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## Forecasting GDP growth with financial market data in Finland: Revisiting stylized facts in a small open economy during the financial crisis

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### ABSTRACT

This paper examines the ability of financial variables to predict future economic growth above and beyond past economic activity in a small open economy in the euro area. We aim to clarify potential differences in forecasting economic activity during different economic circumstances.

Our results from Finland suggest that the proper choice of forecasting variables is related to general economic conditions. During steady economic growth, the preferred choice for a financial indicator is the short-term interest rate combined with past values of output growth. However, during economic turbulence, the traditional term spread and stock returns are more important in forecasting GDP growth. The time-varying predictive content of the financial variables may be utilized by applying regime-switching nonlinear forecasting models. We propose a novel application using the negative term spread and observed recession as signals to switch between regimes. This procedure yields a significant improvement in forecasting performance at the one-year forecast horizon.

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### 1. Introduction

What will be the GDP growth in your country during the next quarter or the next year? Because economic growth is known to be positively serially correlated, the persistence of growth provides a natural starting point for predicting future economic growth during steady economic conditions. However, economic turmoil may pose additional challenges to forecasting. Economists would certainly like to have more predictors of economic growth than simply past growth. Financial market data are forward-looking aggregators of information that are easy to interpret and are observed in real time without measurement errors. Therefore, since the beginning of the 1980s, the potential to utilize financial market information to forecast economic activity has been explored. Certain financial variables, such as interest rates, term spreads and stock returns, are examples of readily available and precise indicators; however, can these variables provide robust forecasts of future economic activity during both steady growth periods and more turbulent conditions?

Since the late 1980s, many studies have documented the usefulness of the yield curve or even the simple term spread for predicting economic activity (e.g., Estrella, 2005a; Estrella & Hardouvelis, 1991; Harvey, 1988; Laurent, 1989; Stock & Watson, 2003). It has become a

standard procedure in the U.S. to use the term spread between the ten-year Treasury note and the three-month Treasury bill to predict recessions and future economic activity (e.g., Estrella & Mishkin, 1996; Haubrich & Dombrosky, 1996). The inversion of the term spread has been demonstrated to be a reliable “advance warning” of a subsequent recession; however, its ability to forecast GDP growth rates is less clear. Many studies have found that since 1985, the term spread has been a less accurate predictor of U.S. output growth (e.g., Chinn & Kucko, 2010; Stock & Watson, 2003). This phenomenon may reflect either the increased stability of output growth (the Great Moderation) and of other macroeconomic variables since the mid-1980s or changes in the responsiveness of monetary policy to output growth and inflation (Wheelock & Wohar, 2009). If the central bank concentrates exclusively on controlling inflation, then the term spread will most likely be a less accurate predictor of GDP growth (Estrella, 2005b; Stock & Watson, 2003).

Despite evidence that parameter instability may weaken the performance of the term spread in predicting economic growth, the spread has gained acceptance as the single best indicator of economic activity and a “near-perfect tool” for forecasting (e.g., Estrella, 2005a). Notwithstanding the predominance of the term spread in forecasting economic activity, Ang, Piazzesi, and Wei (2006) found that the short-term interest rate had more predictive power than any term spread for forecasting GDP growth in the U.S. during the period from 1952 to 2001.

Stock prices are forward looking and thus represent another obvious financial indicator of future economic activity. Economists and investors

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have a well-known rule of thumb that stock market prices predict economic growth approximately one-half year in advance. However, compared with the predictive content of the term spread, less empirical evidence exists regarding the ability of stock prices to predict economic activity (e.g., Stock & Watson, 2003). Chionis, Gogas, and Pragidis (2010) found that augmenting the yield curve with a stock index significantly improved the ability to predict GDP fluctuations in the euro area. Nyberg's (2010) results supported this conclusion with respect to predicting recessions in Germany and the U.S. Junttila and Korhonen (2011) discovered that both stock market dividend yields and short-term interest rates were relevant information variables for forecasting future economic activity in the U.K., the euro area and Japan, particularly during turbulent times. Furthermore, Henry, Olekalns, and Thong (2004) emphasized that stock returns predict GDP when the economy is contracting but that the predictive power of stock returns in non-recession periods is less clear. This mixed evidence is expressed in Samuelson's (1966) famous note: "The stock market has predicted nine out of the last five recessions." In any event, economic turbulence tends to strengthen the link between the stock market and economic activity.

The case of Finland is interesting in many ways. The vast majority of the previous literature has examined larger countries, particularly the G7; however, the predictive content of financial variables is less known in smaller European countries. As a member of the Economic and Monetary Union (EMU), the Finnish economy is subject to the monetary policy of the European Central Bank (ECB), which strongly targets inflation rather than economic growth. Moreover, the monetary policy of the ECB is conducted on the basis of the entire euro area; therefore, interest rates in the euro area may be far from optimal for smaller euro countries that face asymmetric shocks. Indeed, evidence suggests that output shocks have been more country-specific in Finland than in other EU countries (e.g., Haaparanta & Peisa, 1997; Kinnunen, 1998), and the question of asymmetric shocks was among the main concerns when Finland considered EMU membership in the late 1990s. Therefore, there are good reasons to assess the predictive content of the term spread and the short-term interest rate in small member countries in the euro area.

After recovering from an economic depression during the 1990s, Finland experienced an era of continuous and sound growth until the global financial crisis plunged the Finnish economy into a deep recession in 2008. A distinctive feature of this slump was its severity; in a single year, Finland's GDP collapsed by an astonishing 10%, one of the largest decreases in economic activity among developed countries (see Fig. 1). Undoubtedly, the ups and downs of the Finnish economy pose a true challenge for forecasting economic activity.

This paper contributes to the existing literature by explicitly addressing the predictive content of the classical term spread versus the short-term interest rate and stock returns in the context of a small open economy (SOE). Ang et al. (2006) found that compared with the term spread, short-term interest rates were a better predictor of economic activity in the U.S. Our aim is to test whether this result is specific to the U.S. or whether it holds true for other countries as well. Furthermore, we seek to clarify potential differences in forecasting economic activity between eras of steady growth and economic turbulence, such as the financial and debt crises in Europe. Many of the previous studies have concentrated on the predictive content of a single financial indicator (e.g., Stock & Watson, 2003); however, we assess the predictive content of combinations of indicators. More broadly, this paper provides further information on the predictive ability of financial market indicators in smaller economies, a context that has rarely been examined in the previous literature.

The remainder of this paper is organized as follows. Section 2 presents the model setup and the data. Section 3 contains the empirical analysis of the study, and Section 4 concludes.

## 2. The model setup and the data

### 2.1. Forecasting models

We assess and compare the predictive content of the following financial market variables: term spread, stock returns, and short-term interest rate. When constructing the empirical forecasting models, we apply the following modeling strategy. We first consider the predictive content of purely financial market indicators (Model 1). This model utilizes only real-time financial market information. Because we are interested in the forecasting ability of financial indicators beyond dependence on historical GDP growth, the information content of the financial indicators is combined with past values of growth (Model 2). However, during turbulent periods, past growth may lose its predictive content, potentially limiting the relevance of Model Specification 2. Note also that Model 1 is not subject to revisions of the GDP data, which may be especially large during economic turbulence. Finally, the forecasting ability of these models is compared with that of two simple autoregressive benchmarks, the Direct Multiperiod Model 3 and the Iterative Multistep Model 4, in which forecasts are made using the one-period ahead model iterated forward according to the forecast horizon (Marcellino, Stock, & Watson, 2006). Direct autoregressive (AR) forecasts have been the most common used in the previous

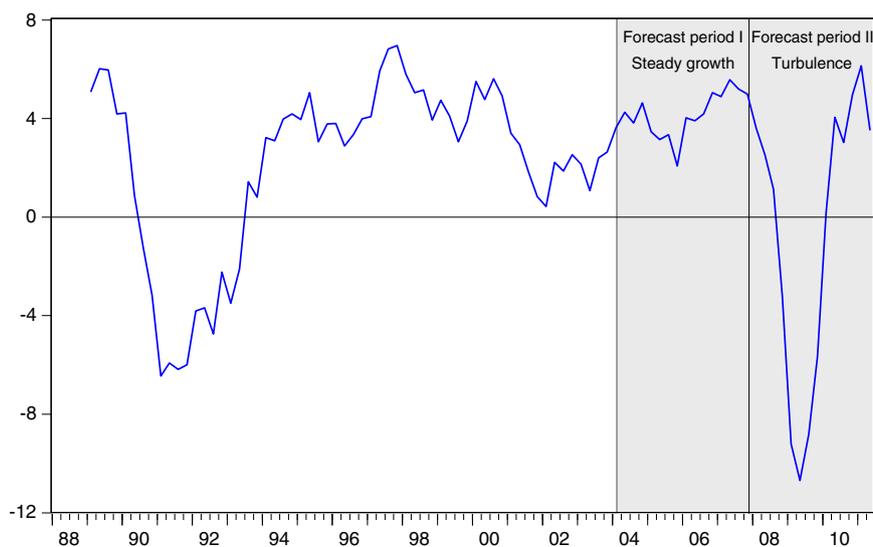


Fig. 1. The annual GDP growth in Finland and the forecast periods.

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