



Financial variables and euro area growth: A non-parametric causality analysis

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ABSTRACT

This paper investigates the predictive ability of financial variables for euro area growth through bivariate and multivariate non-parametric Granger causality tests. Apart from assessing the within-country forecasting ability of commonly-employed financial variables, such as the term spread, the stock market returns and the growth of real money supply, we also test for cross-country influences. In this way, we reveal the countries that are more useful in predicting growth in other member countries along with the ones that are more receptive to other countries' financial developments. Our results suggest that financial variables are useful leading indicators for euro area growth at a joint level, albeit at different horizons, ranging from one to six quarters. Our finding of overall increased levels of receptivity among member states provides useful information for policy makers, especially in the case of monetary union such as the euro area.

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1. Introduction

A vast literature in finance and macroeconomics is devoted to the forecasting ability of financial variables for real economic activity. Empirical evidence is mixed and results are not robust with respect to model specification, sample choice and forecast horizon.¹

The financial variables often employed in empirical studies are the ones identified as leading indicators of economic activity, such as stock returns, interest rates, interest rate spreads, and monetary aggregates. Among the many studies that establish the forecasting ability of stock market returns for output growth are Goldsmith (1969), Bosworth (1975), Hall (1978), Fama (1981), Geske and Roll (1983), as well as more recent studies by Barro (1990), Fama (1990), Schwert (1990), Estrella and Mishkin (1998), Hassapis and Kalyvitis (2002), Hassapis (2003) and Panopoulou et al. (2006). These studies find that stock returns are highly correlated with future real activity, for various data frequencies covering very long periods, and are robust to alternative definitions of the data series. Over the last years many researchers have revealed a positive association between the yield spread and future economic activity. With respect to monetary aggregates, these are often linked to the monetary stance and as a result to expectations for future growth and inflation. Among the plethora of studies that find that the term structure and/or monetary

aggregates are associated with future economic activity, are the ones by Stock and Watson (1989), Harvey (1988, 1997), Estrella and Hardouvelis (1991), Plosser and Rouwenhorst (1994), as well as the more recent ones by Estrella and Mishkin (1997, 1998), Hassapis et al. (1999), Black et al. (2000), Galbraith and Tkacz (2000), and Hamilton and Kim (2002). There is evidence, however, that the forecasting ability of the term spread has fallen over the past decades (see, inter alia, Giacomini and Rossi, 2006).

The creation of the euro area monetary union brings the issue of the forecasting ability of financial variables for euro area growth either at a country or aggregate level to the fore. In the last two decades, the euro area countries participated in the creation of the European Monetary Union, which took place in three stages. The final stage began in 1999 with the irrevocable fixing of exchange rates, the transfer of monetary policy competence to the European Central Bank (ECB) and the introduction of the euro as the single currency. During this period, inflation rates, interest rates, monetary aggregates of candidate countries gradually converged in the aftermath of the Maastricht Treaty criteria. The euro area money market – the market segment closest to the single monetary policy – reached a stage of “near perfect” integration almost immediately after the introduction of the euro. The government bond market also exhibited a fast integration process; long-term yields have converged, mainly due to reduced fiscal deficits, inflation and currency premia, and are increasingly driven by common factors, although local factors such as liquidity and credit risk continue to play a role. Furthermore, in order to signal its commitment to monetary analysis in the context of its strategy and to provide a benchmark for the assessment of

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¹ See Stock and Watson (2003) for a review of the empirical literature.

monetary developments, the ECB announced a reference value of 4.5% for the annual growth rate of the broad monetary aggregate M3 in December 1998. Developments in the equity markets of member countries are driven by expectations about the future course of the economy through the expected dividend and earnings growth. Declining uncertainty reflected in reduced equity risk premia can further enhance stock market valuations. Attention is paid to sound public finances of the member states as they enhance economic growth and support macroeconomic stability. To this end, the Stability and Growth Pact, adopted in 1997 and revised in 2005, obliges euro area members to pursue appropriate “close to balance or in surplus” budgetary objectives over the medium term.²

With the exception of a few, studies have concentrated and examined the predictive ability of financial variables for US future growth. Similar evidence for the euro area countries is quite scarce and more recent. Among the first to tackle this issue are Davis and Fagan (1997) who find that the yield curve improves the forecast ability of output growth for the six out of the nine European countries examined. Sensier et al. (2004) examine the roles of domestic and international variables in predicting business cycle regimes in four European countries, namely Germany, France, Italy and the UK and find that real money growth and stock market prices are important for all countries except for Germany and Italy, albeit with differing signs and lag lengths. The yield curve, however, cannot beat the separate use of either long-term or short-term rates, which are found to be significant with mostly a negative effect. On the contrary, Moneta (2005) finds that the yield spread is the single most powerful predictor of recessions in the euro area especially for forecasting horizons beyond one quarter. The same conclusion is reached by Duarte et al. (2005), who use aggregate data for the euro area over the period 1970–2004 and confirm the ability of the yield curve as a leading indicator for output growth and future recessions. Employing an extensive list of leading indicators, Banerjee et al. (2005) find that measures of short- and long-term interest rates as well as the interest rate spread are among the best performing single indicators for GDP growth. More recently, Panopoulou (2007) finds that financial variables manage to improve forecast precision for some country and at some horizon with the most prominent variable being the stock market returns that improves forecasts in the majority of the cases considered.

Contrary to the traditional approach that concentrates on single equation and multivariate parametric models in order to assess the forecasting performance of a set of financial variables, we take another route and reinvestigate systematically the relationship between financial variables and growth by using non-parametric Granger causality tests. Employing monthly data for the euro area countries, we first investigate the bivariate relationship between a set of financial variables and output growth in the context of the methodology proposed by Cheung and Ng (1996).³ This non-parametric Granger causality methodology is based on the residual cross-correlation function of the series under scrutiny and is robust to distributional assumptions, which are likely to be important since the variables at hand may exhibit both autocorrelation and conditional volatility effects. As a second step, following Lemmens et al. (2005) we extend our bivariate testing procedure to a multivariate one by pooling together the information from the whole panel of the euro area countries. This multivariate testing procedure, introduced by El Himdi and Roy (1997), enables us to investigate the general predictive content of a candidate

financial variable for economic growth for the entire panel. Furthermore, it can be modified so as to reveal more information with respect to the interdependencies within the euro area. Specifically, it enables us to test whether developments in financial variables of one country affect real economic activity in the remaining countries, i.e. to discover a country's “clout.” Similarly, we can test for the receptivity of a country, i.e. discover the countries that are more likely to be led by developments in the financial variables of the remaining ones in the euro area.

To the best of our knowledge, this multivariate testing methodology has been hardly employed in the literature. Specifically, El Himdi and Roy (1997), who proposed this methodology, applied this multivariate test to investigate the causal relations between money (M1 and M2) and income (Gross National Product) for Canada, as well as to study the causal directions between the Canadian and American economies. Lemmens et al. (2005) adapted the El Himdi and Roy (1997) test to jointly test the forecasting ability of multiple production expectation series for the members of the European Union. In this sense, they assessed whether part of the joint effect they found was due to cross-country influences and they determined the countries which have the most ‘clout,’ i.e. are more useful in predicting other countries' growth along with those that are influenced more by the others, i.e. they display more ‘receptivity.’

The layout of this paper is as follows: Section 2 outlines the bivariate and multivariate Granger causality testing procedures used for the empirical estimation of the relationship between growth and financial variables. Section 3 presents and comments on the empirical results for the euro area countries and Section 4 summarizes the main findings of the paper.

2. Econometric methodology

In this section, we briefly describe the non-parametric techniques utilised in the present study which aim at detecting any Granger causality running from financial variables to output growth. In subsections 2.1 and 2.2 we describe the bivariate and multivariate methodologies employed, respectively.

2.1. Bivariate causality tests

Consider a bivariate stationary and ergodic stochastic process $Z_t = [y_t, x_t]^\top$, $t = 1, 2, \dots$, where y_t and x_t represent output growth and a candidate financial variable, respectively. Cheung and Ng (1996) proposed a test based on the sample cross-correlations function of the standardised residuals and involves two stages. In the first stage, univariate time-series models are estimated for both the series under scrutiny, such as the typical ARMA(p, q)-GARCH(1,1). In our case the correct order of the ARMA(p, q) model for the mean of the series is determined by means of the Schwartz Information Criterion (SIC). In the second stage, we calculate the sample cross-correlations of the standardised residuals, typically defined as follows:

$$\begin{aligned}\hat{u}_{yt} &= (y_t - \hat{\mu}_{y,t}) / \hat{h}_{y,t} \\ \hat{u}_{xt} &= (x_t - \hat{\mu}_{x,t}) / \hat{h}_{x,t}\end{aligned}$$

where $\hat{\mu}_{y,t}$, $\hat{\mu}_{x,t}$ and $\hat{h}_{y,t}$, $\hat{h}_{x,t}$ are the estimated conditional means and variances of output growth and a candidate financial variable, respectively.

The sample cross-correlation function of u_{yt} and u_{xt} ($\hat{\tau}_{xy}(k)$) is given by:

$$\hat{\tau}_{xy}(k) = \frac{\hat{C}_{xy}(k)}{\sqrt{\hat{C}_{xx}(0)\hat{C}_{yy}(0)}} \quad (1)$$

² These are assessed against reference values of 3% and 60% of GDP for general government deficit and debt ratios respectively.

³ The methodology put forward by Cheung and Ng (1996) extends the one proposed by Haugh (1976) to test for both causality in mean and variance. In the present text, we adopt the two-stage procedure of Cheung and Ng (1996), which filters out second-order effects prior to testing for causality in mean.

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