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The Small Business Capital Market Behavior in Athens Stock Exchange

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ABSTRACT. Financing small and medium enterprises (SMEs), especially business investments and growth, is a composite and particular complicated affair in the Greek entrepreneurial reality. This paper examines the significance of secondary capital markets, as an alternative source of financing small-medium enterprises' new entrepreneurial plans. Cointegration technique is applied to test the relationship between the secondary capital market and the dominant sectors in Athens Stock Exchange (ASE). Causality tests are also used to provide evidence on the existence of interdependence between the cointegrated series. The results indicate that there is significant uni-directional causality between primary and secondary capital market in Greece, enhancing us to suggest valuable policy implications.

KEY WORDS: causality, cointegration, entrepreneurship, small busisness capital markets

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1. Introduction

The term secondary markets indicates the financial markets of parallel negotiation that function concurrently with the primary in the framework of an integrated financial center in which the introduction of smaller enterprises is less difficult since the entry requirements are limited. The secondary markets aim to make stock markets accessible to small-medium enterprises, offering lower costs, availability of capital for investment plans and entrepreneurial development.

The value that small-medium firms contribute to the domestic and international economy is significant, and many of today's small businesses will be tomorrow's market leaders (Audretsch et al., 2002. Therefore, the establishment of either separate or integrated markets that promote small firms development is fundamental to the healthy growth of capital markets.

Several studies tested the price behavior in the main market of SE and performed tests of efficient market hypothesis (e.g., Niarchos, 1972, Alexakis and Petrakis, 1991, Niarchos and Alexakis, 1998). In an efficient market the competing market participants reflect information rationally and instantaneously on prices, making past relevant information useless in predicting future prices. An efficient market should react only to new information but since this is unpredictable by definition, price changes or returns in an efficient market, cannot be predicted (Fama, 1970, 1976).

However, up to now there has been limited research for the price index performance of the secondary capital market, and its linkages with the dominant sectors in ASE. The only study for the Greek secondary market so far comes from Samitas and Kenourgios (2005), who provide evidence for the absence of integration among

the major European SMBs markets (United Kingdom, France, Germany, Italy and Greece), signaling their diversified role in financing SMEs. Some intriguing lead-lag patterns between small and large portfolios in the USA and UK have been found and reported. Lo and MacKinlay (1990) show that large capitalization portfolios lead small ones on the New York Stock Exchange. More evidence is provided in Boudoukh et al. (1994), Badrinath et al. (1995) and Jegadeesh and Titman (1995), but, as Campbell et al. (1997, p. 78) have remarked, ''we are still far from having a complete understanding of their nature and sources''. More recently, Mills and Jordanov (2000) investigate whether lead-lag patterns similar to those found in the US hold between small and large firm portfolios from the London Stock Exchange. Their findings support that such patterns do exist.

The aim of our study is to investigate whether it is possible to predict stock price changes in the Greek secondary capital market (Parallel Market) that could be due to its co fluctuation with the other dominant sectors (banks, industrial, insurance and construction) and their relative indices in ASE. The theory of cointegration, in this case, became the most sufficient method for testing the co-dependence between stock markets' indices. The cointegration examines the existence of a long-run common stochastic trend among stock prices. Cointegration between two stock indices implies that it is possible to use the price movements in one market in order to predict the price movements in the other market.

The second section of this paper presents the Greek SMEs environment, the third section analyses the main methodological issues, section four describes the data and the empirical results and section five concludes with policy implications.

2. Greek SMEs market environment

When studying the financing reality in Greek SMEs we have to examine the main features of three different fields: The institutional, the market and the entrepreneurs' cultural attitudes. From this inquiry we'll detect the grounds of the SMEs financing system deficiency. That way, we'll consider the possibility of changing the financing alternatives for the SMEs.

The principle attribute of Greek economy that brings into operation the SMEs is the existence of a critical institutional field. There is a striking discrepancy between the political and economic speeches and the adoption of drastic measures in order to accumulate positive aspects for the entire economic system. This situation precludes any convergence with the economies of the European Union and it causes repercussions for the indigenous economy (Paraskevopoulos, 2001). The most important economic indexes are in red. The rate of inflation and the unit cost prices unfailingly exceed the European Union' average. The competitiveness of the Greek economy and its production needs extra capital and new technology based innovative products. The rate, though, of dispenses for the research and development is in the lower level between the 15 of European Union (Bank of Greece, 2005).

Furthermore, the fiscal policies instead to diminuend the problem, continue in unproductive methods. The patronage characteristics of the political relationships support a corruptive public sector that hampers the progress of a significant competitiveness. The unwillingness of the Greek governments to apply the appropriate cure for the plight of the public corruption and the chronic economic disease of the country disenchanted the foreign direct investments.

The main features of the Greek economy are a state that hesitates to sustain the swinging changes, a low competitiveness context, a dearth of foreign direct investments and a corruptive context. At the same time, the economy's globalization creates the conditions that support the economic changes and awake to the dangers.

The innovation that is the principle aspect of competitive markets (Reklitis et al., 2000) became, in the case of the Greek market, a marginal activity. After the Maastrich treaty in 1992, European partners pressured the Greek state; to overcome the ''bad habits'' of the selective enterprises protection.

In these conditions is easy to understand the business culture: The first and prevalent business idea in the marketplace is the ''fast and facile business profit''. The SMEs create every business

attempt in this kind of day-to-day business philosophy (Droucopoulos and Thomadakis, 1993; Fotopoulos and Spence, 1998). But in our globalized economy the entrepreneurs, who avoided the long time projects and the innovations designs, soon reached to compromise with new inevitable situation (Reklitis and Trivellas, 2002). Accordingly to the new business claims, financing of small and medium enterprises is a fundamental aspect in Greek marketplace and seeks for alternatives.

Greek small and medium enterprises have two major sources of finance, the European Union funds and the banking loans. The main purpose of the European grants is the modernization of small and medium enterprises and the development of new innovative products. Nevertheless, the use of these capitals covers daily business necessities. On the other hand, the banks seek for positive track records and collateral, which generally new firms do not have for long. All these obstacles in financing SMEs lead them to look for alternative sources of funding.

3. Methodological issues

3.1. *Cointegration*

The empirical investigation of price changes in one market generating price changes in the other market is given in equation (1):

$$P_t - \delta_0 - \delta_1 S_t = \varepsilon_t \tag{1}$$

where P_t and S_t are contemporaneous primary and secondary price indices at time t; δ_1 and δ_0 are parameters; and ε_t is the deviation from parity. If P_t and S_t are non-stationary but the deviations are stationary, P_t and S_t are cointegrated and an equilibrium relationship exists between them (Engle and Granger, 1987). For P_t and S_t to be cointegrated, they must be integrated of the same order. Performing unit root tests on each price series determines the order of integration. If each series is non stationary in the levels, but the first differences and the deviations ε_t are stationary, then the prices are cointegrated of order (1,1), denoted CI (1,1), with the cointegrating coefficient δ_1.

In order to test for cointegration between the two markets, the Johansen's Maximum Likelihood Procedure (Johansen, 1988) is implemented. This is a preferred method of testing for cointegration as it allows restrictions on the cointegrating vectors to be tested directly, with the test statistic being χ^2 distributed. This specific procedure provides a unified framework of estimating and testing the cointegration relationships in a VAR error correction mechanism, which incorporate different "short-run" and "long-run" dynamic relationships in a variable system (Bachman et al., 1996).

The Johansen's procedure firstly specifies the following unrestricted N-variable VAR:

$$x_t = \mu + \sum_{i=1}^{k} \Pi_i x_{t-i} + \varepsilon_t \tag{2}$$

where $x_t' = [p_t', s_t']$, μ is a vector of intercepts terms and ε_t is a vector of error terms. Johansen (1988, 1991) and Johansen and Juselius (1990) reparameterized eq. (4) in the form:

$$\Delta x_t = \mu + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} - \Pi x_{t-k} + \varepsilon_t \tag{3}$$

Equation (3) is now a VAR reparameterized in error correction form, where $\Pi = -(I - \Pi_1 ... - \Pi_k)$ represents the long response matrix. Writing this matrix as $\Pi = \alpha\beta'$, then the linear combinations $\beta' x_{t-k}$ will be I(0) in the existing of cointegration, with α being the adjustment coefficients, and the matrix Π will be of reduced rank. The Johansen approach can be used to test for cointegration by assessing the rank (r) of the matrix Π. If $r = 0$ then all the variables are I(1) and there are no cointegrating vectors. If $r = N$ then all of the variables are I(0) and, given that any linear combinations of stationary variables will also be stationary, there are N cointegrating vectors. Finaly, if $0 < r < N$ there will be r cointegrating vectors.

3.2. *Error correction and causality*

The cointegration between two series involves a continuous adjustment of innovation prices, so that these would not become larger in the long run. Engle and Granger (1987) have shown that all the cointegrated series can include an error correction (the "Granger representation theorem") and, on the contrary, the existence of

cointegration is a necessary condition in order to construct error correction models.

If ΔS_t and ΔP_t denote the first differences of secondary and primary price indices, the following cointegrating regressions are possible:

$$\Delta S_t = \alpha_1 + a_S z_{t-1} + \sum_{i=1}^{n} \alpha_{11}(i)\Delta S_{t-i} + \sum_{i=1}^{n} \alpha_{12}(i)\Delta P_{t-i} + \varepsilon_{St} \quad (4)$$

$$\Delta P_t = \alpha_2 + aP z_{t-1} + \sum_{i=1}^{n} \alpha_{21}(i)\Delta S_{t-i} + \sum_{i=1}^{n} \alpha_{22}(i)\Delta P_{t-i} + \varepsilon_{Pt} \quad (5)$$

where, $z_t = S_t - [b + a\ P_t]$ is the error correction term. Equations (4) and (5) represent a Vector Error Correction Representation (VECM) in first differences; thus, all variables are held jointly endogenous and OLS is an appropriate method of estimation.

Each equation is interpreted as having two parts. The first part is the equilibrium error (from the cointegrating regressions). This measures how the left-hand-side variable adjusts to the previous period's deviation from long run equilibrium. The remaining portions of the equations are the lagged first differences, which represent short-run effects of the previous period's price changes on the current period's price changes. For example, in equation (4) the change in S_t is due to both "short-run" effects, possibly from both ΔP_t and ΔS_t, and to the last-period equilibrium error, z_{t-1}, which represents adjustment to long-run equilibrium.

The error correction term enters into the two equations with a one period lag and is estimated from the cointegrating regressions, with constant terms being included to make the mean of the error series zero. The coefficients α_S και α_P measure the single-period response of the left-hand-side variable to departures from equilibrium ("speed of adjustment coefficients"). At least one speed of adjustment coefficients must be nonzero for the model to be an error correction model. If the value of α_S in eq. (4) is zero, the current period change in the index does not respond at all to the last period's deviation from long-run equilibrium.

The link between cointegration and causality stems from the fact that if two market indices are cointegrated, then causality must exist in at least one direction (unidirectional causality) and possibly, in both directions (bi-directional causality) (Granger, 1986).[1]

The existence of a unidirectional causality from S_t to P_t requires: (i) that some of the a_{21}'s in eq. (5) must be non-zero while all the a_{12}'s in eq. (4) must be equal to zero and/or (ii) the error correction coefficient αp in eq. (5) is statistically significant at conventional levels. If the coefficients a_{21} and a_{12} are individually and jointly non-zero, then a feedback relationship or a bi-directional causality between the two price series exists. On the other hand, if the above coefficients are equal to zero, then there is not a causality relationship between the two variables, as each variable is determined by its prices and the relevant innovations.

4. Data and empirical results

Daily price indices of primary and secondary stock markets in Greece were used in this study, as well as the price indices of the dominant sectors (banking, insurance, construction and industrial). The composite price index of the ASE primary market comprises the 60 most highly capitalized shares of the main market and reflects general trends of the stock market. The index of the parallel market includes the first 40 most highly capitalized shares of the ASE parallel market.

Table I reports the value of transactions, while Table II the market capitalization of the ASE listed companies for the primary and parallel market during the period 1998–2004. Because dividends are not included, the indices simply represent prices. The data was converted to natural logs and covered the period from January 1998 to December 2004.[2] Data was drawn from the Athens Stock Exchange Financial Statistics and the Center of Financial Studies (University of Athens).

To determine the order of each price series, the Dickey–Fuller and the Augmented Dickey–Fuller t-tests (Dickey and Fuller, 1981) are computed on the levels of each price series. Performing the tests on the levels of each series

TABLE I
The value of transactions in the ASE, 1998–2004

Year	Main market		Parallel market	
	Amount (mn euros)	Annual change (%)	Amount (mn euros)	Annual change (%)
2004	31,928.1	8.0	3159.0	−29.3
2003	29,558.3	50.8	4975.9	0.7
2002	19,596.8	−41.8	4943.7	−26.0
2001	33,698.5	−59.9	6679.4	−60.3
2000	83,961.9	−45.3	16,824.8	−12.3
1999	153,373.1	292.3	19,175.7	158.6
1998	39,097.6	140.5	2233.5	190.8

Source: ASE.

TABLE II
Market capitalization of the ASE listed companies, 1998–2004

Main market					
End of year	Financial sector[a]	Manufacturing	Other[b]	Amount	Parallel market
2004	33,816.2	15,250.4	37,619.6	86,686.1	5,346.35
2003	26,030.4	17,458.3	34,678.7	78,167.3	6,111.4
2002	17,578.0	12,383.7	30,487.7	60,449.3	5,188.3
2001	30,105.5	19,178.4	39,894.6	89,178.5	7,720.8
2000	44,076.6	32,788.1	30,419.2	107,283.9	10,672.3
1999	64,783.2	61,863.2	51,244.0	177,890.4	19,646.6
1998	23,740.5	18,619.2	21,797.3	64,157.0	2,867.8

Source: ASE.
[a] Banks, Insurance Companies, Portfolio Investment Companies, Leasing Companies.
[b] Holding Companies, Construction, Telecommunications, Water Supply, Electricity, Shipping, Information Technology, TV and Entertainment, Gaming, Health, Wholesale trade, IT Equipment, Retail trade, Mobile Telephony Retail Services, Hotels, Resorts, Advertising, Real Estate, Mining, Motor Vehicle Trade and Maintenance, Transport Rental Services, Fish farming, Agriculture and Farming, ''Change of activity''.

shows that the null hypothesis of a unit root (H_0) cannot be rejected; thus, each series is I(0). On the contrary, the results of the tests on the first differences indicate that each series is I(1). Table III reports the results of the Unit roots tests.

Since all the series are I(1), the Johansen procedure test for cointegration is used. Hall (1991) has demonstrated that in using this procedure to test for cointegration it is necessary to carry out tests to establish the appropriate order of the VAR. The results of the Akaike (1973) Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC) established that a lag length of 2 is appropriate for all series.[3]

Having established the appropriate lag length, we can now proceed to test whether secondary market cointegrates with primary market and the other dominant sectors. Table IV reports the Likelihood ratio (LR) test for cointegration based on Maximal eigenvalue and Trace test statistics for the number of cointegrating vectors.

As we can see from Table IV, the Johansen cointegration tests among secondary stock market relative index and ASE's dominant sectors (banks, insurance, industry, construction) are rejected. The results lead to similar findings with those of the Engle–Granger's methodology. The rejection of cointegration means that there are no linkages among the Greek secondary market and all the other internal markets.

On the contrary, the hypothesis of cointegration between the primary and secondary markets and their relative indices in Athens

TABLE III
Unit roots tests in all sectors

ASE	ADF	Statistic	ADF critical value*
General index	Value	−2.5372	−3.4233
	ΔValue	−21.1822**	
Parallel market index	Value	−0.6844	−3.4233
	ΔValue	−18.1312**	
Banks index	Value	−2.6641	−3.4233
	ΔValue	−21.3211**	
Insurance index	Value	3.4441	−3.4233
	ΔValue	−21.5222**	
Industrial index	Value	−2.6339	−3.4233
	ΔValue	−21.5512**	
Construction index	Value	0.7915	3.4233
	ΔValue	−19.9717**	

Notes:
Value = the logarithm of the market index.
ΔValue = the first difference of the logarithms.
*5% critical value of the Augmented Dickey–Fuller test statistic.
**Statistically significant at 5% confidence interval.

TABLE IV
Johansen tests for cointegration

System	Null hypothesis	Alternative hypothesis	Tests for cointegration vectors based on	
			Maximal eigenvalue	Trace
Parallel market index- general index	$r=0$	$r \leq 1$	16.7442	21.4552
	$r \leq 1$	$r=2$	3.3321	3.3321
Parallel market index- banks index	$r=0$	$R \leq 1$	16.1721	21.0711
	$r \leq 1$	$r=2$	3.8813	3.8813
Parallel market index- insurance index	$r=0$	$r \leq 1$	14.0964	19.3190
	$r \leq 1$	$r=2$	1.3324	1.3324
Parallel market index-industrial index	$r=0$	$r \leq 1$	13.3611	18.3323
	r ≤ 1	$r=2$	3.0889	3.0889
Parallel market index-construction index	$r=0$	$r \leq 1$	14.7115	16.9901
	$r \leq 1$	$r=2$	2.7709	2.7709

Note: The 95% critical values of the test based on Maximal eigenvalue are 15.8654 ($r=0$, $r \leq 1$) and 9.4400 ($r \leq 1$, $r=2$), while the critical values of the test based on Trace are 20.0710 and 9.4400 respectively.

Stock Exchange (ASE) is not rejected. The test statistics indicate that the null hypothesis of zero cointegrating vectors is rejected at 5% level, while the hypothesis of one cointegrating vector cannot be rejected between primary and secondary markets and their relative indices.

The existence of cointegration in the two markets implies that it is possible to use the price movements in one market (primary) in order to predict the future price movements in the other market (secondary), and thus possible arbitrage profits can be explored in the long run.

Thus, the two markets are I(1), with linear combinations being I(0), confirming that the two price series are CI (1,1). This implies the inexistence of weak-form efficiency in the long run, and that the Greek primary and secondary markets are improper for domestic diversification.

Since both price series are CI (1,1), an error correction model with lag length 2 on ΔS_t and ΔP_t is estimated using OLS regression[4]:

$$\Delta LS_t = a_1 + a_S\, z_{t-1} + \sum_{i=1}^{2} \alpha_{11}(i)\Delta LS_{t-i} + \sum_{i=1}^{2} \alpha_{12}(i)\Delta LP_{t-i} + \varepsilon_{St} \quad (6)$$

$$\Delta LP_t = a_1' + a_P\, z_{t-1} + \sum_{i=1}^{2} \alpha_{21}(i)\Delta LS_{t-i} + \sum_{i=1}^{2} \alpha_{22}(i)\Delta LP_{t-i} + \varepsilon_{Pt} \quad (7)$$

Tests carried out for serial correlation, functional form, and heteroskedasticity confirmed the models' statistical adequacy.

Table V displays the test results of the restrictions imposed on the speed of adjustment coefficients (α_S and α_P) and the lagged variables coefficients (α_{12} and α_{21}) to eq. (6) and (7), using the Wald test statistic, which being χ^2 distributed.

The results of the Wald test on the speed of adjustment coefficients (α_S and α_P) indicate that the secondary and primary markets behave somewhat differently. The lack of significance of α_S means the secondary market does not respond to the previous period's deviation from equilibrium. The significance of α_P means the current period primary stock prices responds to the previous period's deviation from equilibrium. The finding that one of the speeds of adjustment coefficients is nonzero ($\alpha_P \neq 0$) confirms that the model is an error correction model.

The significant speed of adjustment in eq. (7) does not mean that the secondary market leads or causes the primary market. Respectively, the insignificant speed of adjustment in eq. (6) does not mean that the primary market is not leading the secondary market. In order to conclude about the direction of causality or the lead-lag relationship between the two markets, we have to test the significance of the lagged variables coefficients. The results of the Wald test on coefficients α_{12} and α_{21} show that the null hypothesis (the coefficients are individually and jointly equal to zero) must be rejected for α_{12}. Thus, the significance of α_{12} and α_{21} indicates the existence of a uni-directional causality and strong informational relationship between the two markets, since the last period's price changes in S_t (P_t) "short run" affect the current period's price changes in P_t (S_t). This lead-lag pattern, where the primary index (larger capitalization stocks) lead and the parallel index (smaller capitalization stocks) follow, is in line with the international evidence. The strong informational linkage between the two markets and the absence of the weak-form efficiency in the ASE could be an explanatory factor for this specific pattern. However, given the thinness of the Greek secondary market in terms of capitalization and value of transactions compared to the primary market, the existence of this lead-lag relationship could be explained by the infrequent trading of small capitalization stocks and so the non synchronous trading in ASE.

TABLE V
Wald test results

Null hypothesis (H_0)	Wald statistic	*P*-value
$\alpha_S = 0$	0.38390	0.354
$\alpha_P = 0$	6.6831	0.010
$\alpha_{12} = 0$	73.1881	0.229
$\alpha_{21} = 0$	21.3394	0.000
$\alpha_{12} = 0$, $\alpha_{21} = 0$	35.6394	0.001

Note: The Wald test statistic is distributed as χ^2 under the null hypothesis of coefficients equal to zero.

5. Concluding remarks

The secondary market continues to offer certain investors unique opportunities. Entrepreneurs and investors' expectations are gradually adjusting to the new financial era. Opportunities for innovation abound. However, the attractions of the secondary market are minored by equally significant challenges.

This paper applied cointegration techniques to test the relationship between the secondary (parallel) capital market and the dominant sectors in Athens Stock Exchange. It also examines the existence of interdependence between primary and secondary markets in order to test the price behavior of the secondary market and market efficiency in a weak level.

The Johansen tests used indicate that only the general index (primary market) and the parallel market index (secondary market) are cointegrated. Thus, an error correction model is developed in order to investigate the causality or the lead-lag relationship between the two markets.

The analysis of this model indicates and supports the presence of uni-directional causality between the general index and the parallel index, and thus an informational linkage. This means that the index prices in primary market may contain useful information regarding consequent price movements of the parallel market. This may be due to the absence of weak-form market efficiency or the infrequent trading in the parallel market.

Given to our empirical findings, the close relationship between secondary and primary market, the unique characteristics of the secondary market it is needed to be reorganized in an autonomous trading market with its own managerial policy. The difficulties involved with sourcing, valuing, structuring and negotiating secondary opportunities can be meaningful. Entrepreneurs need to be careful in the way they gain exposure to the secondary market and ensure that their investment strategy is best able to capture the opportunities in this fast evolving and challenging market.

Notes

[1] The Standard Granger causality tests do not take into account the significance of error correction coefficients. Engle and Granger (1987) focused on the fact that the estimates of a VAR are misspecified in the case of cointegrated variables, because the error correction terms that are attached to error correction models are not accounted. The argument is that the models implemented for testing the causality relationship are misspecified if the variables, which are tested for the direction of causality, are cointegrated.

[2] The high frequency (daily) data caused not serious ARCH effects in the residuals, but normally this type of sample frequencies are not dominated by linear autoregressive structures but instead by nonlinear conditional variance autoregressive effects. In the interests of brevity, test results are not presented here.

[3] In order to assess the model adequacy, at each lag the VAR residuals are checked for satisfying the white noise assumption. The Breusch–Godfrey LM test for serial correlation (Godfrey, 1988) and the Jarque–Bera test for normality (Jarque and Bera, 1987), with the test statistics being χ^2 distributed, are used. The presence of serial correlation on the innovations of the VAR indicates also the existence of the effects of infrequent trading and the bid-ask price effect. In the interests of brevity, test results are not presented here. Results are available from the authors on request.

[4] The full output from the estimation of Engle–Granger tests and the error correction model is available from the author upon request.

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