The Effects of Stock Market Liquidity on Real GDP growth: New Evidence from European Markets during the Period

(2000 – 2016)

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ABSTRACT

This dissertation was written as part of the MSc in Banking and Finance at International Hellenic University.

This study examines the impact of stock market liquidity, which proxies for the implicit cost of trading shares with the real GDP growth in the European market using modern econometrics techniques. We provide evidence that stock market liquidity contains strong and vigorous information about the condition of the economy for both the UK and Italy in the presence of well-established leading indicators. Our findings show that stock market liquidity improves real GDP activity in the case of Italy, while the liquidity of the stock market slow down the Real GDP activity in the UK market and there is a reverse relationship between stock market liquidity and the real GDP growth rate in the short-terms. The empirical findings show that there is a differential role of liquidity in explaining the course of macroeconomic condition between a capital-based market and Mediterranean-European (i.e. Less-developed) economies.

We would like to take this opportunity to express gratitude to our professors at the International Hellenic University for motivating us to work independently and to our colleagues and family for giving us unconditional support. Finally, Special thanks to our dissertation supervisor, Prof. Panagiotis Artikis, for his advice and encouragement.

Keywords: illiquidity ratio, real GDP growth, stock market volatility, relative spread, stock market liquidity.

Suzan Khalayla
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CHAPTER ONE: FRAMEWORK OF THE STUDY

1.1 Introduction

This study investigates the relationship between stock market liquidity and economic activity in two developed European countries with different characteristics: the UK and Italy. The primary hypothesis is that there is a positive relationship between stock market liquidity and economic activity. To examine this hypothesis, we study several measures of liquidity, more specifically Illiquidity ratio and relative spread, in combination with other leading indicators (i.e. housing starts, short-term interest rate and market volatility) that may affect real GDP activity. By doing so, we examine illiquidity measures in conjunction with economic growth.

How liquidity be defined? A liquid asset (financial or real asset) may be converted into cash quickly and at a low cost. In a liquid financial market, investors are able to sell large blocks of assets without substantially changing the price (Choi and Cook, 2005). In an illiquid market, however, there might be an adverse impact on stock prices. Liquidity concerns the affluence and cost at which investors can trade assets in the market. Most literature on liquidity is in the field of market microstructure, which focuses on the sources of illiquidity (e.g. inventory costs and market designs can generate limited liquidity). Nevertheless, liquidity itself can also affect asset prices. Investors typically prefer liquid over illiquid securities. Thus, liquid assets have higher prices and lower expected return. Furthermore, if liquidity varies over time, investors are exposed to liquidity risk. Depending on the sign of the correlation of liquidity innovations with returns, this can amplify or reduce the total risk exposure of an investor. But how do European Union markets respond to liquidity? European Union countries faced one of the most onerous financial crises in history, facing a high shortage of liquidity. Moreover, the European Union member states were indirectly divided into two categories: the strong economies that managed to anticipate the financial

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1This definition dates back to Keynes ((1930), p. 67) who measured individual asset as more liquid than alternative “if it is more certainly realizable at short notice without loss.”
crisis quickly and efficiently and the economies of the Mediterranean (Greece, Italy, Spain, and Portugal) that faced significant illiquidity rise of bond spread and financial austerity. Moreover, Italy, the third greatest economy of the Eurozone, faced significant financial difficulties, austerity measures, and rise of unemployment rate.

Although Apergis et al, 2015 has measured the relationship between liquidity and economic growth between developed countries with different economic orientation, the comparison between a developed country that anticipates the financial recession quickly and a developed country that faces all the above-mentioned problems of a financial recession has not been examined. As a result, it is indicative to examine the relationship between illiquidity and economic activity in this context.

We chose the UK as an example of a developed country that anticipated the financial recession well and whose economy is capital-market oriented. On the other side of the spectrum, we chose Italy as an example of a Mediterranean developed country that faced significant difficulties, with consequences until today. Information about the relationship between liquidity and economic activity in this context can be generalized in the European Union. Moreover, it enriches our understanding regarding how an economy behaves in cases of both liquidity and illiquidity and which are the features that better describe these manners.

1.2. Objectives of the Study
This study analyzes the role of capital market liquidity in the economic activity of developed European stock exchanges, mainly the London and Milan stock exchanges. The capital market has been the focus of economic policies and policy makers. It provides the fulcrum for stock market activities and it is often cited as an indicator of business direction. An active capital market may be relied upon to measure changes in the general level of economic activities (Obadan, 1998). The main question that is analyzed in our study is whether there is a positive relationship between stock market liquidity and economic growth in the United Kingdom and Italy during the period from 2000 to 2016.
The underlying questions that may need to be answered to answer this question are:

- Is there a positive relationship between housing indicators in the capital market and economic growth?
- Is there a relationship between the short-term interest rate in the capital market and economic growth?
- What is the relationship between market volatility in the capital market and economic growth?

1.3. Methodology of the Study

This study quantifies the impact of stock market liquidity on economic activity. We employ an Instrumental Variable regression model in order to eliminate potential endogeneity between the endogenous Regressors. We select this specific model because there is a reverse causal relationship between economic growth and liquidity measures. As a result, a simple ordinary Least Squares Model cannot fully describe the aforementioned relationship with accurateness. According to Apergis et al (2015), implementing instruments is a great method of taking care potential problems of endogeneity. However, the study considers potential endogeneity problems; we choose a two-stage least squares (2SLS) method, Moreover by performing Toda and Yamamoto Granger causality test using a vector auto regression (VAR) approach because reverse causality may exist in the relationship between the real economy and stock market liquidity in the short run. The study applied different models with different proxies for illiquidity and Eviews 8 Software for windows is used to obtain the results. This fills the literature gap on the relationship between stock market liquidity and economic activity in the European Market.

1.4. Importance of the Study

Our study outcomes might help policy makers and commercial managers improve their resource distribution, since they can be more certain about the use of stock market liquidity to reach the expected outcomes that rely deeply on economic
movement. In addition, the obtained results may provide additional information about the liquidity of a capital market, which is expected to reduce the risk associated with investments, and allow investors to obtain equities and sell them fast and without sustaining high costs, if they want to change their portfolios. An enhanced mode of stock market liquidity will also improve capital allocations, thus leading to further investments. Correspondingly, providing liquidity measures to the stock market is expected to significantly reduce liquidity risks met by investors and lead to equity capital cost reductions in future fund raising and economic growth. It is hoped that the current analysis will contribute to the existing literature in the following fields:

- The effect of stock market liquidity on the economic activity of developed countries in the European Union;
- Testing which liquidity measures describe economic growth in this setting.

1.5. Contents of the Study

This study is organized as follows:

- chapter 1 (present chapter) introduces the subject;
- chapter 2 presents the theoretical framework;
- chapter 3 presents a literature review about liquidity and economic growth;
- chapter 4 describes the economies under study;
- chapter 5 presents model specifications and a full description of the methodology;
- chapter 6 presents different scenarios, analysis, and results for UK;
- chapter 7 presents different scenarios, analysis, and results for Italy;
- Chapter 8 concludes and recommends policy changes and further research.
CHAPTER TWO: THEORETICAL FRAMEWORK

The importance of the question whether financial systems are important for economic growth, seems to be pretty vibrant. The importance of the answer to this question was critical over the last decade, when financial crisis and economic recession covered more or less the biggest part of the world. One line of research argues that financial systems are inconsequential for economic growth; another line strains the importance of the financial system in mobilizing reserves, distributing capital, using corporate governor, and easing risk management (Levine and Zervos, 1991).

2.1. Stock Market Liquidity Role in Economic Activity

The foundation for examining whether stock market liquidity can act as a leading sign for economic activity is threefold:

First, according to the “flight to quality” hypothesis put forward by Longstaff (2004), who argues that, in times of market uncertainty, investors fear that the markets may tumble; they choose to seek more liquid securities; in order to increase their abilities to sell them in the case where they request to leave the market. We often observe investors rebalance their portfolios toward less risky and more liquid securities, especially in fixed income markets, where some market participants abruptly want to decrease their portfolio exposure to securities bearing credit risk. Bank runs and terrors, credit crunches, and sudden declines in the market values of corporate bonds are all examples of the effects of a flight to quality. However, “flight to liquidity” is defined as a different phenomenon from “flight to quality”; since market participants shift their portfolios from less liquid to more liquid securities with identical credit risk.

Moreover, recently, some market participants suddenly prefer to hold highly liquid securities such as U.S. Treasury bonds rather than less liquid securities. This is consistent with studies that have been done by Woodford (1990) and Holmström & Tirole (1996, 1998), who examine the role of the public sector in providing liquidity to financial markets. A good example of a flight to quality occurred in the
wake of the 1998 Russian default when Treasury bonds suddenly increased in value relative to less liquid debt instruments, causing credit spreads to widen and resulting in major losses at long term capital management and many other highly leveraged hedge funds. Of course, there may have been elements of both a flight to quality during the 1998 hedge fund crisis. It is important, however, to consider what effects a pure flight to liquidity may have on security prices.

Standard asset-pricing theory implies that the value of a security should equal the present value of its cash flows and should not depend on how popular the security is as a trading vehicle. More specifically, if two securities have identical cash flows in all states of the world, then the two securities should have the same value even if one suddenly becomes more popular among investors during a flight to liquidity. Finding evidence of a significant flight-to-liquidity premium in the price of the more popular security would pose a challenge to traditional asset-pricing theory.

Second, liquidity can affect economic activity through certain investment channels, since a liquid secondary market may facilitate investments in productive long-run projects (Levine, 1991). For instance, Bencivenga & Smith (1991) developed a model where savings are channeled to more productive activities through permitting investors to modify the composition of their assets towards the illiquid growth amplifying ones. Investors face uncertainty about their future liquidity demands and consequently hold two types of assets: a liquid one, which is safe but sterile, or an illiquid one with high returns but risky. The existence of financial intermediaries shifts the composition of assets towards the more risky ones and therefore increases growth. Financial institutions allow individuals to diminish the risk associated with their liquidity needs. Despite the uncertainty individuals face about future liquidity needs, banks face a predictable demand for liquidity from their depositors. So banks are allowed to allocate investment funds more efficiently. Furthermore socially unnecessary capital liquidation can be reduced because investors are no longer required to liquidate investment in the presence of financial intermediaries. Moreover, Bencivenga et al. (1995) present that stock markets decrease liquidity risk to which investors are exposed by making financial
assets tradable but banks enabling depositors to withdraw cash before a scheme’s maturity. This reduces the deterrent to investing in long-run projects.

The lowering of transaction costs in financial markets is vital to their investigation. Moreover, the liquidity shock hypothesis claims that unexpected falls in asset markets liquidity cause equity prices to decrease and the price of liquid assets to increase (Kiyotaki & Moore, 2008). Besides, during the time when firms have to manage their funding constrictions on their investments, this decrease in equity prices diminishes the resources for investments a firm can rise by issuing equity or/ and using equity as collateral in borrowing. Accordingly, investments fall, output follows and a recession starts. The liquidity shock hypothesis has received wide attention as of its immediate policy suggestions. If unexpected volatilities in equity liquidity are the reasons of economic growth, then a government can diminish the economic performance by making the supply of liquid assets countercyclical. At the beginning of a recession, a government can use liquid assets to buy up some of the illiquid equity to avoid equity prices from falling rashly. The growth in the supply of liquid assets lowers firms ‘funding constraints, while the steadiness of equity prices further improves firms’ ability to use the equity market to fund their investment schemes with lower cost of capital, therefore, increasing the return on the projects they implement. These policy implications seem to provide a justification for the large and repeated injections of liquidity by the US Federal Reserve System as well as other central banks over the recessionary period 2008–2009 (Apergis et al. 2015).

Third, Brunnermeier & Pedersen (2009) show, that when markets are illiquid, market liquidity is highly sensitive to further changes in funding conditions. Subsequently during periods of recession, both a lack of assets ‘markets liquidity and reduced financial intermediaries’ funding liquidity are owed to the main two liquidity spiral: marginal spiral and loss spiral and, as shown in figure 8.
Foremost, a margin spiral appears if margins are growing in market illiquidity. In this case, a financing shock to the investor's lowers market liquidity, resultant to higher margins, which squeezes investors' funding constraint afterwards. Second, a loss spiral arises if investor holds a large initial position that is negatively correlated with buyers’ demand shock. In this case, funding shock increases market illiquidity, leading to investor losses on their initial positions, forcing investors to sell more, causing an additional price fall. These liquidity spirals support each other, indicating a larger total effect than the sum of their separate effects. Furthermore, reduced funding liquidity leads to a flight to quality; since liquidity suppliers shift their liquidity providing toward stocks with low margins. This is consistent with studies have been done by Mitchell et al. (2007) who find significant liquidity-driven divergence of prices of the convertible bond markets after capital shocks to the main convertible arbitrage hedge funds. Similarly, Garleanu et al. (2008) conclude that option market makers’ unhedgeable risk is priced, especially in times following crises. Reduced funding liquidity leads to a
flight to quality in the sense that liquidity providers shift their liquidity provision toward stocks with low margins.

2.2. Stock Market and Growth: Brief Theoretical Framework

Prior to the empirical part of this study, in this section, we provide the core theoretical framework that links stock market improvement to economic growth, and gives what may be missing in the view that stock markets are leading signs to economic growth.

In the view of modern growth theory, the relation between stock market movement and economic growth has been an important subject of discussion. Back to King and Levine (1993), Atje and Jovanovic (1993) and Levine and Zervos (1998), who validate the connection of stock market improvement to economic growth. Their empirical outcomes modification to the theoretical arguments of some economists who have suggested that the existence of a stock market has little relevance or importance to real economic activity (Devereux and Smith, 1994, and Mayer, 1988); They support the view that a well-functioning stock market may affect economic activity in an economy through the following channels: (a) growth of saving, (b) efficient allocation of investment resources, and (c) better utilization of the existing resources. Leigh (1997) considers that the stock market is supposed to encourage saving by providing households with additional instruments, which may enhanced by meeting their risk partialities and liquidity needs, then increases economic growth.

The growth models expression about the influence of stock market development to economic growth through various broadcast channels. Pagano (1993) examines the modest endogenous growth model in order to understand the several routes that link stock market development to economic growth. His model denotes the main framework of this relationship, and is presented by:

\[ y = A \varphi s - \delta \]  

(1)
Where \( y \) symbolizes the economic growth rate. Also, \( A \) is the social marginal productivity of capital, and \( \varphi \) is the fraction of saving representing the efficiency of stock market. The gross saving rate is represented by \( s \), besides \( \delta \) denotes depreciation rate.

Ahead of endogenous growth framework, stock market liquidity can boost economic growth by: (1) improving the allocation of resources toward the most productive investment projects and then increasing the productivity of capital, \( A \). (2) An effective stock market raises the fraction of saving \( \varphi \) by directing more saving to investment and reducing the costs of the financial intermediation procedure. (3) Stock market improvement affects the saving rate \( S \) by providing households with additional tools that possibly will better meet their risk preferences and liquidity essentials.

To focus on the empirical effect of stock market development and economic reform on economic growth, we extend the growth model in Equation (1) toward providing additional inclusive evaluation that includes the most important determinants of economic growth and economic reform besides stock market channels during the period 2000 to 2016. The main framework of our empirical analysis takes the following form:

\[
\begin{align*}
\text{RealGDPGrowth}_t &= \alpha + \beta [\text{Stock Market liquidity}]_t + \lambda [\text{Economic Reform Dummy}]_t \\
&\quad + \gamma [\text{Control Variables Set}]_t + u_t,
\end{align*}
\]

(2)

The dependent variable, Growth, equals real quarterly GDP growth rate. Stock Market Improvement is delivered by illiquidity measures. Since the Financial crises situation affected the GDP level an Economic Reform Dummy variable is added to the model; it represents the Crises situation that affects the economies understudy for the period 2000-2016. The Control Variables Set includes the conditioning variable that control for other determinants associated with economic growth. These determinants include housing starts, volatility and short term interest rate. \( u_t \) is an error term, and the subscripts \( t \) epitomizes the time.
CHAPTER THREE: LITERATURE REVIEW

The causality question has remained an important subject in the financial academic research ever since. For almost a century economists have been examining the role of the financial sector in the route of economic growth. A significant number of theoretical and empirical literatures have emerged. Initially this literature focused on the question whether the liquidity of stock market plays a causal role in economic growth in developed and developing markets worldwide. There are extensive empirical studies that examine this relationship and these studies can be classified in two groups. The first group contains studies that analyze stock market liquidity can act as a leading pointer for economic activity in developed countries. The second group includes the studies that have been undertaken in developing countries.

3.1. Developed Countries

Arestis et al. (2001) examine the relationship between stock market development and economic growth through quarterly time-series data for five developed countries, while controlling for the effect of banking system and market volatility. These countries are: the United States of America (USA), the United Kingdom (UK), France, Germany, and Japan over the period from 1968 to 1998. While the data period is diverse for the countries in the sample. The findings expose that in Germany, there is indication of bidirectional causality between banking system development and economic growth. The stock market on the other hand is weakly exogenous to the level of output. In the USA, financial development does not affect real GDP in the long-run. While Japan shows bidirectional causality between both banking and stock market variables and the real GDP, even though in the UK the results indicate evidence of unidirectional causality from banking system to stock market development in the long-run, but the causality between financial development and economic growth in the long-run is very weak. The suggestion in France recommends that in the long-run both the stock market and banking system contribute to real GDP but the contribution of the banking system is considerably stronger.
Furthermore Boubakari (2010) tested the casual relationship between stock market and economic growth for five European countries (Belgium, France, Portugal, Netherlands and United Kingdom) by using quarterly time series data over the period from 1995 to 2008. The authors applied Granger causality test to examine the relationship by using variables of market capitalization, total trade value and turnover ratio as indicators for stock market development, GDP as indicator for economic growth and FDI. They find that countries that have efficient and liquid stock market have a positive relation between stock market and economic growth and inverse were the case with those countries that have ineffective and less liquid stock market.

Næs et al. (2011) employ US and Norwegian stock market data and show that stock market liquidity (in terms of the trading costs of equities) can be used as a powerful “for most sign” of the real economic activity, although after controlling for the existence of other variables, which are widely used in previous related empirical literature for forecasting business cycles. Their study cover a US dataset over the period from 1947 to 2008 accompanied by a dataset for Norway overpass the period from 1990 to 2006. Moreover the authors realize a vital relationship between the size of the firms and the information content of liquidity in predicting GDP growth, their finding agrees with the “flight to quality” outcome.

It’s worth mention that Florackis et al. (2014a) focus only on the UK market and considers only macroeconomic activity in terms of GDP growth, the author examine the descriptive power of stock market liquidity in estimating the real UK. GDP growth, over the period from 1989 to 2012. By using standard linear and nonlinear models, they discover a statistically significant negative relationship between stock market illiquidity and future growth in GDP of UK, even after including the usual explanatory variables (e.g., term spreads, short-term interest rates). They also indicate that the effect of market illiquidity is stronger during periods of and poor economic growth. Besides, through an out-of-sample forecasting analysis they realize that a regime switching model of illiquidity. Liquid
market conditions expect UK growth in GDP better than any other model, even the one published by the Bank of England’s inflation report.

More recently Apergis et al. (2015) analyze the relationship between stock market liquidity, with macroeconomic settings for both UK and Germany over the period from 1994 to 2011. The authors afford evidence that stock market liquidity encloses strong and strong evidence about the status of the economy for both the UK and Germany in the incidence of well-established leading indicators. Their findings represent the standing of small cap firms’ liquidity in explaining the state of the economy and support the “flight-to-quality argument”. They empirically conclude that there is no any different role of liquidity in explaining the development of macroeconomic variables between a capital market and a bank-oriented economy.

3.2. Developing Countries

The role of stock markets in both developed and developing markets has moved the research attention to recognize the cause and effect relationship between stock market development and economic growth over the last few decades. From late 1980s there has been significant development in developing stock markets particularly; in terms of market capitalization, listed companies and investors. Levine & Zervos (1996) study the empirical association between stock market development and long-run economic growth. To assess this relationship, the authors applied pooled cross-country time-series regression of forty-one countries over the period from 1976 to 1993. The data proposed that stock market development is positively associated with long run economic growth. A similar study has been done by Demirgüç-Kunt & Levine (1996) using conglomerating measures such as stock market size, liquidity, and integration with world markets, into index of stock market development. The growth rate of Gross Domestic Product (GDP) per capita was regressed on a variety of variables designed to control for initial conditions, political stability, investment in human capital, and macroeconomic conditions; and then include the conglomerated index of stock market development. The conclusion that there is a strong correlation between
stock market development and long-run economic growth, they conclude that countries with strong stock markets as well have well-built banks and nonbank financial intermediaries, but countries with weak stock markets tend to have weak banks and financial intermediaries this result is consistent with the theories that imply a positive relationship between stock market development and economic growth.

In addition, Mohtadi & Agarwal (2004) investigate the casual relationship between stock market development and economic growth for 21 developing countries. This study used panel data over the period 1977 to 1997. Results showed that the market capitalization ratio, shares traded ratio, foreign direct investment, domestic investment and secondary school enrollment have positive relation with economic growth. The study determines that the stock market played a vital role in the economic growth through direct and indirect channel in developing markets.

El-Wassal (2005) proceedings that the emerging stock markets capitalization has amplified 32 times and developed stock market’s capitalization has enlarged only 11 times among the period from 1980 to 2000. These illustrations the expansion of emerging stock markets capitalization is nearly three times larger than expansion of developed stock market’s capitalization. It is often debated that if stock market can predict the economy growth or vice versa. Furthermore studies have been done by Jefferis &Okeahalam(2000); Shirai(2004); Adajaski & Biekpe(2006) approve that larger increase in stock prices is a sign of forthcoming economic growth, in addition to large decrease in stock prices is an indication of future economic downturn.

Yartey & Adjosi (2007) examined the effect of stock markets development on economic growth for 15 African countries. The authors used the ratio of market capitalization to GDP as the stock market development indicator, the total value of shares traded relative to GDP, which is robust of liquidity of the stock markets. Stock markets turnover to GDP ratio as another liquidity indicator, the

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2These countries are: Argentina, Brazil, Chile, Colombia, Egypt, Greece, India, Indonesia, Korea, Rep., Malaysia, Mexico, Nigeria, Pakistan, Peru, Philippines, Portugal, South Africa, Thailand, Turkey, Venezuela and Zimbabwe.

3The African countries are: Botswana, Egypt, Cote d’Ivoire (BRVM), Ghana, Kenya, Malawi, Mauritius, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.
Macroeconomic variables include GDP as the economic growth development indicator, investment and trade openness (sum of exports and imports relative to GDP). They used the Difference Generalized Method of Moments dynamic instrumental variable modeling method to test the hypothesis of the study. They conclude that the total value of shares traded relative to GDP has a positive and significant effect on economic growth while the other stock market development indicators don't have any significant outcome.

A study made by Erdogan et al. (2012), relates the economic growth with the relationship between market liquidity (transaction volume of market / GDP) and stock market deepness (market value/GDP). In their study, the researchers used panel data for 23 countries during the period between 1991 and 2008. The results from the regression; the “macro liquidity deviations” (MLD), were found to have a predictive effect on current GDP growth. In other words, in the period of two years, an increase in market depth, not accompanied by an increase in market liquidity (resulting in negative MLD) can be used as an early signal of financial crisis.

Moreover, Brown & Nyeche (2016) examine the domineering of stock market on economic performance in Nigeria. The authors use mostly time series data based relating to market capitalization, total value traded ratio, real GDP per capita, inflation rate and trade openness of the economy during the period 1994 to 2008. Their results signify the standing of market capitalization’ liquidity has a positive effect on the state of the economy; all these conform to the expectation. Based on their findings, the authors recommend that the government of developing country should implement the improvements in place as this will enhance the market. Berger et al. (2017) also access the liquidity in relation with financial crises. However, it is mostly the bank liquidity analyses. The focus of study was on five financial crises (e.g. the 1987 stock market crush and the credit crunch of the early 1990s). After examining each case, the conclusion was that high liquidity creation relative to trend tends to be followed by financial recessions; an excessive liquidity creation may lead to financial struggle.
3.3. Critical Studies

Beside the literature in favor of the high predictive power of liquidity, there are studies that doubt this claim. Switzer & Picard (2015), also research the predictive power of current liquidity on stock market returns and on economic growth. They analyze the study of Naes et al. (2011) by stating that the framework of the latter is problematic; the study is based on a linear regression framework, while increasing evidence claim that macroeconomic variables follow non-linear behavior. The authors on the other hand use a non-linear approach to conclude that there is weak evidence that liquidity indicator as leading actor in predicting future economic settings. Likewise, a study is done by Zhu et al. (2002); conflicting to the study of Levine & Zervos (1998). The authors point out that the results of Levine and Zervos are driven by outliers in their model, which can be seen after implying a more careful set of controls for outliers. After re-examining the same set of data the authors came to a conclusion that from the overall sample of 47 countries, only the “Asian tigers” can present a positive and significant correlation between the stock market turnover and GDP growth, and that, only due a unique financial structure in those countries.

3.4. The Current Study

In view of that the link between stock market liquidity and economic growth has attracted limited interest in the literature; further evidence is needed in terms of market selection, empirical methods and the sample period, in order to fully understand this association. The present study contributes to the literature through number of ways. We shed further light in the literature with the use, for the first time, of data from two European stock markets, the UK and Italy. This study, analyzing the role of capital markets on economic growth in two developed countries; one of the Northern Europe and one country of the Mediterranean Sea, region where economies were mostly harmed during the recent financial crises; since they have not been cross-examined in the previous empirical literature.

\*These countries are: Taiwan, South Korea, Hong Kong, Singapore and Thailand.
4.1 The Real GDP Activity during the Period 2000-2016

Financial crisis has been the hot issue for discussions and economic studies over the last decade. The overabundance of investments in mortgage-backed securities, the bankruptcy of Lehman Brothers, the mortgage “bubble” burst in the US, and the consequences that followed had a domino effect for economies, which were harmed at a bigger or smaller level. What started in 2008 as banking crisis, rapidly turned into the 2009 global recession.

Rise of interest rates, borrowers’ defaults, and crash in the housing and stock market spread to European banks through the mortgage-backed securities. The housing recession, in combination with banking-rescue packages, proved to be an unbearable burden for the peripheral European countries. The mutual dependency between sovereigns and banks in those countries proved to be problematic. With public finances struggling and banks’ situation worsening, the whole European financial system was threatened. Thus, since 2010, some countries found themselves being supported by the European rescue effort. Stress tests and transparency were now on the agenda to prevent Euro area sovereigns from defaulting. Some called it a threat, while others called it a wealth opportunity.

An important measure that was affected was GDP, which fell in real terms in all European countries by an average of 4.3%. Unemployment, which is also an important economic indication, increased in most European countries between 3% and 14%. Among the countries worst affected by the property bubble were Italy, Spain, and Ireland, where demand for housing contemporaneously fell and banks subsequently collapsed.

In general terms Italy is one of the most affected by the global recession countries in EU. With Spain and Ireland, Italy was highly affected by the property bubbles; demand for housing contemporaneously fell and banks collapsed afterwards. GDP of Italy decreased by 1.2% and 5.1% in 2008 and 2009 accordingly, at the time that the rest European countries had an average increase of 0.5% and a decrease of 4.3%. A year after, as presented in figure2, Italy showed a modest recovery in 2011; there was a significant growth in the Real GDP rate. On a long-term period, Italian GDP was growing on average by 1.7% from 1982
until 2017. According to OECD database, GDP growth of Italy is projected to reach the level of 1.5% in 2018 and 1.3% in 2019.

**Figure 2.** Real GDP growth of Italy (2000-2018)

Source: CEIC (ceicdata.com)

Healthcare expenditures in Italy reduced in the period 2006-2011 by 0.6%, compared to the 9.4% in other regions. The overall healthcare expenditures made up a 9.2% of GDP in 2010, 1.1% higher than 2001. According to a report by ISTAT (Italian National Statistics Bureau), 18.2% of Italians were at ‘risk-at poverty’ at the end of 2011. This number remained stable from the start of the recession, nevertheless, it was much higher than in countries of comparable size e.g. France and Germany (13.5% and 15.6% accordingly).

Despite the downturns, however, Italy managed to maintain positive public deficits. This finds Italy to be at a better position that most other European countries, which have high public deficits and subsequently high public debt. Despite that Italian economy is one of the biggest economies in Europe; it has exceptionally high public debt and a weak banking sector.

On the other hand, as shown in figure 3, UK economy seems to perform well; the growth rate of real GDP has steady increasing trend, but the fact that there have been three downturns in the economy during the period 1980 -1992, UK economy experience
in 2008, for the first time a sharp fall in GDP, but there was a recovery situation in 2010. Over the period 1980-2014 UK’s real GDP had an average growth rate of 2.2% per year. In 2014 indicatively, UK GDP per head was 87% higher than thirty years ago.

Figure 3. Real GDP growth of UK (1980-2014)

Source: Office for National Statistics (visual.ons.gov.uk)

UK does not defer much from the average of the rest European countries in terms of GDP, in fact from 2008 to 2012 no important differences may be observed. After 2012, though, UK’s economy started to perform better. Housing starts, an interesting measure to observe, presented the highest indications in 2009 and 2014. In terms of GDP outputs components, services steadily hold the first place of UK income after 2008 accounting for three-quarters of the UK economy, while manufacturing, production and constructions fluctuate but seem to be at levels close to each other.

Figure 4. UK GDP output components (2008-2014)

Source: ‘UK GDP: five key charts’, The Guardian
Someone could wonder how financial crisis affected the UK economy. The consequence of this recession in the financial sector is indeed a milestone in UK’s and EU’s history. An opinion that is expressed by some analysts, could be synopsized in the words of Lord Darling (Labor MP Candidate in 2015 elections); “I don’t think Brexit would have happened if it hadn’t been for the political and economic events of the preceding 10 years. People were disillusioned. They felt badly treated. They felt squeezed.”

Not long after 2008 were announced the news about a possible Brexit which brought uncertainty and influenced future investments decisions of the firms both public and private. Investors started considering whether to invest in such conditions and of a probability to seek for more friendly environments to invest their capital.

The results of the Brexit announcement can already be seen. FTSE100 and FTSE 250 indices had been growing since 2016, but their performance is skewed by the proportion of foreign companies listed. These overseas firms are the reason that the indices show a good performance; UK stocks on the other hand seem to underperform. Inflation also didn’t show any good indications, in fact reducing real income at the time that British pound made a dive of 10%, taking the lowest price against dollar since 1985, at $1.35.

Furthermore, the decrease of financing from capital markets was almost at one-fifth in 2016. While in 2015 financing from capital markets was at £22,6bn, in 2016 it fell to
£18.4bn. Companies decided to postpone any IPOs and new listings. Many deals have been either cancelled or pulled, while prices have been reduced.5

These trends mean that possible changes in economic policy created not stable prospective. UK capital market suffered from lack of trust, investors preferred other ways of investing rather that bonds and stocks. Companies from their side had to find other sources of financing, for example by taking loans. At the time even government’s attempt to persuade companies to issue more debt did not bring capital market at the point it was before.

The British vote to leave EU has shocked the financial markets, causing effects comparable to the start of the financial crisis of 2008. The London’s status as the financial capital of Europe and world is questioned now, and even more if it losses it’s ‘passporting’ rights and will not be any more the place where European banks can reside and sell their products to the rest countries of the Union. The ‘no deal’ outcome doesn’t put positive perspectives on the future of UK finances; OECD predicts that this case could wipe £40 billion off the UK’s GDP growth by the end of 2019.

4.2. London Stock exchange and Borsalitaliana Description

The United Kingdom (UK) may be the sixth largest national economy in the world, but it houses the world’s largest financial center alongside New York. Actually, London is one of the largest cities in the world and with the highest city gross domestic product (GDP) in Europe. This makes the UK a very important financial hub for international investors. Moreover, London Stock Exchange (LSE) is one of the world’s oldest stock exchanges and can trace its history back more than 300 years. The London Stock Exchange has a market capitalization of over six trillion US dollars; making London Stock of Exchange the third largest stock exchange in the world. There are around 3,000 companies from over 60 countries listed on the exchange, including those from Africa, China, Latin America, Europe, and Asia. London Stock Exchange Group was created in October 2007 when London Stock Exchange merged with Milan Stock Exchange, Borsalitaliana, creating Europe’s most

diversified Exchange Group. General information about two indices of interest (FTSE 100 and FTSE MIB), are presented in Table 1.

Table 1: General Information about the two indices

<table>
<thead>
<tr>
<th>Index</th>
<th>FTSE100</th>
<th>FTSEMIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>1.21BLN(11/30/17)</td>
<td>419.43MLN(12/01/17)</td>
</tr>
<tr>
<td>Trading Hours</td>
<td>08:00-16:50</td>
<td>08:00:16:40</td>
</tr>
<tr>
<td>Currency</td>
<td>GBP</td>
<td>EUR</td>
</tr>
</tbody>
</table>

Source: Bloomberg database

4.2.1 UK Financial Times Stock Exchange 100 Index (FTSE100)

The FTSE100 is an index of share prices of the largest 100 companies listed on the London Stock Exchange (LSE) by market capitalization. The index was launched on January 3, 1984 at a base value of 1000, and the index level is calculated in real-time. The FTSE 100 represents approximately 81% of the entire market capitalization of the LSE, it has a high performance as presented in figure 6 and even though it doesn’t encompass the whole market, it is widely viewed as the best indicator of the health of UK stocks. Recently, however, given the uptick in international companies counted in the FTSE 100, this particular market index is no longer viewed as the best health indicator of the UK economy that goes to the FTSE 250, which has a smaller proportion of multinationals among its constituents.

Figure 6: Representation of FTSE 100 performance

Source: Trading View database
4.2.2 Milano Indice Di Borsa (FTSE-MIB)

The FTSE-MIB is the benchmark stock market index for the Borsalitaliana, the Italian national stock exchange. It has market capitalization of € 2.37 Trillion. The index consists of the 40 most-traded stock classes on the exchange. The index was administered by Standard and Poor’s until this responsibility was passed to FTSE Group, which is 100% owned by the Borsalitaliana parent company London Stock Exchange Group. We can observe that the performance of FTSE-MIB index was performing better before 2008 crises, and it has recovered in the year 2012, its performance is getting better but in lower rates than pre crises ones as presented in figure 7.

Figure 7: Representation of FTSE MIB performance

![FTSE MIB performance graph](image)

Source: Trading View databases
CHAPTER FIVE: METHODOLOGY

5.1 The Model Specification

In order to allow comparability with preceding studies, and the valuation of the bias that results from neglecting the dynamic nature of economic growth models. The model’s endogenous variable is defined to be the growth rate of the countries’ real GDP. That is, the variable $\Delta y_{t-1}$ in relations (4) and (5) below. As it is well known, the definition of a macro-variable’s growth rate, say $Y$, is based on the nature of the variable with respect to time. If $Y$ is treated as a discrete time variable $(Y_t)$, then its growth rate is defined as:

$$g_{Y,t} = \frac{Y_t - Y_{t-1}}{Y_{t-1}}, \quad \text{with } t \in \mathbb{N}^*$$

(3)

Moreover, considering the difference in market characteristics between Italy and UK; we consider equity controls for growth model in the case of UK, and non-equity controls for the one of Italy. The built models according to equation (2) presented as follows:

- UK growth model:
  $$\Delta y_{t+1} = \alpha + \beta_1 XLIQ_t + \beta_2 CRI + \beta_3 V_t + u_t$$
  (4)

- Italy growth model:
  $$\Delta y_{t+1} = a + \beta_1 XLIQ_t + \beta_2 CRI + \beta_3 ST_t + \beta_4 HSG_t + u_t$$
  (5)

The description and theoretical hypothesis for the model dependent and explanatory variables are presented in table 2. The detailed explanation about each variable is presented in Hypothesis and variables section.
### Table 2: Theoretical Discussion (Hypotheses) and Expected Sign of the Explanatory Variables

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Variable</th>
<th>Exp. Sign</th>
<th>Variable Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta y_{t+1}$</td>
<td>Real GDP Growth Rate</td>
<td>+</td>
<td>Dependent variable, Quarterly real GDP growth rate over the period 2000-20016</td>
</tr>
<tr>
<td>$XLIQ_t$</td>
<td>Illiquidity Proxy</td>
<td>-</td>
<td>The main explanatory variable, $XLIQ_t$ is a vector of the liquidity measures (ILR or RS).</td>
</tr>
<tr>
<td>$CRI_t$</td>
<td>Crises Dummy</td>
<td>-</td>
<td>Economic reform dummy variable.</td>
</tr>
<tr>
<td>$V_t$</td>
<td>Stock Market Volatility</td>
<td>-</td>
<td>Equity control variable.</td>
</tr>
<tr>
<td>$ST_t$</td>
<td>Short Term Interest Rate</td>
<td>-</td>
<td>Non-Equity Control Variable.</td>
</tr>
<tr>
<td>$HSG_t$</td>
<td>Housing Starts Growth Rate</td>
<td>+</td>
<td>Non-Equity Control Variable.</td>
</tr>
</tbody>
</table>

*Sources: Apergis et al (2015)*

### 5.2. Hypothesis and Variables

The main objective of this study is to examine the information content of stock market liquidity, based on firm-level data, to describe the course of economic performance, after controlling for the economic reform and  for a number of equity (i.e. stock market volatility) and non-equity (i.e., housing starts, and short-term interest rates) factors. In doing so, we apply alternative liquidity proxies to different indicators of economic growth, while we utilize a sample of stocks sourced from one of the largest European stock market, i.e. the London Stock Exchange as a representation for Northern European developed market and Milan Stock denotes Mediterranean Sea European market that mostly affected during the recent financial crises. The explanatory variables of stock market liquidity, economic reform and the main determinants of economic growth are selected according to the insights provided by the economic theory and prior empirical literature as follows.
a) The Real GDP growth rate \( (GDPG_t) \): denotes the dependent variable; to measure economic growth, we use the real GDP series which are sourced from the FRED database on a quarterly basis are chained volume estimates and seasonally adjusted.

b) Liquidity Measure \( (XLIQ_t) \): As the liquidity measures are representing the main independent variable in this study. There are numerous indicators developed in the literature that stab to measure stock market liquidity. The high frequency liquidity measures require intraday data on bid/ask quotes, order flows, volume of trades etc., which are not available for a long period of time. Thus, we implement low frequency liquidity measures that can be estimated with daily data, which are available for longer time periods. Besides, since liquidity is an unobservable characteristic of an asset market, which cannot be captured in a single measure, it is preferable to examine the issue with the use of a variety of liquidity measures. We use two alternative liquidity measures: illiquidity ratio (ILR) and the relative spread (RS). According to Goyenko and Ukhov (2009) and Goyenko et al. (2009), these two liquidity proxies capture the spread cost and the price impact when estimated with daily data. The basis for using ILR and RS is twofold. First, they are simple and straightforward to calculate and do not require a large amount of data or preventive molds as the more sophisticated proxies, such as the Roll (1984) and Lesmond et al. (1999) liquidity measures. Second, they are the most commonly used liquidity measures by practitioners and investment professionals and have been previously used in the relevant literature in other aspects of liquidity.

I. The Illiquidity Ratio \( (ILR_t) \): it captures the sensitivity of prices to trading volumes, since it is a measure of the elasticity dimension of liquidity. ILR is the ratio of absolute stock returns to monetary volume on a daily basis as presented in the following equation:

\[
ILR_{t,T} = \frac{1}{D_T} \sum_{t=1}^{T} \frac{|R_{i,t}|}{VOL_{i,t}}
\]

Where:

- \( D_T \) : is the number of observations within a time frame \( T \),
- \( |R_{i,t}| \) : is the absolute return at day \( t \) for stock \( i \), and \( VOL_{i,t} \) is the trading volume in monetary values at day \( t \) for stock \( i \).
ILR, is showing how much prices move for each monetary unit of trades. It is essentially provides an indicator of illiquidity. Since a high value indicates low liquidity; then ILR, has a negative effect on Real GDP growth rate.

Moreover, Amihud (2002) shows that the ILR is positively and significantly related to both the price impact and the fixed cost component estimates defined by Brennan and Subrahmanyam (1996). Also Hasbrouck (2009) shows that, the ILR is the outstanding available price-impact proxy made from daily data.

II. The Relative Bid/Ask Spread (RS). It is estimated as the ratio of the quoted spread (i.e., the differences between the best ask and bid quotes) over the midpoint price (i.e., the averages of the best ask and bid quotes) on a daily basis, the RS is calculated as:

\[ RS_{i,T} = \frac{1}{D_T} \sum_{i=1}^{T} \frac{(P_{ASK}^{i,T} - P_{BID}^{i,T})}{(P_{ASK}^{i,T} + P_{BID}^{i,T})/2} \]  

(7)

Where \( P_{ASK}^{i,T} \) and \( P_{BID}^{i,T} \) are ask and bid prices, respectively, at day t for stock i.

RS, is an illiquidity measure which provides a relative measure of trading costs and proxies for a percentage two-way transaction since a high spread indicates high illiquid market where the implicit costs of trading are high. High RS, indicates high illiquidity, and so RS, has a negative effect on real GDP growth rate.

The listed companies sample consists of all stocks listed on the FTSE100 and the FTSEMIB indices. In order to calculate the liquidity proxies, data on daily stocks prices, returns, and the trading volume for each company in the sample are sourced from Bloomberg and only stocks with available data are included into the sample. The time window of the study for the UK and Italy spans from 01/01/2000 to 31/12/2016.

c) Economic Reform Dummy (CRI): is represented by 2008- Financial crises situation that affected the economies understudy during the period 2000-2016. It takes the value 0 when there is no crisis and the value 1 when there is.

d) Controlvariable set: In order to account for the other financial variables that have been identified in the literature that can explain economic growth, we use a number of non-equity and equity controls as follows:
1. **Non-Equity Control Variables:**

- **Housing Starts Growth Rate** ($HSG_t$): is a leading economic indicator that reflects the growth rate of the privately owned new houses on which construction has been started over a given period. It includes a growth rate of the number of new single or multi-family houses as determined from the number of permits issued for construction of residential buildings. $HSG_t$ is estimated from housing starts series which are sourced from the OECD database on a quarterly basis. Real estate investments are good measure of expected demand for real estate. Since economic performance is reflected onto GDP, thus $HSG_t$ is expected to have a positive effect on real GDP growth rate. Several authors study housing starts, such as Green (1997), Kim (2000), Hui and Yiu (2003) and Iacoviello (2003). They suggest that residential shocks explain definitely the variation in GDP; they find a direct effect from housing prices to consumption, which, in turn, influences the course of economic growth.

- **Short-Term Interest Rates** ($ST_t$): are presented by the 3-month Treasury bills on Quarterly basis which is sourced from FRED data base on quarterly basis. $ST_t$ is expected to have a negative effect on GDP growth. There are numerous explanations for this relationship. One of them is that, Central Bank policy usually disturbs short-term rates more than long term rates. When monetary policy is narrowing, short-term rates tend to rise and the economy cools down. Expansionary monetary policy lowers short-term rates and the economy is being enthused. Another possible explanation is that market participants can predict economic downturns. When they expect there might be a recession in the next few quarters. They try to park their capital in longer-term financial instruments, which depresses long-term yields and leads to inverted yield curves, Kenny (2017).

2. **Equity Control Variable** is represented by **Stock Market Volatility** ($V_t$): measured as the cross section average standard deviation of daily returns of the sample stockover
the quarter6. The Stock Market Volatility is expected to have a negative effect on GDP growth. Stock; High volatility tends to associate with low economic growth rate and low volatility is associated with high economic growth rate. High economic growth rate tend to stabilize the investment decisions and create certainty among the investors. Under such situations, investors prevent to alter their investment decisions spontaneously with regard to good or bad news. A low growth rate, on the other hand, makes their investment decisions highly volatile, Kumar and Tamimi (2012).

5.3 The Sample and the Data
The sample of time series data (secondary), that covers the period 2000-2016 on quarterly bases. As our study considers two markets; London and Milan stock exchanges, the data that was collected aims at these two markets (FTSE100 for London and FTSE MIB for Milan). The currencies on national-based are considered. The sources are: Bloomberg, OECD and FRED database. Our sample consists of all listed companies on FTSE100 AND FTS-MIB indices in the London Stock Exchange and Milan Stock Exchange respectively; due to the lack of information for all listed companies on the indices of interest, as not all of them were listed during the whole study period; therefore the stocks information that covering the whole period under study are considered. It’s worth mentioning that the listed companies under study are the largest traded firms in both stock of exchanges, and the large firm stock price behave differently than the small one’ in the time of uncertainty.

Table 3 offers some descriptive statistics about the two liquidity proxies in London’s market, as well as about three other variables and Table 4 shows the results of correlation between those variables. A table 5 continues with descriptive statistics about the two liquidity proxies of Milan’s stock market and four other variables. However table 6 presents information about the correlation coefficients of these variables. Moreover, the listed companies understudy is presented in Appendix.

6The returns of FTSE100 and FTSE MIB are calculated from the prices that sourced from Bloomberg on daily basis.
### Table 3: Descriptive Statistics for UK: 2000-2016

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>0.004</td>
<td>0.005</td>
<td>0.015</td>
<td>-0.022</td>
<td>0.006</td>
<td>-2.289</td>
<td>9.758</td>
<td>188.774</td>
<td>0.00</td>
<td>68</td>
</tr>
<tr>
<td>V</td>
<td>0.010</td>
<td>0.009</td>
<td>0.034</td>
<td>0.004</td>
<td>0.005</td>
<td>1.899</td>
<td>8.442</td>
<td>124.749</td>
<td>0.00</td>
<td>68</td>
</tr>
<tr>
<td>CRI</td>
<td>0.059</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>0.237</td>
<td>3.750</td>
<td>15.063</td>
<td>571.636</td>
<td>0.00</td>
<td>68</td>
</tr>
<tr>
<td>ILR</td>
<td>0.112</td>
<td>0.042</td>
<td>0.589</td>
<td>0.006</td>
<td>0.145</td>
<td>1.625</td>
<td>4.614</td>
<td>37.314</td>
<td>0.00</td>
<td>68</td>
</tr>
<tr>
<td>RS</td>
<td>0.003</td>
<td>0.001</td>
<td>0.015</td>
<td>-0.003</td>
<td>0.003</td>
<td>1.430</td>
<td>4.441</td>
<td>29.047</td>
<td>0.00</td>
<td>68</td>
</tr>
</tbody>
</table>

Note: The descriptive statistics results are obtained using Eviews 8.0 Software for windows.

### Table 4: Probability Correlation Matrix (UK model): 2000-2016

<table>
<thead>
<tr>
<th>Correlation Probability</th>
<th>GDPG</th>
<th>V</th>
<th>CRI</th>
<th>ILR</th>
<th>RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>1</td>
<td>-0.4673</td>
<td>-0.8137</td>
<td>0.2234</td>
<td>0.2463</td>
</tr>
<tr>
<td>V</td>
<td>(0.00)</td>
<td>1</td>
<td>0.4943</td>
<td>-0.1440</td>
<td>0.1704</td>
</tr>
<tr>
<td>CRI</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>1</td>
<td>(0.07)</td>
<td>(0.16)</td>
</tr>
<tr>
<td>ILR</td>
<td>(0.04)</td>
<td>(0.05)</td>
<td>(0.15)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RS</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) P-values under in the parenthesis. (2) (GDPG = Real GDP Growth Rate), (CRI = The Dummy Variable representing the crisis), (ILR = the Amihud’s illiquidity ratio), (RS = the relative bid-ask spread), (V = Stock Market Volatility). (3) The correlation matrix results are obtained using Eviews 8.0 Software for windows.
Table 5: Descriptive Statistics for Italy Sample: 2000-2016

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>0.000</td>
<td>0.002</td>
<td>0.015</td>
<td>-0.028</td>
<td>0.007</td>
<td>-1.448</td>
<td>6.761</td>
<td>63.821</td>
<td>0.000</td>
<td>68</td>
</tr>
<tr>
<td>HSG</td>
<td>0.001</td>
<td>0.001</td>
<td>0.020</td>
<td>-0.022</td>
<td>0.013</td>
<td>-0.191</td>
<td>1.819</td>
<td>4.366</td>
<td>0.113</td>
<td>68</td>
</tr>
<tr>
<td>ST</td>
<td>0.005</td>
<td>0.005</td>
<td>0.012</td>
<td>-0.001</td>
<td>0.004</td>
<td>0.297</td>
<td>1.779</td>
<td>5.227</td>
<td>0.073</td>
<td>68</td>
</tr>
<tr>
<td>CRI</td>
<td>0.059</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>0.237</td>
<td>3.750</td>
<td>15.063</td>
<td>571.636</td>
<td>0.000</td>
<td>68</td>
</tr>
<tr>
<td>ILR</td>
<td>0.038</td>
<td>0.015</td>
<td>0.279</td>
<td>0.008</td>
<td>0.051</td>
<td>2.603</td>
<td>10.281</td>
<td>226.993</td>
<td>0.000</td>
<td>68</td>
</tr>
<tr>
<td>RS</td>
<td>0.003</td>
<td>0.001</td>
<td>0.022</td>
<td>-0.020</td>
<td>0.005</td>
<td>-0.125</td>
<td>10.757</td>
<td>170.676</td>
<td>0.000</td>
<td>68</td>
</tr>
</tbody>
</table>

Note: The descriptive statistics results are obtained using Eviews 8.0 Software for windows.

Table 6: Probability Correlation Matrix (Italy model): 2000-2016

<table>
<thead>
<tr>
<th>Correlation Probability</th>
<th>GDPG</th>
<th>HSG</th>
<th>ST</th>
<th>CRI</th>
<th>ILR</th>
<th>RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>HSG</td>
<td>0.4183</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
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<tr>
<td>ST</td>
<td>-0.1771</td>
<td>0.5244</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.00)</td>
<td></td>
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<tr>
<td>CRI</td>
<td>-0.6595</td>
<td>-0.3602</td>
<td>0.3005</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.01)</td>
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<tr>
<td>ILR</td>
<td>0.0809</td>
<td>0.4039</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.51)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS</td>
<td>-0.2139</td>
<td>-0.3129</td>
<td>-0.1370</td>
<td>-0.0318</td>
<td>0.0438</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.01)</td>
<td>(0.27)</td>
<td>(0.79)</td>
<td>(0.72)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) P-values under correlation coefficients. (2) (GDPG = Real GDP Growth Rate), (CRI = The Dummy Variable representing the crisis), (ILR = the Amihud’s illiquidity ratio), (RS = the relative bid-ask spread), (ST= The short term interest rate), (HSG = The Housing Starts variable). (3) The correlation matrix results are obtained using Eviews 8.0 Software for windows.
5.4. Econometric Methodology

5.4.1. Two Stage Least Squares (2SLS) Estimation Model

Anderson and Hsiao (1981, 1982) suggested an Instrumental Variables (IV) estimation method that leads to a consistent estimator. Two Stage Least Squares (2SLS) as instrumental variables (IV) approach is considered to estimate the models understudy; three reasons determine the selection of the estimation method. Firstly, considering data characteristics, we need to select a procedure that allows for the presence of non-observable determinants of economic growth. Secondly, particular properties of the dependent variable should be taken into account. Stock market performance has naturally cyclical dynamics, so that the methodology should permit a variable to show initial behavior. Thirdly, the endogeneity of such variables has to be controlled.

Two Stage least squares (2SLS) regression method is a statistical technique that is used in the analysis of structural equations. This technique is the extension of the ordinary least square method (OLS) method. It is used when the dependent variable’s error terms are correlated with the independent variables. In OLS method, there is a straightforward assumption that the value of the error terms is independent of explanatory variables. When this assumption is violated, 2SLS method helps us to solve this problem. This analysis assumes that there is a secondary predictor that is correlated to the problematic predictor but not with the error term.

Given the existence of the instrument variable\(^7\), two stages methods are used as follows: (1) in the first stage, a new variable is created using the instrument variable. (2) In the second stage, the model-estimated values from stage one are then used in place of the actual values of the problematic predictors to compute an OLS model for the response of interest, Angrist& Imbens (1995) and Bollen(1996). The 2SLS method is used to estimate the parameters of stochastic equations (4) and (5).

The first question concerns the specific form of the system of equations and the distinction between endogenous, exogenous and predetermined variables. According to Gujarati

\(^7\) An instrument variable is used to produce a new variable by changing the problematic variable.
(2003), this distinction is of vital importance in order to perform the Rank Condition of Identifiability and detect the system’s equations which are just identified, under identified or over identified. In the frame of equations (4), and (5) rewritten as follows:

$$
\Delta y_{t+1} = \alpha + \beta x_t + \sum_{i=1}^{p} (y_i \Delta y_{t+1-i}) + u_t
$$

Where: the vector $x_t$ is a set of explanatory variables, including our proxies of stock market liquidity, economic reform, and all control variables set. Also, $u_t$ is an error term. The lagged values of the endogenous variable appear on the right hand side of the equation in order to solve the problem of endogeneity. The upper bound of the sum of the predetermined endogenous variables, that is, parameter $p$, takes an integer value in the closed value interval $[0, p_{max}]$. This value, say $P^*$, is determined using the FPE or some other information criterion (AIC, SIC, Hannan – Quinn etc.). The arising at this point question is focused on the mathematical formula that is used in order to determine the value of the $p_{max}$ parameter. This value could be set equal to the square or third root of the available number of observations, that is, $p_{max} = \sqrt{T} = \sqrt{68} \approx 8$ or $p_{max} = \sqrt[3]{T} = \sqrt[3]{68} \approx 4$. Alternatively, its value could be determined endogenously in the frame of the following relation:

$$
p_{max} = \text{int}\left\{ h\left(\frac{T}{100}\right)^{\frac{1}{4}} \right\} = \text{int}\left\{ 12\left(\frac{68}{100}\right)^{\frac{1}{4}} \right\} = \text{int}\{10.897\} \approx 10 \text{ or } 11
$$

5.4.2. Some Necessary Tests

To consider the models under study, several tests would be applied before considered any estimated model. Therefore the following tests are considered:

1) The unit root test for both models is estimated as a start. Many economic time series data show having trending behavior. An important econometric obligation is determining the most suitable form of the trend in the data. If the data are trending, then some form of trend removal is vital, so we apply the unit root test. Unit root tests are used to confirm the stationarity of a series and its can be used to determine if data is stationary or not. But how do we test for a unit root? The primary work on testing for a unit root in time series was prepared by Dickey and Fuller(1979) The main objective of the test is to examine hypothesis that $\varphi=1$ using the following equation:

$$
y_t = \varphi y_{t-1} + u_t
$$
Where the null hypothesis: \( H_0 \): series contains a unit root, concludes that the series contain a unit root (the variables non-stationary) While the alternative hypothesis (\( H_1 \): series does not contain a unit root) confirms that the variables are stationary.

There are different forms for the Dickey Fuller tests regressions used to show the existence of unit-root test: without intercept and trend, with intercept only and with both intercept and trend as shown in the following forms:

1. The first: without trend and intercept:
   \[ \Delta Y_t = \varphi Y_{t-1} + u_t \]

2. The second: with intercept only
   \[ \Delta Y_t = \beta_0 + \varphi Y_{t-1} + u_t \]

3. The third: with both intercept and trend
   \[ \Delta Y_t = \beta_0 + \beta_1 t + \varphi Y_{t-1} + u_t \]

In order to study the existence of stationary series, we can employ the Augmented Dickey–Fuller (ADF), Phillips–Perron, ADF-GLS, and KPSS unit-root techniques. However, The KPSS method tests the hypothesis that there is no unit root (the series is stationarity) against the alternative of a unit root (non-stationarity). Also Phillips and Perron have developed a more inclusion theory of non-stationarity unit root. The tests are similar to ADF tests, but they insertion an automatic correction to the Dickey and Fuller procedure, and the test usually give the same conclusions as the ADF tests, but the computations of the test statistics are relatively complicated.

2) Serial correlation test: Lagrange Multiplier (LM) test for serial correlation is considered in the models estimation; it is available for residuals from either least squares or two-stage least squares estimation. The LM test may be used to test for higher order ARMA errors and is applicable whether there are lagged dependent variables or not. The null hypothesis of the LM test is: \( H_0 \) : That there is no serial correlation up to lag order, where \( P \) is a pre-specified integer. If null hypothesis is accepted, all instruments are uncorrelated with the error, \( LM \rightleftharpoons X_q^2 \) where \( q \) is the number of “extra” instruments, Godfrey (1988).
3) Heteroskedasticity Test, if the homoscedasticity assumption is true, then the variance of error terms should be constant. There are several Heteroskedasticity tests that are appropriate for both OLS and 2SLS regressions such as Breusch-Pagan-Godfrey (BPG), Harvey, ARCH LM test and White’s Heteroskedasticity test. The ARCH LM test is a Lagrange multiplier (LM) test for autoregressive conditional heteroskedasticity (ARCH) in the residuals is considered; its more recommended for financial time series. The Null hypothesis is: H0: there is no ARCH up to order in the residuals (Engle 1982).

4) Endogeneity test: the Regressors endogeneity test, also known as the Durbin-Wu-Hausman Test, tests for the endogeneity of some, or all, of the equation Regressors. By comparing the significant difference of using 2SLS model, the Durbin-Wu-Hausman test suggests that 2SLS seems appropriate. This is confirmed by the rejecting of the null hypothesis: H0: the regressors are exogenous(exogenous variables are those which are not explained by instruments). If the null is accepted this means the coefficients estimated by the 2SLS estimator are the same as the ones estimated by the OLS estimator, where the P-value is significant at the five percent level, but what if p-value is insignificant at five percent level?although the model with conditional homoscedasticity provides a useful theoretical benchmark, Green(2012).

5) Long-run relationship cointegration test: the Wald-test (F-statistic) is performed by daunting restrictions on the long-run coefficients in equation (4) and (5) respectively where:

\[ H_0: \beta_2 = \beta_3 = \beta_4 = 0 \quad H_0: \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0 \]
\[ H_1: \beta_2 \neq \beta_3 \neq \beta_4 \neq 0 \quad H_1: \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0 \]

If null hypothesis is accepted, it can be concluded that the variables aren’t co-integrated and that there is no long-run relationship among them. If the alternative hypothesis is accepted, then variables are co-integrated and there is a long-run relationship among them (Pesaran, Shin and Smith, 2001).
5.4.3. Causality Tests

Toda and Yamamoto (1995) recommend an alternative method for testing causality. The main clue is to exaggeratedly augment the correct order, \( K \), of the VAR by the maximal order of integration, say \( T_{\text{max}} \). The augmented VAR is then estimated and Wald tests for linear or nonlinear restrictions are carried out on the first \( K \) coefficient matrix, Caporale et al. (2004).

We use Toda-Yamamoto causality tests for testing statistical causality between stock market illiquidity measures and real GDP growth. The null hypothesis of Toda and Yamamoto causality test is: \( H_0: \) stock market illiquidity does not Granger-cause economic growth.

The Wald statistic converges in distribution to a random variable with \( m \) degrees of freedom, unrelatedly to whether the process is stationary, \( I(1) \), \( I(2) \), possibly around a linear trend or whether it is co-integrated. Moreover, their methodology requires some pretesting in order to determine the lag length of the procedure. Sims et al. (1990) demonstration that lag selection procedures, commonly employed for stationary VARs, which are based on testing the significance of lagged vectors by means of the Wald (or LM or LR) tests, are also valid for VARs with \( I(1) \) processes, which might show cointegration. We augment the bivariate VAR by the maximum order of integration in the series. In this case the variables turn out to be \( I(1) \). Therefore, we augment the bivariate VAR by one lag and test for non-causality zero restrictions on the parameters of the original VAR by carrying out Wald tests on the first \( K \) coefficient matrix (Toda and Yamamoto, 1995).
CHAPTER SIX: EMPIRICAL ANALYSES from UK SAMPLE

6.1. Baseline Estimates

As mentioned earlier in the Methodology chapter (chapter five), pre-tests should be applied beforehand estimating any model. Therefore, the unit root test for model variables and two illiquidity proxies is estimated as a start. Augmented Dickey Fuller (ADF) unit root test results are shown in table 7 for all variables included in the model. It can be noticed that the variables are integrated with same order of stationarity. All the variables are integrated at the zero level I (0).

Table 7: Augmented Dickey Fuller Unit Root Test Results for the Variables of Interest.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intercept</th>
<th>Intercept + Trend</th>
<th>None</th>
<th>Intercept</th>
<th>Intercept + Trend</th>
<th>None</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>(4.06)***</td>
<td>(4.09)***</td>
<td>(2.87)***</td>
<td>(9.64)***</td>
<td>(9.53)***</td>
<td>(9.69)***</td>
<td>I(0)</td>
</tr>
<tr>
<td>ILR</td>
<td>(4.85)***</td>
<td>(5.61)***</td>
<td>(1.70)*</td>
<td>(10.20)***</td>
<td>(10.11)***</td>
<td>(10.26)***</td>
<td>I(0)</td>
</tr>
<tr>
<td>RS</td>
<td>(3.65)***</td>
<td>(3.14)</td>
<td>(3.99)***</td>
<td>(10.86)***</td>
<td>(11.33)***</td>
<td>(10.57)***</td>
<td>I(0)</td>
</tr>
<tr>
<td>V</td>
<td>(4.13)***</td>
<td>(4.16)***</td>
<td>(1.90)*</td>
<td>(10.18)***</td>
<td>(10.10)***</td>
<td>(10.25)***</td>
<td>I(0)</td>
</tr>
<tr>
<td>CRI</td>
<td>(3.16)**</td>
<td>(3.13)</td>
<td>(3.07)***</td>
<td>(6.60)***</td>
<td>(6.55)***</td>
<td>(6.65)***</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Notes: (1) The value in brackets at the variable column represents the t statistics in the ADF test (2) *** Stationarity at 1%, ** stationarity t 5% * stationarity at 10%. (3) Results are obtained using Eviews 8.0 Software for windows.

To forecast long-run relationships among the variables in the model; after performing the ADF unit root test, we apply instrumental variable 2SLS on our data sample for United Kingdom over the period 2000-2016. As well, the explanatory variables enter the simple growth equation (4) with the lagged values as instruments. Next, we experiment with the alternative measures of stock market liquidity ILR and RS. Table 8 and table 9 present the estimation results of 2SLS over equation (4) using ILR and RS respectively as substitutions for illiquidity in the stock market, along with the key diagnostics such as F-Statistic, R-Squared, Wald test for joint significance (P-value), and Durbin-Wu-Hausman test (P-value), to check whether 2SLS significantly different from OLS estimates.
Table 8: Growth and Stock Market Equation (4): 2SLS Estimates

<table>
<thead>
<tr>
<th>Lags=8</th>
<th>Explanatory Variables</th>
<th>Dependent Variable: Real GDP Growth</th>
<th>Instrumental Variables (2SLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>0.0078***(5.47)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ILR</td>
<td>0.0093*(1.87)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CRI</td>
<td>-0.0190***(-6.49)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>-0.3127**(2.07)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R-Square</td>
<td>0.670</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F-Statistic</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wald -Test (P value)</td>
<td>(38.60) 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Durbin-Wu-Hausman test (P value)</td>
<td>0.031</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial correlation (P value)</td>
<td>0.135</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heteroscedasticity (P value)</td>
<td>0.905</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) Lags = shows the number of lags of the explanatory variables used as the instruments in the regression (2) t-statistics in parentheses. ***1% significance level, **5% significance level, and *10% significance level. (3) The estimation results are obtained using Eviews 8.0 Software for windows.

Table 9: Growth and Stock Market Equation (4): 2SLS Estimates

<table>
<thead>
<tr>
<th>Lags=4</th>
<th>Explanatory Variables</th>
<th>Dependent Variable: Real GDP Growth</th>
<th>Instrumental Variables (2SLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>0.0083 ***(5.90)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RS</td>
<td>0.4680 **(2.38)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CRI</td>
<td>-0.0188 ***(-5.98)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>-0.390 **(-2.51)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R-Square</td>
<td>0.692</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F-Statistic</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wald -Test (P value)</td>
<td>(43.83) 0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Durbin-Wu-Hausman test (P value)</td>
<td>0.014</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial correlation (P value)</td>
<td>0.052</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heteroscedasticity (P value)</td>
<td>0.0855</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) Lags = shows the number of lags of the explanatory variables used as the instruments in the regression (2) t-statistics in parentheses. ***1% significance level, **5% significance level, and *10% significance level. (3) The estimation results are obtained using Eviews 8.0 Software for windows.

In abovementioned tables, we choose the most fitting model to afford the valid “good” instruments, which are correlated with the endogenous variable and at the same time orthogonal to the errors. The estimation starts with all the Regressors included, and
instrumented with the eighth lagged value when substituting the illiquidity proxy (ILR) and fourth lagged value for their levels in the case of applying (RS) as a proxy of illiquidity. By comparing the significant difference of using 2SLS model, the Durbin-Wu-Hausman test suggests that 2SLS seems appropriate using both cases. This is confirmed by the rejecting of the null hypothesis that the coefficients estimated by the 2SLS estimator are the same as the ones estimated by the OLS estimator, where the P-value is significant at the five percent level. Moreover, the Wald-test (F-statistic) results indicate that both models variables are co-integrated and there is a long run relationship among them. As well there is no serial correlation or hetroskedasticity in the model estimates, so our model estimates are consistent.

On the other hand, from R-squared obtained from both models, we can conclude that the model obtained by employing RS as a measure for illiquidity is explaining 69% of variations in the real GDP growth rate. While the results obtained from the model by employing ILR measure explaining 63% of the variations in the real GDP activity. The R-Squared values are in both cases greater than 50% and so the models are accepted.

The coefficient estimates results for ILR and RS display some variations in the form of value and level significance, the estimated coefficients ILR ratio is 0.01 and it’s significant at the level of ten percent while RS ratio is 0.47 and it’s significant at five percent level. However they are similar in the form of sign of the relationship, they both have a significant positive effect on the real GDP growth during the period under study. In contrast, from one handed the control variables results exhibit some variations in terms of coefficients values, on the other hand, they are similar in terms the level of significance and relationship sign, where the Crises proxy (cri) is negative and significant at the one percent level. The stock market volatility effect is negative and significant at the five percent significance level.

The results obtained from applying both proxies, suggest that there is a positive effect of stock market illiquidity on the real GDP growth in the long run. This result motivate us to observe saving rate in UK during 2000-2016 as shown in figure 8, we can observe that UK saving rate is decreasing during the period of the study; since UK capital-based market and foremost developed economy in Europe; providing more liquidity to the market, that may shift a composition of saving into capital and by reducing uncertainty, increasing liquidity
may diminish saving rates enough to acquire a negative effect on real GDP growth rate. This result is in the same line with previous study done by Bencivenga and Smith (1991).

Figure 8: Saving Rate as a percentage of GDP for UK

On the other hand, our results regarding stock market volatility effect on the real GDP growth rate is as expected and it’s settle previous studies that have been done by Estrella and Mishkin (1998); Rudebusch and Williams (2009); Wright (2006); Meichle et al. (2011); Næs et al. (2011) and Apergis et al. (2015). As well the effect of Crises proxy is as expected and it has a strongly significant negative effect on the real GDP growth rate.

6.2. Causality Tests

To determine the causal relationship between illiquidity measures and real economic activity in the short run, we apply Toda and Yamamoto causality test using the maximum number of lags \( p = 11 \) that are chosen based on Schwarz Information Criterion (SIC). The results of causality tests are presented in table 10. The table shows Granger causality tests between the real GDP growth and (a) the Amihud ILR, (b) the relative spread (RS). The cross-sectional liquidity measures are calculated as equally weighted averages across stocks. The test is performed for the whole sample period for the UK from 2000 to 2016. For each measure, we first test the null hypothesis that macro variable does not Granger cause market illiquidity and whether market illiquidity does not Granger cause the macro variable.
The results in parentheses denote the sign of the association between the variables under investigation.

The results obtained from both illiquidity proxies ILR and RS, shows there is no causal relationship between illiquidity towards the real GDP in the short-run, while the interesting finding that the relationship is different in terms of the effect of Real GDP growth on stock market liquidity, it proves that there is a reverse relationship in the short run, that the GDP courses the stock market illiquidity; so we conclude that in the short run, there is only one way causality running from Real GDP growth towards Illiquidity ratio ILR.

Table 10: Causality tests for UK (large Firms)

<table>
<thead>
<tr>
<th>Dependent Variable: Real GDP Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiquidity Ratio (ILR):</td>
</tr>
<tr>
<td>$H_0: \Delta ILR \neq \Delta GDPG$</td>
</tr>
<tr>
<td>$X^2$-test</td>
</tr>
<tr>
<td>$p$-Value</td>
</tr>
</tbody>
</table>

| $H_0: \Delta GDPG \neq \Delta ILR$ |  
| $X^2$-test                         | (-) |
| $p$-Value                          | 37.80 |
|                                 | (0.00)**|

Relative Spread(RS):

| $H_0: \Delta RS \neq \Delta GDPG$ |  
| $X^2$-test                         | 10.74 |
| $p$-Value                          | (0.47) |

| $H_0: \Delta GDPG \neq \Delta RS$ |  
| $X^2$-test                         | 5.19 |
| $p$-Value                          | (0.92) |

Notes: F-test values and corresponding p-values (in parentheses) for each test. ***Denotes a rejection of the null hypothesis of causality at the 1% level. (3)The estimation results are Obtained using Eviews 8.0 Software for windows.
CHAPTER SEVEN: EMPIRICAL ANALYSES FROM ITALY SAMPLE

7.1 Baseline Estimates

The unit root test for the included variables in the model estimated as a start. Augmented Dickey Fuller (ADF) unit root test results are shown in table 11 for all variables included in the model. It can be observed that the variables are integrated with same order of stationarity. All the variables are integrated at the zero level I(0).

Table 11: Augmented Dickey Fuller Unit Root Test Results for the Variables of Interest.

<table>
<thead>
<tr>
<th>Variable</th>
<th>intercept</th>
<th>intercept + trend</th>
<th>none</th>
<th>intercept</th>
<th>intercept + trend</th>
<th>none</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>-3.89***</td>
<td>-3.85***</td>
<td>-3.91***</td>
<td>-8.97***</td>
<td>-8.96***</td>
<td>-9.40***</td>
<td>I(0)</td>
</tr>
<tr>
<td>ILR</td>
<td>-4.01***</td>
<td>-4.63***</td>
<td>-3.49***</td>
<td>-8.61***</td>
<td>-7.76***</td>
<td>-8.61***</td>
<td>I(0)</td>
</tr>
<tr>
<td>RS</td>
<td>-4.12***</td>
<td>-4.19***</td>
<td>-3.52***</td>
<td>-7.92***</td>
<td>-7.86***</td>
<td>-7.98***</td>
<td>I(0)</td>
</tr>
<tr>
<td>HSG</td>
<td>-1.75</td>
<td>-1.88</td>
<td>-1.81*</td>
<td>-8.96***</td>
<td>-8.95***</td>
<td>-9.00***</td>
<td>I(0)</td>
</tr>
<tr>
<td>ST</td>
<td>-2.07</td>
<td>-3.07</td>
<td>-2.11**</td>
<td>-4.40***</td>
<td>-4.36***</td>
<td>-4.28***</td>
<td>I(0)</td>
</tr>
<tr>
<td>CRI</td>
<td>-3.16**</td>
<td>-3.13</td>
<td>-3.13***</td>
<td>-6.60***</td>
<td>-6.56***</td>
<td>-6.65***</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Notes: (1) The value in brackets at the variable column represents the t statistics in the ADF test (2) *** Stationarity at 1%, ** stationarity at 5% * stationarity at 10%. (3) Results are obtained using Eviews 8.0 Software for Windows.

To forecast long-run relationships among the variables in the Italy sample model; we followed the same methodology that have been applied for UK sample model. After performing the ADF unit root test, we apply instrumental variable 2SLS on our data sample for Italy over the period 2000-2016. In addition, the explanatory variables enter the simple growth equation (5) with the lagged values as instruments. Next, we experiment with the alternative measures of stock market liquidity ILR and RS. Table 12 and table 13 present the estimation results of 2SLS over equation (5) using ILR and RS respectively as substitutions for illiquidity in the stock market, along with the key diagnostics such as F-Statistic, R-Squared, Wald test for joint significance (P-value), and Durbin-Wu-Hausman test (P-value), to check whether 2SLS significantly different from OLS estimates.
Table 12: Growth and Stock Market Equation (5): 2SLS Estimates

<table>
<thead>
<tr>
<th>Lags=10</th>
<th>Explanatory Variables</th>
<th>Dependent Variable: Real GDP Growth Instrumental Variables (2SLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>0.005519 ***(4.06)</td>
</tr>
<tr>
<td></td>
<td>ILR</td>
<td>-0.0559**(-2.40)</td>
</tr>
<tr>
<td></td>
<td>CRI</td>
<td>-0.0117***(3.10)</td>
</tr>
<tr>
<td></td>
<td>HSG</td>
<td>0.2484 ***(3.28)</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>-0.5070***(2.03)</td>
</tr>
<tr>
<td></td>
<td>R-Square</td>
<td>0.571</td>
</tr>
<tr>
<td></td>
<td>F-Statistic</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Wald -Test (P value)</td>
<td>(18.24) 0.00</td>
</tr>
<tr>
<td></td>
<td>Durbin-Wu-Hausman test (P value)</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>Serial correlation (P value)</td>
<td>0.126</td>
</tr>
<tr>
<td></td>
<td>Heteroscedasticity (P value)</td>
<td>0.0593</td>
</tr>
</tbody>
</table>

Notes: (1) Lags = shows the number of lags of the explanatory variables used as the instruments in the 2SLS regression (2) t-statistics in parentheses. ***1% significance level, **5% significance level, and *10% significance level. (3) The estimation results are obtained using Eviews 8.0 Software for windows.

Table 13: Growth and Stock Market Equation (5): 2SLS Estimates

<table>
<thead>
<tr>
<th>Lags=10</th>
<th>Explanatory Variables</th>
<th>Dependent Variable: Real GDP Growth Instrumental Variables (2SLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>0.0043***(3.67)</td>
</tr>
<tr>
<td></td>
<td>RS</td>
<td>-0.3796***(2.30)</td>
</tr>
<tr>
<td></td>
<td>CRI</td>
<td>-0.0155***(4.02)</td>
</tr>
<tr>
<td></td>
<td>HSG</td>
<td>0.1529*(1.92)</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>-0.4377*(-1.76)</td>
</tr>
<tr>
<td></td>
<td>R-Square</td>
<td>0.589</td>
</tr>
<tr>
<td></td>
<td>F-Statistic</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Wald -Test (P value)</td>
<td>(21.19) 0.00</td>
</tr>
<tr>
<td></td>
<td>Durbin-Wu-Hausman test (P value)</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>Serial correlation (P value)</td>
<td>0.094</td>
</tr>
<tr>
<td></td>
<td>Heteroscedasticity (P value)</td>
<td>0.162</td>
</tr>
</tbody>
</table>

Notes: (1) Lags = shows the number of lags of the explanatory variables used as the instruments in the 2SLS regression (2) t-statistics in parentheses. ***1% significance level, **5% significance level, and *10% significance level. (3) The estimation results are obtained using Eviews 8.0 Software for windows.
In aforesaid tables, we choose the most fitting model to afford the valid “good” instruments, which are correlated with the endogenous variable and at the same time orthogonal to the errors. The estimation starts with all the Regressors included, and instrumented with the tenth lagged value for their levels. By comparing the significant difference of using 2SLS model, the Durbin-Wu-Hausman test suggests that 2SLS seems fitting using the case of using illiquidity ratio (ILR) proxy. This is confirmed by the rejecting of the null hypothesis of Durbin-Wu-Hausman test that the regressors are exogenous. While the results obtained by using relative spread (RS) fails to reject the null hypothesis of Durbin-Wu-Hausman test, but the model does not suffer from Heteroscedasticity, in this case the 2SLS estimator is consistent and its better in explaining the relationship than OLS estimator. Moreover, the Wald-test (F-statistic) results indicate that both models variables are co-integrated and there is a long run relationship among them. Moreover both models are consistent (they don’t confront heteroskedasticity or serial correlation).

On the other hand, from R-squared obtained from both model estimates, we can conclude that the model obtained by employing ILR as a measure for illiquidity is explaining 57.1% of variations in the real GDP growth rate. While the results obtained from the model by employing RS measure explaining 58.9% of the variations in the real GDP activity. The R-Squared values are in both cases greater than 50% and so the models are accepted.

The coefficient estimates results for ILR and RS display some variations in the form of value; the estimated coefficient of ILR ratio is approximately -0.05 and it’s significant at the level of five percent while RS ratio is approximately -0.38 and it’s significant at five percent level as well. However they are similar in the form of sign of the relationship, they both have a significant negative effect on the real GDP growth during the period under study at the significance level of five percent. The interesting result is the crises proxy has a negative and significant effect in both obtained results at one percent significance level, and the difference in coefficient value is slightly small it’s approximately -0.012 in the case of ILR proxy, while it is round -0.015 in case of RS. On the other hand, the control variables results exhibit some variations in terms of coefficients values and significance level, in both results they have the expected signs that are in parallel with previous literature, the effect of housing starts is positive and significant on the real GDP activity and the short term has a significant negative effect on the Real GDP growth in the long run relationship and si(cri) is negative and
significant at the one percent level. The stock market volatility effect is negative and significant at the five percent significance level.

The results obtained from applying both proxies, suggest that there is a negative effect of stock market illiquidity on the real GDP growth in the long run. This result is expected it’s in the same line to the theory (stock market liquidity and economic growth ) implying that stocks are more liquid and more easily trading. Also this findings agree and results of most of the empirical research (i.e Arestis et al. (2001), Næs et al. (2011) Florackis et al. (2014a) and Apergis et al.(2015).)

On the other hand, the non-equity control variables proved to be useful in explaining the economic activity; our result regarding housing starts growth rate (HSG) effect on the real GDP growth activity is as expected and it is settle with previous studies that that have been done by Estrella and Mishkin.(1998); Rudebusch and Williams.(2009); Wright.(2006); Meichle et al. (2011); Næs et al.(2011) and Apergis et al.(2015). The other non-equity oriented control variable is the Short-term interest rates (ST) have a statistically significant and negatively related relationship with economic activity. These results hold in across both illiquidity proxies, they are as expected by theoretical arguments and consistent with the previous empirical evidence that have been done by Estrella and Mishkin, 1998; Rudebusch and Williams.(2009); Wright.(2006); Meichle et al.(2011); Næs et al. (2011); Apergis et al.(2015).

As well, the results of Crises proxy hold in across both illiquidity proxies and it is as expected and it has a strongly significant negative effect on the real GDP growth rate.

7.2. Causality tests

To determine the causal relationship between Illiquidity measures and real GDP activity in the short run, we apply Toda and Yamamoto causality test using the maximum number of lags ( \( p =10 \) ) that are chosen based on Schwarz Information Criterion (SIC). The results of causality tests are presented in table 14. The table shows Granger causality tests between the real GDP growth and (a) the Amihud ILR, (b) the relative spread (RS). The cross-sectional liquidity measures are calculated as equally weighted averages across stocks. The test is performed for the whole sample period for the Italy from 2000 to 2016. For each measure, we first test the null hypothesis that illiquidity does not Granger cause the real
GDP growth and whether Real GDP growth does not Granger cause the illiquidity macro variable. The results in parentheses denote the sign of the association between the variables under investigation. The exciting findings show there is a causal relationship between illiquidity towards the real GDP in the short-run when RS as the illiquidity proxy only. On the other hand, the relationship is different in terms of the effect of Real GDP growth on stock market liquidity, it proves that the real GDP growth activity does not cause the illiquidity in the short-run (results hold in across both illiquidity proxies). We conclude that in the short run, there is only one way causality running from Real GDP growth towards illiquidity ratio (RS). These findings are compatible with the forward-looking nature of liquidity associated to the stock market as recommended by Fama (1991). In addition, it recognizes the importance of market liquidity as a component of the financial system in the process of economic growth, gaining further support by the argument put forward by Levine and Zervos (1998).

Table 14: Causality tests for Italy (large Firms)

<table>
<thead>
<tr>
<th>Dependent Variable: Real GDP Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiquidity Ratio (ILR):</td>
</tr>
<tr>
<td>$H_0: \Delta ILR \not\rightarrow \Delta GDPG$</td>
</tr>
<tr>
<td>$X^2$-test</td>
</tr>
<tr>
<td>$p$-Value</td>
</tr>
<tr>
<td>$H_0: \Delta GDPG \not\rightarrow \Delta ILR$</td>
</tr>
<tr>
<td>$X^2$-test</td>
</tr>
<tr>
<td>$p$-Value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relative Spread (RS):</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0: \Delta RS \not\rightarrow \Delta GDPG$</td>
</tr>
<tr>
<td>$X^2$-test</td>
</tr>
<tr>
<td>$p$-Value</td>
</tr>
<tr>
<td>$H_0: \Delta GDPG \not\rightarrow \Delta RS$</td>
</tr>
<tr>
<td>$X^2$-test</td>
</tr>
<tr>
<td>$p$-Value</td>
</tr>
</tbody>
</table>

Notes: F-test values and corresponding p-values (in parentheses) for each test. *** Denotes a rejection of the null hypothesis of causality at the 1% level. (3) The estimation results are obtained using Eviews 8.0 Software for windows.
CHAPTER EIGHT: CONCLUSIONS

The present research investigates the stock market liquidity impact on the economic activity of the European market, particularly in the UK and Italian markets. The main question that motivated this study was whether stock market liquidity improves economic indicators in the countries of interest during the period 2000 to 2016. To answer this question, was whether there is a relationship between housing starts, stock market volatility, and short-term interest rate and economic activity had to be answered. To answer these questions, the analysis uses the endogenous real GDP growth model for the UK and Italy, which is based on the relationship between stock market development and the economic growth framework. The empirical results from the UK sample are surprising in terms of the relationship of stock market liquidity and economic growth. Unexpectedly, even though the UK is a capital-market-based economy, we conclude that from one hand London stock market liquidity slow down the economic growth, on the other hand the economic growth causes the stock market liquidity in the UK economy. While the empirical results from the Italian market are as expected, as they corroborate the empirical literature that argues that stock market liquidity and economic indicators are strongly associated over the period under study. We conclude that the Milan stock exchange market provided significant depth and liquidity to promote economic growth in the economy during the period 2000-2016. Also, looking at the control variables (the short-term interest rate, housing starts, and the volatility of the stock market) and the crisis control variable, the estimation results show that all these variables have the correct sign and reveal variation in significance with respect to the estimation method. In general, though, they are consistent with economic theory. The results hold in across both illiquidity proxies.

For future change in the state of the economy, our results could help policy makers and corporate managers improve resource allocation, since they can be assertive in making use of stock market liquidity to make decisions that rely deeply on liquidity of the stock market and economic movement. Moreover, providing more strength to the liquidity profile of a capital market is likely to condense the risk associated with investments, as this will let investors buy equities and sell them fast and without incurring in high costs should they need to make changes in their
portfolios. An improved mode of stock market liquidity will also improve capital allocations, consequently leading to increasing investments. Furthermore, firms with illiquid markets for their equity tend to be more exposed to a number of external shocks. Moreover, we cannot ignore the role of monetary authorities in the process of implementing an efficient monetary policy with respect to preserving stable financial markets, given that, during a crisis, stock markets are highly illiquid. Thus the role of central banks in controlling liquidity levels in those markets by directly providing liquidity to large investors that hold long positions in stocks, at least in the UK market.

Further research could include more countries with developed capital markets, countries with less-developed capital markets, and/or countries with a different capital structure around the globe to obtain more evidence on the relationship between stock market liquidity and economic conditions. It could also identify the factors that directly affect stock market liquidity and indirectly affect macroeconomic activity, such as those of legal, regulatory, accounting, tax, political, and macroeconomic order. Finally, it could examine the relationship of these factors with both market liquidity and the macroeconomic indicators.
REFERENCES


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# APPENDIX

**Table 1. Descriptive statistics on UK large caps liquidity proxies**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
<th>No. firms</th>
<th>No. Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILR</td>
<td>0.1120</td>
<td>0.0000</td>
<td>84.2256</td>
<td>0.0069</td>
<td>73</td>
<td>4,435</td>
</tr>
<tr>
<td>RS</td>
<td>0.0029</td>
<td>-0.1339</td>
<td>0.1004</td>
<td>0.0012</td>
<td>73</td>
<td>4,435</td>
</tr>
</tbody>
</table>

*Source: Team Estimates*

**Table 2. Descriptive statistics on Italy large caps liquidity proxies**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
<th>No. firms</th>
<th>No. Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILR</td>
<td>0.0382</td>
<td>0.0000</td>
<td>10.4650</td>
<td>0.0093</td>
<td>20</td>
<td>4,435</td>
</tr>
<tr>
<td>RS</td>
<td>0.0030</td>
<td>-0.4446</td>
<td>0.1694</td>
<td>0.0016</td>
<td>20</td>
<td>4,435</td>
</tr>
</tbody>
</table>

*Source: Team Estimates*

**Table 3. Listed companies on FTSE 100**

| HSBA LN Equity | BATS LN Equity | BP/ LN Equity | RDSB LN Equity | DGE LN Equity | GSK LN Equity | AZN LN Equity | VOD LN Equity | ULVR LN Equity | PRU LN Equity | LLOY LN Equity | RIO LN Equity | RB/ LN Equity | SHP LN Equity | BARC LN Equity | SDR LN Equity | SBRY LN Equity | PSON LN Equity | NXT LN Equity | TW/ LN Equity | DCC LN Equity | STJ LN Equity | IAG LN Equity | AFB LN Equity | CRDA LN Equity | SKY LN Equity | NG/ LN Equity | IMB LN Equity | BLT LN Equity | BT/A LN Equity |
|----------------|----------------|--------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| SMT LN Equity  | RSA LN Equity  | CRH LN Equity| AV/ LN Equity  | STAN LN Equity| REL LN Equity  | BA/ LN Equity  | WPP LN Equity  | TSCO LN Equity| LGEN LN Equity| AAL LN Equity | RR/ LN Equity | FERG LN Equity| SSE LN Equity  | SN/ LN Equity  | INF LN Equity  | BDEV LN Equity| PSON LN Equity| PSON LN Equity| SMIN LN Equity| JMAT LN Equity| UU/ LN Equity | SGRO LN Equity| CRDA LN Equity| SKY LN Equity | NG/ LN Equity | IMB LN Equity | BLT LN Equity | BT/A LN Equity |

*Source: Blomberg*
Table 4. Listed companies on FTSE MIB

<table>
<thead>
<tr>
<th>ENEL IM Equity</th>
<th>REC IM Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCG IM Equity</td>
<td>A2A IM Equity</td>
</tr>
<tr>
<td>ISP IM Equity</td>
<td>BPE IM Equity</td>
</tr>
<tr>
<td>ENI IM Equity</td>
<td>BRE IM Equity</td>
</tr>
<tr>
<td>G IM Equity</td>
<td>SPM IM Equity</td>
</tr>
<tr>
<td>ATL IM Equity</td>
<td>UNI IM Equity</td>
</tr>
<tr>
<td>STM IM Equity</td>
<td>US IM Equity</td>
</tr>
<tr>
<td>TIT IM Equity</td>
<td>BMED IM Equity</td>
</tr>
<tr>
<td>MB IM Equity</td>
<td>BZU IM Equity</td>
</tr>
<tr>
<td>LDO IM Equity</td>
<td>MS IM Equity</td>
</tr>
</tbody>
</table>

Source: Bloomberg