厦门大学

硕 士 学 位 论 文

调查金融环境是欧元区增长差异的主要决定性因素

Investigating financial conditions as key determinants of growth differentials in the Euro Area

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摘 要

金融危机凸显了将金融因素纳入宏观经济模型的必要性。由于为货币政策往往会通过金融市场对经济产生影响，金融状况对各国央行来说十分重要。本文主要研究了金融状况对欧洲国家经济增长的影响。核心问题是:能否将金融状况合并成一个新的指数，以解释欧洲国家之间的经济增长差异?本文最重要的贡献在于收集和建立一个欧洲国家的金融状况指数(FCI)。

为了构建指标，本文在金融变量面板上应用主成分分析。为了解答前文所提出的问题，本文进行了面板数据分析，其中将FCI作为解释变量，同时控制其他增长变量。为了测试FCI在欧洲各国差异的显著性，我采用了Welch's ANOVA检验。

结果表明，FCI在很大程度上解释了GDP增长率。本文认为，由于FCI基于历史数据，故其可以一致并有效反映产出增长情况。与预期相反的是，欧洲各国之间的FCI的差异并不显著。本文在不同的FCI的数据中再次进行增长回归，并添加一个滞后模型，显著性的结果论证了FCI可以被视为经济增长的一个关键决定因素。

关键词：经济状况，货币政策，经济增长，面板数据，PCA

Abstract

The financial crisis highlights the need to incorporate financial linkages into macro-econometric models. Financial conditions are important to central banks, because monetary policy tends to influence the economy by its effect on the financial markets. This master thesis investigates the influence of financial conditions on economic growth in the Euro Area. The central question is: Could financial conditions, combined into a new index, explain the economic growth differentials between European countries? The most important contribution is collecting and setting up the financial conditions index (FCI) for a panel of European countries.

To construct the indices, I apply Principal component analysis on a panel of financial variables. In order to answer the research question, I conduct panel data analysis in which I include the FCI as an explanatory variable while controlling for other growth variables. To test if the FCI significantly differs across European countries, I apply the Welch's ANOVA test.

The results reveal that the FCI significantly explains GDP growth rates. I illustrate that the FCI tracks output growth consistently basing on historical events. Contrary to my expectations, the FCIs difference between European countries resulted insignificant. Running a second growth regression on a different panel of FCIs, as well as applying a lagged model, gives evidence to support the claim that the FCI can be seen as a key determinant of economic growth.

Key words: financial conditions, monetary policy, economic growth, panel data, PCA

Contents

Chapter 1 Introduction

1.1 Background

The financial crisis brought up an important matter to central banking. The collapse of the financial markets showed tremendous effects on the real economy. Therefore, research in connecting signals of the financial markets with the real economy became crucial (Angelopoulou, 2013). This area however is still quite "new" and has many possibilities to look into or to consider.

Most macro-econometric models that are used for analyzing shocks and forecasting have little financial consideration. Mostly they only use the interest rate or extend the models with the exchange rate referred to as monetary conditions. In situations such as the financial crisis, when there are dysfunctional financial markets, the interest rate cannot alone cover all linkages between the markets and the real economy. Therefore, data such as credit values, volatilities, spreads and survey data on supply of loan impact a country's financial conditions. These all together influence growth with their effect on investments, consumption and economic activity.

Jan Hatzius (2010) describes *"financial conditions can be defined as the current state of financial variables that influence economic behavior and (thereby) the future state of the economy."* (p.2)

By constructing a new index based on these financial conditions, one gets a single variable which represents the Financial Conditions Index (FCI). A FCI is usually developed to measure whether financial conditions are loose or tight, or if the financial system is encountering stress. In short the FCI can be seen as a form of

extension to the Monetary Conditions Index (MCI). The advantage of FCIs over MCIs is that it covers a whole range of data of the financial system within one set.

Bernanke (2008) point out that *"well-functioning financial markets are an essential link in the transmission of monetary policy to the economy and a critical foundation for economic growth and stability." (p.1)*

(Paravisini, 2008) states that a tight monetary policy, in which banks face financial constraints and binding capital ratios, lead to a decrease in the supply of credit. A tight credit supply will eventually reduce investments (Campello, Graham, & Harvey, 2010) and thus affect the real economy. (Aramonte, Rosen, & Schindler, 2013)

FCIs are not only related to MCIs, but also to Financial Stress Indicators (FSI). The FSI describe periods of fragility in financial markets and are used for predicting early stages of financial stress. The FCI comes more into play in discovering macro-financial linkages. Usually the two (the FCI and FSI) are closely related, because they cover a number of similar variables as input. It can be said that financial conditions are affected by financial stress, therefore stress measurements should be included in the FCI. (Angelopoulou, 2013)

1.2 Motivation
In this thesis I aim to test the link of financial conditions on economic growth.
The research question is "Could financial conditions, combined into a new index, explain the economic growth differentials between European countries?" Thus the first part of this thesis focusses on what the Financial Conditions Index (FCI) is and how it can be set up. The second part focusses on whether a FCI could significantly explain a country's growth performance. To test this, I use the indices as

explanatory variables in a fixed effects regression. I contribute to the existing literature by extending the concept of the FCI on a panel of countries. This differs from the existing literature, because those are focused on only analyzing individual countries.

There are a number of arguments why the FCI is an interesting research area. First of all, the FCI can be used as guide for effectiveness of policies. Since a FCI measures financial conditions, effects of policies are captured within these elements. Thus, the index can be seen as a leading indicator for the private sector. Moreover, an FCI can be a way to observe changes within the wealth channel. Wealthier countries are expected to have looser financial conditions. Specifically, if a country notes a higher annual growth rate it would be reflected in looser financial conditions in that year. The access to credit supply is an important factor for growth. By capturing movements of the credit supply in the FCI, one will be able to determine the relation of financial conditions on growth. On the negative side, the usage of a FCI could lead to a bubble in the financial system. Too optimistic behavior, based on the predictions of the FCI, would lead to excessive liquidity and the forming of a new bubble.

Based on the background of the FCI and my motivation, the following hypothesis is derived and will be tested:

1. **The FCI explains a country's growth performance while controlling for other growth variables.**

Chapter 2 Literature Review

The literature of FCIs originated in the early 2000s as a motivation to include financial variables in the monetary transmission mechanism. In this literature the financial system is said to be one of the important factors in the transmission of monetary policy. Monetary policy is able to influence the economic behavior by forcing structural changes in the financial conditions. One could observe that credit has always had a huge impact on economic activity, solely by looking at the corporate bond market. Also whether the economy is in a boom or recession is important. Financial conditions that affect investment might have little effect when there's excess capacity in periods of booms (Hatzius, Hooper, Mishkin, Schoenholtz, & Watson, 2010).

In the monetary transmission mechanism there are two categories, the neoclassical and the non-neoclassical channels. The neoclassical covers the consumption, investment and trade channels of transmission and assumes perfect financial markets. Consumption covers wealth and substitution effects over time. Investment covers Tobin's q, asset prices, and capital costs. The trade channel covers how the real exchange rate affects net exports. Variations in risk perception and risk tolerance lead to variations in the market risk premia and this affects both investment and consumption channels.

The non-neoclassical covers all other data not covered in the first category and assumes that imperfections in the financial market take place. This can be due to government intervention and institutional constrains on banks and borrowers. Monetary policies in general limits or extends the lending resources which alter the credit supply. At the same time the credit channel represents the link between policies and economic prospects via the behavior of intermediaries. Information asymmetries brings up uncertainty in the loan value which is key for granting loans.

Asset prices and credit growth move in a similar way as volatilities. Volatility indices can be used to indicate risks of the financial markets. From these examples one can see that the markets are key to propagate monetary policies. Non-neoclassical is commonly referred to as the credit view (Boivin, Kiley, & Mishkin, 2009).

It should be noted that the value of the various transmission channels varies over time. For example, during the beginning of the twentieth century investments was mainly driven by stock prices. At that time consumption was less important. Nowadays consumption is key to grow. People should also keep in mind that there is no strict association in the described relations of policies on the economic behavior and thus the financial conditions. They are at the same time influenced by shocks not caused by policies. In general, one of the interest of policymakers is to find out how unconventional policy tools affect the financial conditions. The financial crisis of 2007 brought up three specific tools which have significant impacts. Those are policy duration commitments, quantitative easing and credit easing. By taking a close look at the transmission channels it is able to determine the effect on the financial conditions caused by these drastic policy tools. (Hatzius et al., 2010)

Monetary and financial conditions
The monetary transmission channel is most likely a bit more complicated then I just described. In detail there would be more linkages as described above. The first generation of FCIs resulted as an iteration of MCIs. The Bank of Canada developed in 1990s a MCI which included interest rates and exchange rates. The MCI managed to represent monetary conditions in flexible exchange rate regimes. This provided central banks new insight on how monetary policy could influence aggregate demand (Freedman, 1995; Jollife, 2002; Kamada & Nasu, 2011). In the same period the Reserve Bank of New Zeeland tested the MCI onto Taylor-rule types that so far

only been applied in policy implementations. To be more precise, the MCI provided insight to which extend the refinancing rate had to be adjusted to account for macroeconomic effects coming from the exchange rate. This was necessary to stabilize monetary regimes (Hunt & Orr, 1999).

(Goodhart & Hofmann, 2002) showed with a Taylor-rule interest rate that the optimal monetary policy rule could be determined. They used a backward looking structural model (Phillips and IS curve model) to show that omitting exchange rate, property and share prices leads to a stronger monetary policy reaction on inflation and output gaps. The underlying thought process is that the lending capacity of households depends on equity and property prices and share prices determines firms' financial capacity. They also showed that omitting asset prices movements leaded to considerable biases in which a miss-specified model results. Thus they stated that monetary policy also is determined by movements of asset prices. Moreover, they derived a FCI next to the MCI, that could be seen as a better predictor of inflation. It showed more variation and better statistics comparing it with the MCI.

(Stock & Watson, 2002a) and (English, et al., 2005) forecast GDP, investment and inflation for four and eight quarters by using a financial diffusion index. This index is created by computing a set of principal components. As input for the principal components they used a range of variables covering interest rates, exchange rates, risk spreads, credit aggregates, performance of banking sector and more. They analogized the results with an alternative model that focused on short-term interest and two other finance indicators. The index results in a useful contribution in predicting macroeconomic variables. However, the results are less useful in predicting inflation. They included the first six principal components of which the

Bayesian information criterion (BIC) chose the smallest number of components to use in the forecasting model.

(Gauthier, Graham, & Liu, 2004) computed multiple FCIs for Canada using monthly data. They used property and equity prices as well as bond yield risk premiums as variables aside interest rates and exchange rates in the FCIs. A similar model as Goodhart and Hofmann was used for forecasting, namely the IS-curve model. Additionally, they computed a vector autoregressive model (VAR) and performed factor analysis. They chose this setup so that they would have multiple FCIs and could compare the results of the different methodologies. They concluded that the indices resulted as significant predictors. Moreover, they found that the IS-curve model showed significance of the FCI on short term up to one year whereas the VAR model performed best up to a two-year horizon.

Post financial crisis

Key in the FCI literature is the financial crisis. The financial crisis brought up the attention of higher dimensional interaction between financial and business cycles. Multiple researchers proposed monitoring financial behavior as integral analysis of macroeconomic forecasting and monetary policy. For example, (Claessens, Ayhan, & Terrones, 2011) and (Osinski, Jacek, Katharine, & Hoogduin, 2013). In the light of policy rates interest rate alone turned out to be insufficient to summarize financial movements in the economy. (Swiston, 2008) used a VAR based model to deal with exogenous financial shocks. The model aimed to relate the endogenous financial variables to real economic activity. He concluded that the FCI may be marked as a useful indicator.

In the OECD World Economic Outlook 2008 the FCI was globally included to capture financial conditions in its outlook. Afterwards it has been applied on

individual country analysis. (Hatzius, et al., 2010) had a big influence in evolving the FCI research. They developed seven different FCIs all focused on the United States on the time period of 2002 till 2012. The models were used by major investment banks, policy makers and advisers. They tested the forecasting ability with a AR model on GDP, employment, industrial production, unemployment with five financial variables. The results were not completely promising although it did better the predictions slightly.

Furthermore, they decided to elaborate the financial index to not only cover a longer time horizon but also to capture cyclical effects. The new index included a total of 45 variables. Key in their approach was purging macroeconomic variables from the index. They justified this by arguing that a FCI focused on measuring financial shocks to the economy. These shocks are seen as exogenous factors. By purging the overall performance of the index increased. This methodology was developed during the 1990s and Hatzius elaborated on that basis by applying it on the FCI. Afterwards they used Principal component analysis (PCA) to construct the index. Their main finding stated that the one-factor model (based on principal components) did not perform less than VAR models.

By all means, the FCI did not outperform the other methodologies in forecasting. However, it did shed new light on capturing financial stress. Additionally, they tested using three factors instead of only one factor. With these findings PCA turned into a common analysis methodology within the FCI literature. Beforehand the methodology was based on a weighted average that was constructed relative to the impact on real economic activity.

(Matheson, 2011) developed a FCI for the United States as well as the Euro Area. His FCI included 30 and 17 variables for the different continents. The data was

setup daily, monthly and quarterly. The FCI could be constructed with missing values. He then used it in a dynamic factor model. He used the FCI in a VAR model to show that it increased forecasting performance. This was done on a time period of two and four quarters.

In the same year (Brave & Butters, 2011) developed an influential national FCI which the Chicago Federal Reserve Bank decided to use. It included over 100 financial variables and used the PCA methodology in order to construct the index. The enormous data collection covered different time lengths. The benefit of their index was that it was able to predict financial stress up to a time period of one year. Next to that they constructed another adjusted FCI that purges endogenous effects of the business cycle. The (ECB, 2012) constructed an index that summarized a large group of financial data to test business cycles. In this they purged production, inflation and EURIBOR rates.

Moreover, (Hatzius & Stehn, 2012) released a new version of the FCI of 2010. They controlled for stationarity and added more variables to the original index. The index had been scaled to 100 so that an increase of the aggregate reflected tighter financial conditions. They concluded that the FCI boosted the four quarter growth forecasting performance by 40 percentage points compared to an autoregressive benchmark.

As said before, most research demonstrated that the FCI showed leading indicator properties. It provided better insights than using the individual variables. It also showed increased forecasting performance of economic activity and investment. (Gauthier, et al, 2004) showed that the FCI was useful in targeting turning points of the economy. However, (English, et al., 2005) found mixed signals in forecasting inflation.

FCIs on Asia

While the majority of FCIs have been developed for the US as leading economy, one must not exclude research on the Asian economies. One of the critiques is that Asia has been less researched in this field. Several FCIs and MCIs have been developed by financial firms and central banks. Goldman Sachs developed individual FCIs for a few Asian countries.

Japan, one of the biggest economies of the world, has been researched by (Shinkai & Kohsaka, 2010; Debuque-Gonzales & Gochoco-Bautista, 2013). They constructed a FCI for Japan to investigate business cycles. Specifically, they were interested in how the global crisis affected the financial conditions in order to observe the global financial integration. (Lane & Milesi-Ferretti, 2010) discussed that the net exports made Japan vulnerable to global risks.

Shinkai and Kohsaka found that in the recession following the global financial crisis the financial shock was larger than the negative real economic factor. Secondly they found that the underlying of shocks significantly differed. The 1991s' case showed that credit market conditions and foreign exchange rates had the biggest impact. During the global financial crisis credit markets were of a less important scale in the transmission channels.

The (International Monetary Fund, 2010) constructed a FCI for several Asian countries to demonstrate that the real economy could benefit by forecasting with financial consideration. They focused mainly on private sector credit growth, interest rates, lending rates, exchange rates and equity prices. (Osorio, et al., 2011) extended the IMF's FCI for Asia by applying a different methodology. They proposed the FCI as a leading indicator by investigating it in a dynamic factor model.