583	.113079	-5.07	0.000	-.7963414	-.3493752
CapitalFormation	.0971526	.0914916	1.06	0.290	-.0836664	.2779716
int1	-.6695182	.3269188	-2.05	0.042	-1.315623	-.0234136
int2	.3956967	.4155844	0.95	0.343	-.4256417	1.217035
int3	-.5349421	.1991945	-2.69	0.008	-.9286193	-.141265
_cons	-1.839269	4.4958	-0.41	0.683	-10.72452	7.045986

Model 2: Long run

Source	SS	df	MS	Number of obs	=	200
				F(13, 186)	=	4.40
Model	513.296237	13	39.4843259	Prob > F	=	0.0000
Residual	1670.52367	186	8.98131007	R-squared	=	0.2350
				Adj R-squared	=	0.1816
Total	2183.81991	199	10.9739694	Root MSE	=	2.9969

GDPgr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Capital	.1723584	.1300632	1.33	0.187	-.0842303	.4289472
Leverage	-.379035	.159924	-2.37	0.019	-.6945331	-.0635369
Liquidity	.2234	.096904	2.31	0.022	.0322277	.4145722
Basel3	-4.896409	3.218042	-1.52	0.130	-11.24496	1.452145
openness	.0031983	.0032326	0.99	0.324	-.0031789	.0095755
Fertility	-.2736044	.9975511	-0.27	0.784	-2.241573	1.694364
inflation	-.0249032	.1642732	-0.15	0.880	-.3489815	.2991751
RuleLaw	.738336	.4576602	1.61	0.108	-.1645361	1.641208
GovernExpen	-.033574	.06803	-0.49	0.622	-.1677836	.1006355
CapitalFormation	.0198087	.0448042	0.44	0.659	-.068581	.1081984
int1	-.011389	.1606627	-0.07	0.944	-.3283445	.3055664
int2	1.012681	.2418423	4.19	0.000	.5355745	1.489787
int3	-.3250919	.1218396	-2.67	0.008	-.5654571	-.0847267
_cons	-.2855957	2.621371	-0.11	0.913	-5.457036	4.885844

Robustness Short run

Source	SS	df	MS	Number of obs	=	160
				F(13, 146)	=	2.58
Model	747.574476	13	57.5057289	Prob > F	=	0.0030
Residual	3252.24425	146	22.2756455	R-squared	=	0.1869
				Adj R-squared	=	0.1145
Total	3999.81873	159	25.1560926	Root MSE	=	4.7197

GMD	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Capital	.244472	.2251275	1.09	0.279	-.2004578	.6894018
Leverage	-.5711369	.3378372	-1.69	0.093	-1.23882	.0965462
Liquidity	.2305834	.1468734	1.57	0.119	-.0596893	.5208561
Basel3	2.22968	5.283242	0.42	0.674	-8.211833	12.67119
openness	-.0014439	.0058196	-0.25	0.804	-.0129454	.0100575
Fertility	.102365	1.327171	0.08	0.939	-2.520584	2.725314
inflation	.3377047	.2001626	1.69	0.094	-.0578858	.7332952
RuleLaw	.0433828	.9739096	0.04	0.965	-1.881399	1.968165
GovernExpen	.1256369	.1176154	1.07	0.287	-.1068118	.3580857
CapitalFormation	.3296551	.095162	3.46	0.001	.1415821	.5177282
int1	-.0626745	.340034	-0.18	0.854	-.7346994	.6093503
int2	.4803348	.4322567	1.11	0.268	-.3739538	1.334623
int3	-.2737598	.2071857	-1.32	0.188	-.6832304	.1357107
_cons	-17.28794	4.676161	-3.70	0.000	-26.52965	-8.046233

Robustness Long run

Source	SS	df	MS	Number of obs	=	200
				F(13, 186)	=	6.12
Model	2086.47546	13	160.498113	Prob > F	=	0.0000
Residual	4881.76986	186	26.2460745	R-squared	=	0.2994
				Adj R-squared	=	0.2505
Total	6968.24532	199	35.0163082	Root MSE	=	5.1231

GMD	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Capital	.3360566	.2223396	1.51	0.132	-.1025751	.7746882
Leverage	-.7803627	.2733858	-2.85	0.005	-1.319698	-.2410272
Liquidity	.2455113	.1656548	1.48	0.140	-.0812926	.5723152
Basel3	.2517136	5.501157	0.05	0.964	-10.60097	11.1044
openness	.0058308	.005526	1.06	0.293	-.0050708	.0167324
Fertility	-.4111581	1.705287	-0.24	0.810	-3.775348	2.953032
inflation	-1.192455	.2808207	-4.25	0.000	-1.746458	-.6384515
RuleLaw	-.2809313	.7823579	-0.36	0.720	-1.824367	1.262504
GovernExpen	.3837756	.1162954	3.30	0.001	.1543479	.6132032
CapitalFormation	-.0612891	.0765916	-0.80	0.425	-.212389	.0898108
int1	-.4155913	.2746486	-1.51	0.132	-.9574181	.1262356
int2	1.555624	.4134229	3.76	0.000	.7400234	2.371225
int3	-.2765719	.2082816	-1.33	0.186	-.6874698	.1343261
_cons	-9.892923	4.481163	-2.21	0.028	-18.73336	-1.052484