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SPILLOVERS BETWEEN BUSINESS CONFIDENCE AND STOCK RETURNS IN GREECE, ITALY, PORTUGAL, AND SPAIN

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ABSTRACT

This paper employs Hong's (2001) causality-in-mean and causality-in-variance tests to investigate the spillovers between business confidence and stock returns for the four economically distressed Southern European countries, namely Greece, Italy, Spain, and Portugal. The sample uses monthly data and covers the period from January 1988 to December 2010. Our causality-in-mean results indicate that there is feedback relationship between stock returns and business confidence in Portugal. The direction of causality-in-mean runs from business confidence to stock returns in Italy, but it is in the reverse direction in the case of Spain. Nevertheless, there is still evidence of a contemporaneous interaction between business confidence and stock returns in both Italy and Spain. On the other hand, causality-in-variance indicate the presence of volatility spillovers from business confidence to stock returns in Portugal, while a causal relationship is found in the current month in the case of Italy. Business confidence causes stock returns only in the mean in Greece. These results indicate that the stock market and business confidence relationship has its own idiosyncratic properties and that the stock market reactions to the current macroeconomic environment and expectations about the future developments might evolve differently in each country. Copyright © 2012 John Wiley & Sons, Ltd.

1. INTRODUCTION

The global financial crisis that started in the US in late-2007 quickly spread to the Euro area. The great recession, the resulting government deficits, and the debt levels due to the rescue packages in the EU countries raised doubts on the future of Euro. Although the governments of all EU countries have conducted similar strategies to overcome the financial crisis, the markets assess the creditworthiness of the fiscal sustainability of different issuers differently. For instance, while government bond yield spreads were co-moving before the escalation of the financial crisis, there is evidence of diversion during the crisis. The spreads for Germany, France, the Netherlands, Belgium, Austria, Finland, Denmark, and Sweden have fallen by January 2011 compared to their levels in January 2007. However, the spreads further increased for Spain, Italy, Portugal, Greece, and Ireland. In addition, the sustainability of budget deficits and the debt to GDP ratios remain questionable for Greece, Spain, Italy, Portugal, and Ireland compared to the other EU countries.[1] Therefore, Greece, Spain, Italy, Portugal, and Ireland are considered to

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[1]Delis and Mylonidis (2011) use rolling Granger-causality tests to investigate the dynamic relation between government bond spreads and credit default swaps (CDS) for Greece, Italy, Spain, and Portugal. Their results indicate CDS prices cause government bond spreads after 2007. Furthermore, a feedback relation is detected during times of financial and economic stress.

be the five largest risks to the future of the EU economy.[2] The news about the economic health of these countries continues to worry the policy makers as well as the financial market players. For instance, the cover page of the July 16–22, 2011 edition of The Economist runs: 'On the Edge: Why the euro crisis has just got a lot worse'.

In this paper, we investigate the causal relationships between business confidence indicators and stock market performance in Greece, Italy, Portugal, and Spain for the period from January 1988 to December 2010. On the methodological side, we employ Hong's (2001) version of Cheung and Ng's (1996) causality-in-variance test. Most of the literature on the relationship between stock market performance and economic sentiments used a demand-side (consumer confidence) indicator. Our study is novel in its use of a supply-side sentiment indicator (business confidence). In addition, the causality-in-variance test is as important as the causality-in-mean test especially for stock returns because it helps capture the volatility transmission patterns as well. Furthermore, we follow the current state-of-the-art approach to the testing for causality-in-variance by taking into account the effects of causality-in-mean.

The rest of the paper is organized as follows. Section 2 reviews the literature, and Section 3 discusses the econometric methodology. In Section 4, we present the empirical results from the causality in mean and causality in variance test. Section 5 concludes.

2. LITERATURE REVIEW

Recent studies on the predictability of stock returns focus on behavioral finance theory which argues that the traditional neoclassical asset pricing or multi-factor models that include only fundamental value of the firm and macroeconomic variables cannot be adequate to predict stock returns. Given the importance of the effects of economic sentiments on stock market performance, a large number of studies examine the relationships between economic actors' sentiments and stock returns. Ng (1992), for instance, argues that a collapse in consumer or business confidence might bring about a severe economic downturn (depression) led by a stock market crash. In this context, Brown and Cliff (2004) and Verma and Verma (2007) find a significant relationship between investor sentiment and stock returns in the US. Otto (1999) and Fisher and Statman (2003) investigate the relationship between consumer confidence and stock returns in the US and find that the direction of Granger-causality runs rather from stock returns to consumer confidence. Lopez and Durre (2003) support these findings by showing that stock market volatility affects consumer confidence in the US and Belgium. In the European context, Jansen and Nahuis (2003) examine the relationship between stock market and consumer confidence in the Euro area. The sample includes Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portuguese, Spain, and the UK. The empirical results show that stock returns and changes in the consumer confidence are positively correlated for nine countries, except for Germany. It is also found that stock returns Granger-cause consumer confidence in the short-term but not vice versa.[3]

The relationship between business confidence *per se* and stock returns has received surprisingly little attention in the literature. One of the exceptions is Collins (2001) who study the relationship between the business confidence indices and stock returns in the US, Germany, Japan, and South Africa using Granger-causality tests and vector autoregressions. Collins's (2001) results indicate no causal effect of business confidence on stock returns even when surprise effects about the business confidence survey results are taken into account.

The reason why business confidence and stock returns are less investigated compared to other lines of the literature on the determinants of stock returns is possibly because business confidence relates to real economic activity and that there is a large literature on the relationship between real economic activity and stock market

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[2] A new rescue plan for Greece was announced on July 22, 2011. See Chamley and Pinto (2011) for an analysis and the chronology of the Greek debt situation.

[3] Further studies on the relationship between consumer confidence and stock returns include Kling and Gao's (2008) analysis on China and Korkmaz and Çevik's (2009) analysis on Turkey. Also note that Best (2008) finds that a CEO confidence variable from the Conference Board explains the market movements in the that S&P500, DJIA, and the Nasdaq indices in the US for the period between January 2000 and April 2008.

performance.[4] Nevertheless, the changes in the business confidence indicators should be leading the actual changes in real activity. Hence, the information contained in business confidence indicators is especially valuable for the stock markets players at times of economic stress as they discount the expectations about the future state of the economy as they arrive.

Given the lack of light at the end of the tunnel of the current crisis in Southern Europe, the expectations and mood swings about the economic environment have become even more important for the stock market players. Our study is unique in this respect as we not only examine the causal links in the mean of the business confidence and stock returns series but also provide insights on the causal relationships in the variance (or, volatility spillover effects) of these series for the four Southern European countries making news headlines since the onset of the global financial crisis.

3. METHODOLOGY

The tests of Grange-causality have traditionally been conducted in the mean of the variables involved. An innovation in the literature on Granger-causality testing is due to Cheung and Ng (1996) who introduce the notion of causality in a higher moment of the series, namely the concept of causality-in-variance. Cheung and Ng's (1996) contribution is especially important in financial economics since the changes in the variance of financial series are said to reflect the arrival of information and the extent to which the market evaluates and assimilates new information.[5] Gebka and Serwa (2007: 207) describe causality-in-mean between financial asset prices as return spillovers while causality-in-variance is said to represent volatility spillovers.

The concept of causality-in-variance can be defined as follows. Let X_t and Y_t be two stationary and ergodic time series described by the following GARCH processes:

$$
\begin{aligned}
X_t &= \mu_{xt} + \sum_{i=1}^{k} b_i X_{t-i} + \varepsilon_t \\
h_t &= \omega_x + \alpha_i \varepsilon_{t-1}^2 + \beta_i h_{t-1}
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
Y_t &= \mu_{yt} + \sum_{i=1}^{k} b_i Y_{t-i} + \zeta_t, \\
h_t &= \omega_y + \alpha_i \varepsilon_{t-1}^2 + \beta_i h_{t-1}
\end{aligned}
\tag{2}
$$

where μ_{xt} and μ_{yt} are the means of X_t and Y_t, h_t is the conditional volatility, and ε_t and ζ_t are the innovation processes for X and Y, respectively.

Let I_t and J_t be two information sets defined by $I_t = \{X_{t-j}; j \geq 0\}$ and $J_t = \{X_{t-j}, Y_{t-j}; j \geq 0\}$. Y_t is said to cause X_{t+l} in variance if:

$$
E\left\{ \left(X_{t+1} - \mu_{x,t+1}\right)^2 | I_t \right\} \neq E\left\{ \left(X_{t+1} - \mu_{x,t+1}\right)^2 | J_t \right\}
\tag{3}
$$

Cheung and Ng (1996) operationalise the notion of causality-in-variance defined in equation (3). First, the squares of the standardized innovations ε_t and ζ_t in equations (1) and (2) are taken: $U_t = \left\{ \left(X_t - \mu_{x,t}\right)^2 / h_{x,t} \right\} = \varepsilon_t^2$ and $V_t = \left\{ \left(Y_t - \mu_{y,t}\right)^2 / h_{y,t} \right\} = \zeta_t^2$. Then, an S-statistic to test for the causal relationship at a specified lag M is computed:

$$
S = T \sum_{j=i}^{M} \hat{\rho}_{uv}^2(j)
\tag{4}
$$

---

[4] A seminal paper in this area is Fama (1981). See also Asprem (1989), Utaka (2003), Rapah, et al. (2005), Abugri (2008) and Tosuma (2009) for a review of the literature and the results on both developed and developing countries.

[5] A number of studies have employed Cheung and Ng's (1996) causality-in-variance test and its variants. Some examples are Hu, et al. (1997), Caporale, et al. (2002), Alaganar and Bhar (2003), Kanas and Kouretas (2003), Neaime (2006), Inagaki (2007), Li, et al. (2008), and Kanas and Ioannidis (2010).

In equation (4), $\hat{\rho}^2_{uv}(j)$ is the sample cross-correlation at lag j which is calculated from $\hat{\rho}^2_{uv}(j) = \{\hat{C}_{uu}(0)\hat{C}_{vv}(0)\}^{-1/2}\hat{C}_{uv}(j)$, where the sample cross-covariance function is given by:

$$\hat{C}_{uv}(j) = \begin{cases} T^{-1}\sum_{t=j+1}^{T}\hat{u}_t\hat{v}_{t-j}, & j \geq 0 \\ T^{-1}\sum_{t=-j+1}^{T}\hat{u}_{t+j}\hat{v}_t, & j < 0 \end{cases}$$

with $\hat{C}_{uu}(0) = T^{-1}\sum_{t=1}^{T}\hat{u}_t^2, \hat{C}_{vv}(0) = T^{-1}\sum_{t=1}^{T}\hat{v}_t^2$. Note that $\hat{u}_t$ and $\hat{v}_t$ are squared standardized residuals derived from the GARCH models expressed in equations (1) and (2).

Cheung and Ng's (1996) S-statistic has a chi-square distribution with $(M-i+1)$ degrees of freedom. The null hypothesis is that of no causality at all lags from i to M. The alternate hypothesis is the presence of causality at some lag j. The choice of i and M depends on the specification of alternative hypotheses. If there is no *a priori* information on the direction of causality, one may set $-i = M$. However, if one wants to examine only the unidirectional causality pattern, then $i = 1$. Similarly, contemporaneous causality can be calculated by setting $j = 0$.

Note that whether there is a causal relationship in the mean of the variables of interest can also be tested by employing Cheung and Ng's (1996) methodology. In this case, the S-statistic in equation (4) is calculated by using the respective GARCH innovations ε_t and ζ_t (instead of their squares) from equation (1) in the sample cross-correlation and the cross-covariance functions.

The criticism of the S-test is that each of the M sample cross-correlations receives equal weighting and thus the resulting test-statistic may not be fully efficient when M is large. In view of this, Hong (2001) proposes a modification to Cheung and Ng's (1996) S-statistic by using a non-uniform kernel weighting function. Hong (2001) defines the Q_2 statistics in which there is no *a priori* information about the direction of causality as:

$$Q_2 = \frac{T\sum_{j=1-T}^{T-1}k^2\left(\frac{j}{M}\right)\hat{\rho}^2_{uv}(j) - C_{2T}(k)}{\sqrt{2D_{2T}(k)}} \tag{5}$$

where $k(j/M)$ is a weighting function for which the Barlett kernel is used.[6]

$$k(j/M) = \begin{cases} 1 - |j/(M+1)| & \text{if } k/(M+1) \leq 1 \\ 0 & \text{otherwise} \end{cases} \tag{6}$$

and

$$C_{2T}(k) = \sum_{j=1-T}^{T-1}(1 - |j|/T)k^2(j/M) \tag{7}$$

$$D_{2T}(k) = \sum_{j=1-T}^{T-1}(1 - |j|/T)\{1 - (|j|+1)/T\}k^4(j/M) \tag{8}$$

In order to test for unidirectional causality, Hong (2001) provides the Q_1-statistic:

$$Q_1 = \frac{T\sum_{j=1}^{T-1}k^2\left(\frac{j}{M}\right)\hat{\rho}^2_{uv}(j) - C_{1T}(k)}{\sqrt{2D_{1T}(k)}} \tag{9}$$

where $k(j/M)$ is a weighting function such as the Barlett kernel and

$$C_{1T}(k) = \sum_{j=1}^{T-1}(1 - |j|/T)k^2(j/M) \tag{10}$$

---

[6]In this study, we use the Barlett kernel since Hong (2001) shows that several non-uniform kernels perform similar results.

$$D_{1T}(k) = \sum_{j=1}^{T-1}(1 - |j|/T)\{1 - (|j| + 1)/T\}k^4(j/M) \tag{11}$$

The Q_2 and Q_1 test statistics are one-sided tests. Hence, upper tailed normal distribution critical values should be used. For example, the asymptotic critical value at the 5% level is 1.645.

Overall, Hong's (2001) testing procedure for causality-variance can be summarized as follows.

1. Estimate univariate GARCH (p, q) models for each time series in question and save the standardized residuals.
2. Compute the sample cross-correlation function $\hat{\rho}_{uv}(j)$between the centered standardized residuals.
3. Choose an integer M and compute $C_{1T}(k)$, $D_{1T}(k)$, $C_{2T}(k)$, and $D_{2T}(k)$.
4. Compute the test statistic Q_1 and compare it to the upper tailed critical value of normal distribution at the desired level. If Q_1 is larger than the critical value, then there is no causality, and accordingly the null hypothesis is rejected. Testing for bidirectional (feedback) causality-in-variance can be calculated similarly using the Q_2-statistic.

The test for the causality-in-mean using Hong's (2001) approach can also be made by employing the GARCH innovations (rather than their squares) for the X and Y series in step 2.

It must be noted that the question of the effects of structural change or breaks in the series of interest has also been raised in the context of causality-in-variance tests. For instance, Van Dijk, *et al.* (2005) and Rodrigues and Rubia (2007) show that causality-in-variance tests suffer from severe size distortions in the presence of structural breaks in the variance of the series. Therefore, it is recommended that the unconditional variance of the series should be tested for the possible presence of breaks before proceeding with further causality tests. In this respect, Inclan and Tiao's (1994) iterative cumulative sum of squares (ICSS) test to detect structural breaks in the unconditional variance of a stochastic process might be employed. In the ICSS test, the null hypothesis is constant unconditional variance, and the alternate hypothesis is a break in the unconditional variance of the series. Nevertheless, the Inclan and Tiao's (1994) test (IT-statistic) is designed for independently and identically distributed random variables. This is a strong assumption for financial series which usually exhibit conditional heteroskedasticity. For this reason, the modified *IT*-statistic developed by Sanso, *et al.* (2004) that allows for conditional heteroskedasticity is recommended for testing for breaks in the unconditional variance of financial time series.

A further complication that arises in testing for causality-in-variance is due to the possible existence of a causal relationship in the means of the series in question. This has already been pointed out by Cheung and Ng (1996). Similarly, Pantelidis and Pittis (2004) demonstrate that the test for causality-in-variance suffers from severe size distortions when strong causality-in-mean effects are left unaccounted for. Hence, the causality-in-mean effects are recommended to be removed by including the lagged values of the variable X that Granger-causes another variable Y in the mean equation of the GARCH model of Y. Gebka and Serwa (2007) also use this filtering approach in order to account for any cointegrating relationships between the variables of interest.

In our empirical analysis, we first test for the breaks in the unconditional variance of the stock returns and business confidence series by using Sanso, *et al.*'s (2004) modification of Incland and Tiao's (1994) test. Furthermore, we pretest and account for the causality-in-mean effects and remove them before testing for causality-in-variance.

Although there are a number of studies employing the conventional Granger-causality tests to investigate the causal link between sentiment indicators and stock returns, these procedures are generally sensitive to the specification of lag lengths. Moreover, the Granger-causality tests rely on distributional assumptions, such as normality and homoskedasticity. Hong's (2001) approach has the advantage of not being dependent on distributional assumptions, and as such, it is more suitable for the investigation of causal relationships involving financial time series which most commonly exhibit non-normality and ARCH effects.

4. DATA AND EMPIRICAL RESULTS

We use monthly data for the business confidence and stock market indices for Greece, Italy, Portugal, and Spain covering the period from January 1988 to December 2010. All data are taken from the OECD's Main Economic Indicators (MEI) database and the stock market indices represent 'all shares' indices with 2005 = 100. The logarithmic stock market return series are calculated by using the $r_t = 100 \times \ln(P_t/P_{t-1})$ formula, and natural logarithm of

business confidence indices are used in the analysis. The variables codes used in our analyses are presented in Table 1.

The descriptive data characteristics are presented in Table 2. It is found that the monthly average stock returns are positive during the sample period. However, the coefficient of variation (CV = standard deviation / mean) of the returns is the highest in the Italian stock market. In addition, the Jarque-Bera normality test statistics suggest that stock returns and confidence indices exhibit significant deviation from normality. The Ljung-Box test statistics for the squared series indicate that conditional variances of the series have volatility clusters except for the Portuguese stock market. The test results show that distribution of the stock returns and business confidence indices exhibit significant ARCH effects.

Whether there are unit roots in the stock returns and business confidence indices is investigated by means of the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979), the PP test proposed by Phillips and Perron (1988), and the Kwiatkowski, *et al.*'s (1992) Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test. We employ the unit root tests with a constant term model and select the lag specification using the Schwarz Bayesian Information (BIC) criteria for the ADF test. For the PP and the KPSS tests, we use the Newey-West bandwidths. According to unit root tests results in Table 2, we conclude that the business confidence indices and stock returns are stationary at the 5% level.

Table 1. The explanations of the variables

Code	Explanations
Greece-BCI	Greece business confidence index
Greece-S	Greece all shares stock returns
Italy-BCI	Italy business confidence index
Italy-S	Italy all shares stock returns
Portugal-BCI	Portugal business confidence index
Portugal-S	Portugal all shares stock returns
Spain-BCI	Spain business confidence index
Spain-S	Spain all shares stock returns

Table 2. Descriptive statistics

	Greece		Italy		Portugal		Spain	
	BCI	S	BCI	S	BCI	S	BCI	S
n	275	275	275	275	275	275	275	275
Mean	−0.013	0.006	−0.002	0.003	−0.013	0.003	−0.005	0.005
Std. Dev.	0.345	0.087	0.539	0.055	0.400	0.052	0.431	0.050
Skewness	−1.012	0.090	−0.429	−0.312	−0.773	−0.304	−0.206	−0.465
Kurtosis	5.388	4.123	3.327	4.570	6.717	5.442	3.697	4.049
J-B	112.306	14.836	9.647	32.701	185.675	72.568	7.514	22.534
	[0.000]	[0.001]	[0.008]	[0.000]	[0.000]	[0.000]	[0.023]	[0.000]
$Q(10)$	179.671	44.433	423.067	25.950	331.864	46.198	471.614	30.410
	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.000]	[0.000]	[0.000]
$Qs(10)$	63.506	126.035	167.470	22.960	247.434	11.420	256.057	20.704
	[0.000]	[0.000]	[0.000]	[0.010]	[0.000]	[0.325]	[0.000]	[0.023]
ADF	−6.837***	−11.951***	−4.666***	−13.302***	−5.419***	−11.744***	−4.202***	−12.09***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
PP	−4.263***	−11.962***	−4.338***	−13.408***	−3.764***	−11.754***	−4.289***	−12.159***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
KPSS	0.028***	0.067***	0.032***	0.077***	0.040***	0.102***	0.042***	0.088***

Notes: J-B indicates Jarque-Bera normality test, $Q(10)$ and $Q_s(10)$ indicate Ljung-Box autocorrelation test for series and squared series respectively. The figures in square brackets show the probability (p-values) of rejecting the null hypothesis. ***, **, and * indicate that the series in question is stationary at the 1%, 5%, and 10% significance level, respectively.

After confirming that the stock return and business confidence series exhibit statistically significant ARCH effects, Hong's (2001) causality test requires the estimation of a GARCH model for each series (Step 1). In choosing the appropriate GARCH model, we estimate various models and compare their likelihoods. We employ the Schwarz BIC in selecting the number of autoregressive parameters in the ARMA model. We find that the GARCH (1,1) model is adequate to describe time series behavior of the data during the sample period. Table 3 presents the estimates of the AR-GARCH model results.

The sum of the α and β parameters in the GARCH model can be considered as an indicator of the persistence in volatility. The sum of α and β parameters ranges between 0.968 (Portugal) and 0.942 (Spain) for the stock returns and between 0.947 (Spain) and 0.547 (Greece) for the business confidence indicators.

Since the data frequency is monthly, we first examine whether there exists a contemporaneous causal relationship between business confidence and stock returns for each country by means of Hong's Q_2 test statistic. The test results shown in Table 4 strongly indicate the presence of contemporaneous causality between business confidence and stock returns for Italy and Spain. These results imply that the changes in business sentiment and stock returns affect each other during the current month in Italy and Spain. Interestingly, this is not the case for Greece and Portugal. We find that the null hypothesis of no causality can be rejected only at the 10% level for Greece whereas the results for Portugal suggest the lack of contemporaneous causality.

Next, we test for the direction of causality-in-mean by employing Hong's (2001) Q_1 test statistic. We use lag windows up to three months since Jansen and Nahuis (2003) demonstrate that a causal relationship between consumer confidence and stock market in Europe occurs at short time horizons. The test results are presented in Table 5. A unidirectional causal relation running from the business confidence index to stock returns is detected for Greece and Italy. On the other hand, stock returns are found to be a Granger-cause of business confidence index in Spain. In the case of Portugal, the test results suggest the presence of feedback effect between business confidence and stock returns.

After examining the causal relationships in the means of the series, we now investigate the presence (or lack thereof) of causality-in-variance between stock returns and business confidence.

As discussed earlier, the presence of structural breaks in the variances of the series distort the results from causality-in-variance tests (Van Dijk, et al., 2005). Hence, we test for such effects using Inclan and Tiao's (1994) ICSS

Table 3. AR-GARCH model results

	Greece		Italy		Portugal		Spain	
	BCI	S	BCI	S	BCI	S	BCI	S
μ	0.003	0.004	0.003	0.005**	−0.004	0.004**	−0.0007	0.005
b_1	1.487***	0.269***	1.470***	0.221***	1.315***	0.443***	1.353***	0.274***
b_2	−1.167***		−0.851***		−0.651***		−0.726***	
b_3	0.602***		0.270***		0.160**		0.252***	
b_4	−0.199***							
ω	0.102	0.0003*	0.009	0.0001	0.003	7.47E-05	0.001	0.0001
α	0.173*	0.158**	0.105	0.119**	0.137**	0.128**	0.038	0.064
β	0.374	0.802***	0.680***	0.844***	0.737***	0.840***	0.909***	0.878***
ν		1.634***	1.432***	1.369***	1.774***	1.333***		1.402***
$\alpha+\beta$	0.547	0.960	0.785	0.963	0.874	0.968	0.947	0.942
Log-L	132.744	313.693	51.355	423.836	102.374	471.583	92.502	452.181
$Q\,(10)$	4.574	5.469	7.908	17.885*	7.498	2.437	12.155	9.434
	[0.918]	[0.858]	[0.638]	[0.057]	[0.678]	[0.992]	[0.275]	[0.491]
$Q\,(20)$	9.799	14.293	20.536	23.804	26.590	14.175	35.078**	20.078
	[0.972]	[0.815]	[0.425]	[0.251]	[0.147]	[0.822]	[0.020]	[0.453]
$Q_s\,(10)$	7.006	15.248	6.093	13.401	6.031	8.293	9.715	14.623
	[0.725]	[0.123]	[0.807]	[0.202]	[0.813]	[0.600]	[0.466]	[0.146]
$Q_s\,(20)$	17.836	19.577	12.408	23.039	16.343	13.554	26.791	24.570
	[0.653]	[0.458]	[0.901]	[0.287]	[0.695]	[0.852]	[0.141]	[0.218]

Notes: ν indicates GED parameter, Log-L indicates Loglikelihood values, Q(.) and Q_s(.) indicate Ljung-Box autocorrelation test. The figures in square-brackets show the probability (p-values) of rejecting the null hypothesis.

Table 4. Contemporaneous causality-in-mean between business confidence and stock returns

Direction of Causality	*Hong's Q_2*
Greece-BCI↔Greece-S	1.301* [0.097]
Italy-BCI↔Italy-S	5.590*** [0.000]
Portugal-BCI↔Portugal-S	−0.567 [0.715]
Spain-BCI↔Spain-S	3.743*** [0.000]

Notes: ***, **, and * indicate significantly causality relationship at the 1%, 5%, and 10% significance level, respectively.

Table 5. Tests of unidirectional causality-in-mean between business confidence and stock returns

	Hong's Q_1		
Direction of Causality	M = 1	M = 2	M = 3
Greece-BCI → Greece-S	1.636* [0.051]	1.482* [0.069]	1.307* [0.096]
Greece-S → Greece-BCI	−0.507 [0.694]	0.096 [0.462]	0.547 [0.292]
Italy-BCI → Italy-S	3.202*** [0.001]	3.282*** [0.001]	3.616*** [0.000]
Italy-S → Italy-BCI	0.834 [0.202]	1.069 [0.142]	1.208 [0.114]
Portugal-BCI → Portugal-S	1.564* [0.059]	1.661** [0.048]	1.708** [0.044]
Portugal-S → Portugal-BCI	1.111 [0.133]	2.095** [0.018]	2.654*** [0.004]
Spain-BCI → Spain-S	0.939 [0.174]	0.759 [0.224]	0.594 [0.276]
Spain -S → Spain -BCI	1.916** [0.028]	1.992** [0.023]	1.932** [0.027]

Notes: ***, **, and * indicate significantly causality relationship at the 1%, 5% and 10% significance level, respectively.

procedure as modified by Sanso, *et al.* (2004). Our findings indicate no breaks in the variances of business confidence and stock returns series.[7]

Given that we have found statistically significant causality-in-mean effects in some cases, we remove the causality-in-mean effects by including the lagged values of the variables that are found to be a Granger-cause as explanatory variables in a (new) GARCH model. Then, we conduct the test for the causality-in-variance using these new standardized residuals.[8]

The test results for contemporaneous causality-in-variance are presented in Table 6. We find that there exists a contemporaneous causal relationship in variance between business confidence and stock returns only for Italy. We do not find evidence of such a causal relationship in variance for Greece, Portugal, and Spain. These results indicate that the Italian stock market is more prone to volatility spillovers between business confidence and stock returns in the current month than in other countries.

In order to identify the direction of causality between the variance of the business confidence index and the variance of stock returns, we again compute Hong's Q_1 statistic and present the results in Table 7.

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[7]The test results are available upon request.
[8]The new GARCH model estimates are not presented to save space, but they are available upon request.

Table 6. Contemporaneous causality-in-variance between business confidence and stock returns

Causality Direction	Hong's Q_2
Greece-BCI↔Greece-S	−0.047 [0.519]
Italy-BCI↔Italy-S	9.770*** [0.000]
Portugal-BCI↔Portugal-S	0.808 [0.210]
Spain-BCI↔Spain-S	−0.698 [0.758]

Notes: ***, **, and * indicate significantly causality relationship at the 1%, 5%, and 10% significance level, respectively.

Table 7. Causality-in-variance between business confidence and stock returns

Causality Direction	Hong's Q_1		
	M = 1	M = 2	M = 3
Greece-BCI → Greece-S	0.064 [0.475]	−0.068 [0.527]	−0.102 [0.541]
Greece-S → Greece-BCI	0.159 [0.437]	0.697 [0.243]	1.477* [0.070]
Italy-BCI → Italy-S	0.388 [0.349]	0.590 [0.278]	0.709 [0.239]
Italy-S → Italy-BCI	0.104 [0.459]	0.672 [0.251]	0.979 [0.164]
Portugal-BCI → Portugal-S	4.077*** [0.000]	4.410*** [0.000]	4.397*** [0.000]
Portugal-S → Portugal-BCI	−0.685 [0.753]	−0.705 [0.759]	−0.743 [0.771]
Spain-BCI → Spain-S	16.605*** [0.000]	16.245*** [0.000]	15.397*** [0.000]
Spain -S → Spain -BCI	−0.449 [0.673]	−0.505 [0.693]	−0.503 [0.693]

Notes: ***, **, and * indicate significantly causality relationship at the 1%, 5%, and 10% significance level, respectively.

Table 8. Summary of the causality test results between business confidence (BCI) and stock returns (S) at 5% significance level

	Causality-in-Mean			Causality-in-variance		
	Contemporaneous	BCI → S	S → BCI	Contemporaneous	BCI → S	S → BCI
Greece	No	Yes	No	No	No	No
Italy	Yes	Yes	No	Yes	No	No
Portugal	Yes	Yes	Yes	No	Yes	No
Spain	Yes	No	Yes	No	Yes	No

We find the presence of a causal relation running from stock returns to business confidence index at only 3 months and 10% level for Greece. While we cannot find a causal link between confidence index and stock returns for Italy, business confidence index variables are found to be a Granger-cause of the variance of the stock returns for Portugal and Spain at 1% significance level. These findings are interesting because sentiments play an important role in the volatility of stock markets for Portugal and Spain. Therefore, researchers and practitioners might consider business sentiment indicators to predict stock market volatility.

The overall view of the quantitative results presented in Tables (4) – (7) can be summarized qualitatively in Table 8 as follows.

Our findings indicate that the nature of the causal relationships between business confidence and stock returns are quite diverse. For Greece, the only causal link is the unidirectional causality from business confidence to stock returns in the mean. There are no contemporaneous causality patterns. In the case of Italy, we again find unidirectional causality from business confidence to stock returns. In addition, contemporaneous spillover effects in mean and variance are also detected. In Portugal, we find evidence of a feedback between business confidence and stock returns. Furthermore, a unidirectional causality-in-variance is found from business confidence to stock returns. For Spain, we find evidence of a contemporaneous causality in the means and a unidirectional causality from stock returns to business confidence. Nevertheless, as in the case of Portugal, business confidence volatility causes stock market volatility in Spain as well.

5. CONCLUSIONS

In this paper, we investigate the mean and variance spillovers between business confidence and stock returns for the four distressed Southern European countries, namely Greece, Italy, Spain, and Portugal, for the period from January 1988 to December 2010. Our paper uses Hong's (2001) version of Cheung and Ng's (1996) causality-in-mean and causality-in-variance tests which are invariant to distributional assumptions. As a methodological improvement, we remove any causality-in-mean effects before carrying out the causality-in-variance tests. Most of the literature on the relationship between economic sentiments and stock market uses a demand-side indicator, e.g. consumer confidence. Instead, our study employs a supply-side confidence indicator, i.e., business confidence index. The link between the real economy and the stock market is hard to evaluate especially at times of economic stress. Hence, a supply-side expectations indicator might be more informative.

Our findings indicate that volatility in business confidence causes stock market volatility in Portugal and Spain. Also, there is evidence of a contemporaneous causality-in-variance interaction between business confidence and stock returns in the case of Italy. Stock market volatility is not found to cause volatility in business confidence in any of the countries at the five percent level of significance. For the causal relationship in the mean of the series, we find that there is feedback (bidirectional causality) in Portugal. Interestingly, the direction of causality-in-mean runs from business confidence to stock returns in Italy, but it is in the reverse direction in the case of Spain. Nevertheless, there is still evidence of a very short-term (contemporaneous) interaction between business confidence and stock returns in both Italy and Spain. These results indicate the stock market and business confidence relationship has its own idiosyncratic properties in each country. For instance, we find that business confidence drives stock returns only in the mean in Greece. On the other hand, there is not only a feedback between the mean stock returns and business confidence in Portugal, but business confidence volatility causes stock market volatility as well. Therefore, the stock market reactions to the current macroeconomic environment and expectations about the future developments might evolve differently in each country.

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