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An empirical examination of the generalized Fisher effect using cross-sectional correlation robust tests for panel cointegration

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ABSTRACT

This study examines the generalized Fisher hypothesis as applied to common stocks by using the recently proposed second generation panel cointegration tests. Unlike their predecessors, these new tests assume the existence of cross-section dependence in the data. For the sample analyzed, we report that these new tests, but not their predecessors, provide strong support for the existence of cointegration between stock and goods prices. Moreover, further analysis cannot reject the hypothesis that the cointegration relation is linear. Finally, our Fisher coefficient estimates are in the range between 0.68 and 1.27 and give support to the generalized Fisher hypothesis.

1. Introduction

The generalized Fisher hypothesis as applied to common stocks states that common stocks should provide a hedge against inflation. Early research during 1970s and 1980s report either a negative or an insignificant relation between stock returns and inflation, inconsistent with the hypothesis. These studies have, as noted by Boudoukh and Richardson (1993), all employ short-term asset returns with time horizons of one year or less. However, Kaul (1987) and Boudoukh and Richardson (1993) report that, when stock returns and inflation are evaluated over a longer time period, the Fisher hypothesis cannot be rejected. The estimated elasticity coefficient in these studies, however, is less than unity. These mixed results have been attributed to the limitations of empirical approaches used. One major problem is that these studies throw away the long-run information contained in the data by using stock return and inflation rather than stock price and consumer price index data.

The next wave of studies takes into account the potential nonstationarity and cointegration properties of stock price and consumer price indices. For example, Ely and Robinson (1997) using data from 16 industrialized countries finds that, for most of the countries analyzed, stocks do maintain their value relative to movements in overall price indexes and this conclusion generally does not depend on whether the source of the inflation shock is from the real or monetary sector. Another study,

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Anari and Kolari (2001) using data from six industrialized countries reports that the long-run generalized Fisher elasticities of stock prices with respect to consumer prices exceed unity and are in the range of 1.04–1.65, which tend to support the Fisher effect. Similar evidence is provided by Luintel and Paudyal (2006) for UK industry indices. They report statistically significant elasticities in the range from 1.22 to 1.64.

In a recent paper, Gregoriou and Kontonikas (2010) examine the long-run relationship between stock prices and goods prices using panel cointegration to utilize the dataset in the most efficient manner. One issue that has often been overlooked in empirical research is to check whether disturbances in panel data models are cross-sectionally independent. In cointegration analysis, ignoring the existence of such dependence may lead to wrong inferences from unit root and cointegration tests and getting biased coefficients estimates for the long-run equation. Gregoriou and Kontonikas (2010) consider the potential cross-sectional dependence problem in their panel cointegration tests. If there is cross-sectional dependence, then the panel cointegration tests depend on nuisance parameters associated with the cross-sectional correlation properties of the data, which means that the tests no longer have a limiting normal distribution. Gregoriou and Kontonikas derive critical values in the presence of non-normality by applying a wild bootstrap simulation and find that the bootstrap test performs well and the panel cointegration tests based on the normal distribution are robust to cross sectional correlation. Their evidence supports a positive long-run relationship between goods prices and stock prices with the estimated goods price coefficient being in line with the generalized Fisher hypothesis.

This paper extends Gregoriou and Kontonikas (2010) by considering more comprehensive econometric methods. In particular, it attempts to make two contributions to the literature. First, it examines the generalized Fisher equation within a panel cointegration framework by paying special attention to the cross-section dependence issue. This is achieved by using Pedroni's fully modified OLS (FMOLS) estimator after augmenting its empirical specification in different ways to deal with cross-section dependence. We employ three methods for that purpose. First, we follow Westerlund (2005) and assume that the dependence can be approximated by means of common time effects. Second, as suggested by Pesaran (2006), we assume that the cross-section dependence is due to unobserved common correlated effects (CCE). Finally, we use oil prices as a proxy for the single common factor. We give evidence on the relative performance of these approaches based on a misspecification test.

The second contribution of the paper is to examine the consequences of not accounting for cross section dependence in the analysis. For that purpose, in every stage of the analysis (i.e., testing for unit root, testing for cointegration and estimation of Fisher coefficient) two sets of estimates are presented. The former ignores the cross-section dependence problem, while the latter takes it into consideration.

We report that, based on Pesaran (2004) test, cross-section dependence exists in the data set. Moreover, inference about stationarity and cointegration is sensitive whether the test employed takes into account the cross-section dependence or not. Finally, the Fisher coefficients estimated by ignoring the cross-dependence problem exceed unity and are larger in magnitude than the estimates reported in Anari and Kolari (2001) and Luintel and Paudyal (2006). In contrast, estimations using Westerlund (2005) and Pesaran (2006) approaches that pass the final misspecification test, give coefficient estimates in the range between 0.68 and 1.27 in support of the generalized Fisher hypothesis.

The remainder of the paper is organized as follows. The next section discusses the econometric framework. The third section presents the data. The fourth section reports and discusses the empirical results. The last section provides the concluding remarks.

2. Methodology

2.1. Pesaran's cross-section dependence test

As discussed before, the first empirical question examined in this paper is to what extent cross-section dependence exists in the data. To explore this issue, we use cross-section dependence test of Pesaran (2004), which is based on average of pairwise correlation coefficients of the OLS residuals from the individual regressions in the panel. The test is basically an extension of Breusch and Pagan (1980) Lagrange Multiplier test. Pesaran (2004) considers the following model:

$$y_{i,t} = \mu_i + \beta_i x_{i,t} + u_{i,t} \tag{1}$$

where on the time domain $t = 1, 2, \ldots, T$, for the cross-section units $i = 1, 2, \ldots, N$. $x_{i,t}$ is a kx1 vector of observed time-varying regressors. The individual intercepts, μ_i and slope coefficients β_i are defined on a compact set permitted to vary across i. For each i, $y_{i,t} \sim iid(0, \sigma_i^2)$ for all t although they could be cross-sectionally correlated. Pesaran (2004) proposes the following statistic for testing the null of zero cross equation error correlations:

$$CD_{LM1} = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{i,j} \right) \tag{2}$$