TESTING WEAK AND SEMI-STRONG FORM EFFICIENCY OF STOCK EXCHANGES IN EUROPEAN MONETARY UNION COUNTRIES: PANEL DATA CAUSALITY AND CO-INTEGRATION ANALYSIS

Mustafa TORUN[1] **Serdar KURT**[2]

ABSTRACT

This study investigated that whether or not there is weak and semi-strong form efficiency of stock exchanges in European Monetary Union Countries with panel data variables stock market price index, consumer price index, purchasing power of euro, unemployment. In order to test the weak form efficiency, we used panel unit root tests and also for the testing semi-strong form efficiency panel co-integration and causality analysis. The result from unit root analysis show that stock markets of European Monetary Union countries is weak efficient. According to results of co-integration and causality analysis, some countries aren't semi-strong form efficient.

Key Words: Weak and Semi-Strong Form Efficiency, Panel Causality, Panel Co-integration.

JEL Classification: G14, C23, C33

AVRUPA PARASAL BİRLİĞİ ÜLKELERİNDE MENKUL KIYMET BORSALARININ ZAYIF ve YARI GÜÇLÜ FORMDA ETKİNLİĞİNİN TESTİ: PANEL VERİ NEDENSELLİK ve EŞBÜTÜNLEŞME ANALİZİ

ÖZET

Bu çalışmada, menkul kıymet borsa endeksi, tüketici fiyat endeksi, Euro'nun satın alma gücü endeksi ve işsizlik değişkenleri kullanılarak, Avrupa Parasal Birliği ülkelerinde menkul kıymet borsalarının zayıf ve yarı güçlü formda etkin olup olmadığı araştırılmıştır. Zayıf formda etkinliği test etmek için panel birim kök, yarı güçlü formda etkinliği test etmek için ise nedensellik ve eşbütünleşme analizleri kullanılmıştır. Birim kök testlerinden elde edilen sonuçlar, Avrupa Parasal Birliği Ülkelerinin menkul kıymet borsalarının zayıf formda etkin olduğunu göstermiştir. Eşbütünleşme ve nedensellik analizi sonuçlarına göre, bazı parasal birlik ülkeleri borsalarının yarı güçlü formda etkin olmadığı tespit edilmiştir.

Anahtar Kelimeler: Zayıf ve Yarı Güçlü Formda Etkinlik, Panel Nedensellik, Panel Eşbütünleşme.

JEL Sınıflandırması: G14, C23, C33

[1] *Yrd.Doç.Dr., Çanakkale On Sekiz Mart University, Department of Economics, Çanakkale, TURKEY, mtorunus@yahoo.com.*

[2] *Öğr.Gör., Karadeniz Technical University, Department of Economics, Beşikdüzü, Trabzon, TURKEY, serdarkurt10@hotmail.com*

1. Introduction

The European Monetary System (EMS) was created in March 1979 with the purpose to promote monetary stability and closer economic cooperation in the countries of the European Community. The Exchange Rate Mechanism (ERM) was at the core of the system. With the advent of the Euro the ERM was revised. The ERM was designed to keep currencies trading in a range around a central rate. After the crises in 1993, the bands were widened to 15% for all except the DEM and NLG, which maintained 2.25% bands. At the end of 1996, the grid included 12 European Union currencies. Britain's pound, Sweden's krona and Greece's drachma remained outside (Gonzalez and Launonen, 2005, p. 28). January 1, 1994, European Monetary Institute (EMI) was founded as stage two of European Monetary Union (EMU). December 15, 1995, EU leaders confirm January 1, 1999, as start date for single currency. March 25, 1998, European Commission recommends 11 members for EMU after evaluating economic performance in 1997. On same day, EMI says all EMU candidates must do more to consolidate public finances. May 2-3, 1998, European leaders due to hold summit. Expectations are that they will select Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain to join the Euro (Gonzalez and Launonen, 2005, p. 29).

The first period of EMU by EMS, the second period by EMI's establishment and the last period of EMU were completed in January 1999. 11 countries were accepted Euro. At 2001 2nd January, Greece was accepted Euro. On 1st January of 2002, banknotes and coins of Euro began in usage in Euro area.

The monetary union is very important for the elimination of financial policy differences among countries, and also establishing a stabilized economic environment. Countries will have difficulties to sustain unity due to important differences between these factors and lack of stability. Before partcipating monetary union, countries have to meet some criteria regarding their fiscal and financial structures. For this purpose, within Maastricht agreement, there are convergence criteria about harmononizing the economic parameters between the countries. These criteria forces countries to tune their economic policies accordingly and closer coordination is sought for. Macro economic data such as the inflation rate, the rate of budget deficit by GDP, devaluation rates, long term interest rates.

Finally, the European Commission recommended 11 countries to participate in the Euro area in March 1998 after evaluating their economic indicators for 1997.

In addition to this, stock and exchange markets are one of the best indicators to check the unity of economic and monetary integration. In monetary union countries, the stock market efficiencies must be closer to each other. Because, differencess of efficiency levels of stock markets cause financial problems about converting savings and foreign capitals to the investment. Moreover these differences cause imbalance and unstable positions among countries.

The study consists of four parts; efficient market hypothesis, literature review, data and the econometric application. Results are explained in the conclusion.

2. Efficient Market Hypothesis

Efficient market hypothesis concepts firstly explained by Fama (1970). In this hypothesis, efficient markets explained as the 'markets where prices totally reflect the existent data' (Fama, 1970, p.383). The data flow into financial markets, and the reactions of market to data, reflections of this process on the prices show variations according to the efficiency level of markets. Efficient market hypothesis divided into three segments, weak form efficiency, semi-strong form efficiency and strong form efficiency.

Weak form efficiency markets include the markets where excessive profits can not be obtained by considering the past prices of shares. In this kind of markets, shares past prices do not give some foresight about future values of shares. Therefore shares demonstrate random walk characteristics.The term; random walk can be shown as follows:

$$Y_t = \rho Y_{t-1} + e_t \qquad (1)$$

In this 1 numbered equation, Yt is prices of shares, et average zero which fitted with classic OLS hypothesis, (□) is fixed variance, (□2) probability error term which wasn't consecutive dependence. This kind of error term called that white noise error term. A market which shoes random walk property, it has a serial unit root and it isn't fixed. You can't gain an over normality revenue by using past values of shares. So this indicates the invalidity of technical analysis.

In a Semi-strong form efficiency market, share prices involve all open public information. In other words, within this public information, and causality, it's impossible to gather over normality profit. This information is also reflected by the stock prices. For this reason, Fundamental analysis will be invalid.

Effect on the stock markets such as the January effect of shares markets, day of the week effect, earning/price ratio effect, small firm effect, weather effect, etc. provide us evidence about the nature of non-efficient market. These abnormal situations where such as mentioned above about investigating specific days or situations.

$$E(Xj, t+1 \mid \Phi t) = 0 \qquad (2)$$

At the 2. numbered equation, E is expected value notation, Xi is i. stock, t is time, Φt shows full information set that is owned. Equation shows that expected value of 0 under conditions of prices that reflected all available full information.

Strong form efficiency is the most comprehensive form of efficient market hypothesis. In this kind of market, in past or current period, all the information included insider trading in firms or public information is reflected by the prices.

Efficient market hypothesis can also be evaluated as a reflection of neo-classic economy school's rational expectations hypothesis idea to financial markets. As similar to rational expectations idea, economical units analyze all the information that they can reach, and they use and guess the information as well as an economist while an economic politics were applied. Individuals could be misleaded only for a very short-term by applying unexpected politics in long term, this kind of politics will be non efficient.

3. Literature

Fama (1970), logarithm differences of 30 shares in Dow Jones Index were considered as profit of shares and implemented auto-correlation test in weak efficiency form in order to find efficiency level. Series were tested by differences of one, four, nine and sixteen day by auto correlation tests. No significant difference could be obtained about linear dependence between price series and profits. Furthermore, partition on share identified that were totally reflected to the end of partition month. Results indicate that stock markets were weak and semi-strong formed efficient. Palmer (1970), Homa and Jafee (1971), investigated relation between Money supply variation ratio and share certificates prices. There is a relation identified between factors. Cooper (1974) and Rozeff (1974)'s findings show that stock exchange markets efficient in semi strong form.

Fama (1981), investigated the relationship between inflation and money supply, and between share profits and products, and identified a positive relation between share profits and variables. Findings of his study put forward a negative relation yet actually spurious relation. In the studies of Darrat and Mukherjee (1986), money supply, long term interest rates, consumer price index, gross domestic product etc. factors were investigated. Mookerjee (1987), applied Granger causality test for France, Japan, Italy, Canada, Germany, England, Holland, Switzerland, and Belgium. According to the results of the test America and England share markets were determined as a semi-strong form efficient. Lee (1992), could not find New York stock exchange market with real gross domestic product semi-strong form efficient. Muradoglu and Onkal (1992) identified Turkey's share markets as a non semi-strong efficient.

Frenberg and Hansson (1993) determined non weak-form efficent about Swedish Stock exchange Market.

Thornton (1993), applied granger causality test for England and Ely and Robinson (1994), for America, Australia, Austria, Belgium, Canada, Finland, France, Italy, Japan, Holland, Norway, Spain, Switzerland and England. The academics investigated and determined semi-strong form efficient result using Johansen co integration tests. Balaban (1995) for Turkey determined neither weak, nor strong form efficient. Poshakwale (1996), determined for India, Friday effect, and non semi-strong form efficient, Kwon and Shin (1999) for Korea, with using production index, foreign exchange, trade balance, money supply factors, they applied Engle and

Granger co integration tests, So determined non efficient in semi strong form, Mobarek and Keasey (2000) for Bangladesh with ARIMA modeling, determined that non efficient in weak form. Rapach (2001) used VAR and impulse-response analyze, that determined for America non efficient in semi-strong form. Zengin and Kurt (2004) determined that for Turkey, for stock exchange markets; efficient in weak form, and non efficient. Kılıc (2005) determined with Markow chain rule that stock exchange markets were efficient in weak form.

4. Data and Econometric Applications

In this part, information given about data sets, and econometric application was explained and the results explained.

4.1. Data

Variables in the workshop are information of 11 country that they are members of monetary union, and it consists of the period of 1999:01-2006:12 and for every country, the share price index 2001=100, index of purchasing power of the euro, 1996=100, index of consumer price 2005=100, unemployment rates were included. The countries were used in this workshop and the country's stock price index respectively, Austrian Traded Index (Austria), Belgian 20 Price Index (Belgium), Helsinki Stock Exchange All-Share Index (Finland), Compagnie des Agents de Change 40 Index (France), Deutscher Aktienindex (Germany), Irish Stock Exchange Equity Overall Index (Ireland), Milano Italia Borsa 30 Index (Italy), Luxembourg Stock Exchange index (Luxemburg), Amsterdam Exchanges index (Netherlands), Portuguese Stock Index 20 (Portugal) and, Association of Stock Exchanges (Spain) all these dates were gathered on Eurostat web page. The L letter in the presence of variables means that logarithm was applied; Δ is mean that difference applied to variables.

4.2 Panel Unit Root Test

Also in panel data modeling, as in time series, to prevent spurious relation in estimated equations, the variables must be constant. In this work, to determine the stationary of series, and it is assumed that common unit root process exists, that consider all these factors are Levin, Lin and Chu (2002) (LLC) and whose assume individual unit root process Im, Peseran and Shin (2003) (IPS) and, also devoloped by Maddala and Wu (1999), Choi (2001) the ADF-Fisher (ADF-F) tests were applied. LLC and ADF tests have constant, inconstant and trend modeling and IPS test has just applied for constant and trend modeling. LLC test is can be explain firstly as following equation

$$\Delta y_{it} = \delta y_{it-1} + \sum_{L=1}^{p_i} \theta_{iL} \Delta y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \qquad m=1,2\ldots.67 \qquad (3)$$

in the equation, dmt is horizontal dummy variable, αmi is horizontal dummy variable coefficients. and , separately processing on and gathering error terms. L (L=1,…,Pi) shows optimal lag length.

$$\hat{e}_{it} = \Delta y_{it} - \sum_{L=1}^{p_i} \hat{\pi}_{iL} \Delta y_{it-L} + \hat{\alpha}_{mi} d_{mt} \tag{4}$$

$$\hat{u}_{it-1} = y_{it-1} - \sum_{L=1}^{p_i} \hat{\pi}_{iL} \Delta y_{it-L} + \hat{\alpha}_{mi} d_{mt} \tag{5}$$

To removing heterogeneous from horizontal data units, the error term which obtained from equations 4 and 5, will be normalized with estimating with standard error of equation 3.

$$\tilde{e}_{it} = \frac{\hat{e}_{it}}{\hat{\sigma}\varepsilon_i} \text{ ve } \tilde{u}_{it-1} = \frac{\hat{u}_{it-1}}{\hat{\sigma}\varepsilon_i} \tag{6}$$

At the second step, short term and long term standard deviation will be estimated and long term standard deviation estimated with short term deviation and SN statistic will be calculated, at the step 3, this value will be used for constant trend and constant models for estimating t statistics. At the third step, panel test statistic will be calculated, and compared with LLC table values. If H0 hypothesis will be rejected, the decision will be like that the series haven't got unit root and the series are constant.

The IPS is focused for every calculation of ADF units statistics averages and IPS and ADF-F are assumed individual unit process tests. For detailed information of these stability tests, Im, Peseran and Shin (2003) and Maddala and Wu (1999), Choi (2001) will be helpful.

The focus point of this paper is variables stationary and relationship between variables, so just explaining about LLC tests considered enough. Results on stability tests given on the table below.

Firstly, unit root tests, investigated for if EMU countries stock exchange markets were in weak form or not. For this reason, stock exchange price index, investigated stationary with unit root tests. LLC, IPS and ADF-F all these three tests have different consideration so the stationary investigation on stock exchange index, all three tests considered that useful. For constant, no constant-trend and constant-trend models test results given in following tables 1 and 2.

Table 1: Panel Unit Root Test Results[a]

	Levin, Lin & Chu	ADF-Fisher
Variable	No Constant and Trend	No Constant and Trend
SEI	1.87	5.73
LSEI	2.21	4.63
ΔLSEI	-10.47*	138.60*

*significiant at 1% a Probabilities for Fisher tests are computed using an asymptotic. Chi-square distribution. All other tests assume asymptotic normality. Automatic selection of lags based on Modified Schwartz criteria.

Stock Exchange index, the SEI variable, non logarithm, logarithm taken, and different of logarithm taken, as three form LLC and ADF-F unit root analyze were applied. At table 1, SEI in both logarithm taken and non logarithm taken situation, in non stationary and non trend modeling in level, determined that it was stationary.

Table 2: Panel Unit Root Test Result[a]

	Levin, Lin & Chu		Im, Pesaran & Shin		ADF-Fisher	
Variable	Constant	Const-Trend	Constant	Const-Trend	Constant	Const-Trend
SEI	4.11	4.14	4.19	6.76	4.70	1.11
LSEI	3.10	3.19	3.66	6.03	5.16	1.28
ΔLSEI	1.06	-10.32*	-4.83*	-11.05*	80.68*	187.09*

* significiant at 1% a Probabilities for Fisher tests are computed using an asymptotic. Chi-square distribution. All other tests assume asymptotic normality. Automatic selection of lags based on Modified Schwartz criteria.

In table 2, for constant and constant-trend models, LLC, IPS and ADF-F unit root test results summarized. According to this, for every unit root tests of SEI and LSEI variables, that seemed all stationary.

For LSEI variables first differenced, every three test show that first differenced SEI variables with no constant-trend, constant, and constant-trend models were stationary as shown in table 1 and table 2. According to this, at stock exchange price index in level, was not stationary, and random walk property exposed. Stock exchange price index series have unit root and random walk property, so it means that EMU countries have weak form efficient in stock exchange markets, also shows that there couldn't be over normality profit with using technical analyze.

Table 3: Panel Unit Root Test Results[a]

	Levin, Lin & Chu	ADF-Fisher
Variable	No Constant and Trend	No Constant and Trend
LUNEMP	-1.40	21.02
LPPE	11.74	0.04
LCPİ	11.72	0.04
ΔLUNEMP	-15.02*	565.98*
ΔLPPE	-2.07**	18.32
ΔLCPİ	-2.11**	18.62

* significiant at 1% a Probabilities for Fisher tests are computed using an asymptotic. Chi-square distribution. All other tests assume asymptotic normality. Automatic selection of lags based on Modified Schwartz criteria.

Stationary test results which applied for other variables summarized at table 3 and table 4. According to no constant-trend models with LLC, ADF-F test results, LUNEMP, LPPE and LCPI variables in level was non stationary, but all variables stationary at first differenced.

Table 4: Panel Unit Root Test Results[a]

	Levin, Lin & Chu		Im, Pesaran & Shin		ADF-Fisher	
Variable	Constant	Const-Trend	Constant	Const-Trend	Constant	Const-Trend
LUNEMP	3.24	2.98	2.08	1.94	14.85	17.87
LPPE	-2.92*	0.62	2.16	1.94	11.03	19.49
LCPİ	-2.63*	0.58	2.31	1.96	10.72	19.65
ΔLUNEMP	-8.30*	-1.70**	-14.09*	-11.13*	196.79*	235.04*
ΔLPPE	-25.99*	-34.27*	-22.28*	-29.62*	223.27*	478.24*
ΔLCPİ	-26.41*	-34.89*	-22.27*	-29.78*	221.88*	480.07*

* significiant at 1% a Probabilities for Fisher tests are computed using an asymptotic. Chi-square distribution. All other tests assume asymptotic normality. Automatic selection of lags based on Modified Schwartz criteria.

LUNEMP variable in level both in constant and constant-trend models defined non stationary at the LLC, IPS and ADF-F tests. At the LPPE and LCPI variables in level, just exposed that constant model was stationary. But all variables at first differenced, at 1% significant that determined stationary. LPPE and LCPI variables were determined stationary just in LLC and constant model so both two test results took in consideration to causality and co integration analyzes will applied to all variables.

4.3 Panel Causality Test

Holtz-Eakin, Newey and Rosen (1988) were developed a equation to determine causality relations in panel data. According to this equation, to investigate bidirectional causality lets consider as follows dynamic two equations,

$$y_{it} = \beta_0 + \sum_{j=1}^{n} \beta_j y_{it-j} + \sum_{j=1}^{n} \alpha_j x_{it-j} + f_i + \phi_{it} \quad (7)$$

At the 7th numbered equation, yit is variable which was investigated for causality, *f*i is fixed effects, n is lag length, Φit is error terms which was fitted with OLS hypothesis.

To eliminating fixed effects, differenced of equation must be applied, at this situation, the constant terms will be removed.

$$y_{it} - y_{it-1} = \sum_{j=1}^{n} \beta_j (y_{it-j} - y_{it-j-1}) + \sum_{j=1}^{n} \alpha_j (x_{it-j} - x_{it-j-1}) + (\phi_{it} - \phi_{it-1}) \quad (8)$$

Differenced equation can be shown as follows.

$$\Delta y_{it} = \sum_{j=1}^{n} \beta_j \Delta y_{it-j} + \sum_{j=1}^{n} \alpha_j \Delta x_{it-j} + \upsilon_{it} \quad (9)$$

Holtz-Eakin, Newey ve Rosen (1988), suggested that for the 9 numbered equation, the variable Δyit-j in relation with error terms so, to removing simultaneous problem, the instrument variable will be used in the equation and the equation will be estimated with two stage least square (2SLS) method. For the instrument variable,

Z 1it =(1, yit-2, yit-3,…,yi1, xit-2, xit-3,…,xi1) for the 9 numbered equation will be used.

For causality relation, required test hypothesis is;

H0: α1= α2=,…,=αm=0

If the H0 was rejected, so there will be relation about in Granger causality between variables.

Causality relations between variables, investigated by Holtz-Eakin, Newey and Rosen (1988) causality tests. Gathered results summarized in table 5 and table 6.

Tablo 5: Holtz-Eakin, Newey and Rosen (1988) Causality Analysis

The Diretion of Relationship	χ^2_h	Causality
LUNEMP >>>>>>>>> LSEI [C LUNEMP(-1) LSEI(-1) LSEI(-2)][a]	1.37	NO
LPPE >>>>>>>>> LSEI [C LPPE(-1) LSEI(-1) LSEI(-2) LSEI(-3)][a]	4.20*	YES
LCPI >>>>>>>>> LSEI [C LCPI(-1) LSEI(-1) LSEI(-2)][a]	2.72**	YES

* and ** respectively significant at 5% and %10. a Instrument variables.

Causality tests results show that there are causality relations from variables LPPE and LCPI to LSEI variable

Tablo 6: Holtz-Eakin, Newey and Rosen (1988) Causality Analysis

The Diretion of Relationship	χ^2_h	Causality
LSEI >>>>>>>>> LUNEMP [C LSEI(-1) LUNEMP(-1) LUNEMP(-2)][a]	6.16	YES
LSEI >>>>>>>>> LPPE [C LPPE(-1) LSEI(-1) LSEI(-2)][a]	1.22	NO
LSEI >>>>>>>>> LCPI [C LCPI(-1) LSEI(-1) LSEI(-2)][a]	1.21	NO

* and ** respectively significant at 5% and %10. a Instrument variables .

To looking causality relation from LSEI variables to other variables, a causality relation determined just from LSEI variable to LUNEMP variable.

4.4 Panel Co integration

In panel data and time series using non stationary variables causes spurious regression .to preventing negative situations of spurious regression, Kao (1999) and Pedroni (1999, 2004) were developed a co integration tests about error term.

Pedroni (1999, 2004), four panel, and three group, totally seven test statistical developed.

In this test, H0 null hypothesis shows that there is no co integration. In this tests, Panel ADF and Group ADF statistics are parametric the others are non parametric tests.

Tablo 7: LSEI-LUNEMP Cointegration Analysis

Pedroni Residual Cointegration Test
Sample: 1999M01 2006M12
Included observations: 1056
Cross-sections included: 11
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Lag selection: Automatic Schwartz
Newey-West bandwidth selection with Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-2.867898	0.0065*	-3.043059	0.0039*
Panel rho-Statistic	3.070688	0.0036*	3.337219	0.0015*
Panel PP-Statistic	3.511516	0.0008*	3.941480	0.0002*
Panel ADF-Statistic	3.308097	0.0017	4.017787	0.0001

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	4.197367	0.0001*
Group PP-Statistic	5.346172	0.0000*
Group ADF-Statistic	5.312012	0.0000*

The panel v-test is right-sided and all other tests are left-sided.
Test statistics are distributed asymptotic standart normal N(0,1)
* respectivly significiant at 1%

Applied test of Pedroni (1999, 2004) to determining the long term panel co integration relationship between LSEI and LUNEMP, LPPE and LCPI variables, at the table 7, table 8 and table 9 the result given. At the table 7 test statistics results, shows that a long term co integration relation between LSEI and LUNEMP variables.

Tablo 8: LSEI-LPPE Cointegration Analysis

Pedroni Residual Cointegration Test
Sample: 1999M01 2006M12
Included observations: 1056
Cross-sections included: 11
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Lag selection: Automatic SIC with a max lag of 4
Newey-West bandwidth selection with Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.485822	0.0182*	-2.726692	0.0097*
Panel rho-Statistic	1.473419	0.1347	2.074671	0.0464**
Panel PP-Statistic	1.397037	0.1503	2.169635	0.0379**
Panel ADF-Statistic	1.438191	0.1418	2.233582	0.0329**

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	2.335925	0.0261**
Group PP-Statistic	2.688504	0.0107*
Group ADF-Statistic	2.651443	0.0119*

The panel v-test is right-sided and all other tests are left-sided.
Test statistics are distributed asymptotic standart normal N(0,1)
* and ** respectivly significiant at 1% and 5%

As watched in table 8, a long term relation determined between LSEI and LPPE.

According to LSEI and LCPI co integration tests results, a co integration relation determined between these variables. According to both causality and co integration tests results, gathered short and long term relationship information if used, the investors could be gathered over normality profit opportunity appeared, so these relations in EMU countries shows that stock exchange markets are not semi-strong formed efficient.

Tablo 9: LSEI-LCPI Cointegration Analysis

Pedroni Residual Cointegration Test
Sample: 1999M01 2006M12
Included observations: 1056
Cross-sections included: 11
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Lag selection: Automatic SIC with a max lag of 4
Newey-West bandwidth selection with Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.484618	0.0182	-2.723449	0.0098
Panel rho-Statistic	1.466007	0.1362	2.064484	0.0474
Panel PP-Statistic	1.392116	0.1514	2.156943	0.0390
Panel ADF-Statistic	1.770339	0.0832	2.466735	0.0190

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	2.326376	0.0267
Group PP-Statistic	2.696344	0.0105
Group ADF-Statistic	2.829591	0.0073

The panel v-test is right-sided and all other tests are left-sided.
Test statistics are distributed asymptotic standart normal N(0,1)
* and ** respectivly significiant at 1% and 5%

5. Conclusion

Before participating monetary union, EMU countries are asked to meet convergence criteria stated in Maastricht agreement as the member country's prices level, inflation rates, budget deficits per GDP, devaluation ratio, and long term interest rates, etc. To create monetary union and for a healthy future of this union, fiscal and financial factors must be in accordance to other member countries.

Stock exchange markets are the more important variables that could give information about financial and economical situations. In this workshop, the EMU country's stock market's weak and semi-strong form efficiency were investigated. It

is identified according to applied panel unit root tests to stock markets index that the results of this test -the stock price index isn't stationary- shows that the EMU country's stock markets were in efficient weak form.

A casuality relationship was determined as a result of the test that was applied. The direction of the relation range from changing purchasing power of Euro and inflation rates to stock exchange returns and from stock exchange returns to unemployment rates. On the other hand, Pedroni's (1999, 2004) co-integration tests results, between stock exchange return with unemployment rates, inflation rates and, purchasing power of Euros, a long term co integration relationship were identified. These causality and co-integration relations, the stock exchange markets in EMU countries show that they were not semi-strong form efficient, totally. In other words, at least some countries were not in efficient in semi strong form.

It could be a good economic policy recommendation to state that closer integration of the efficiency levels of EMU countries with low-form efficiency stock markets will bring positive contribution on the sustainability of monetary union.

References

ALPARSLAN, S. M. (1989), "Test of Weak Form Efficiency in Istanbul Stock Exchange", Unpublished Master Thesis, Bilkent University, Ankara.

BALABAN, E. (1995), "Informationally Efficiency of the Istanbul Securities Exchange and Some Rational for Public Regulation", Central Bank of the Republic of Turkey Research Department. Working Paper No: 9502, April.

CHOI, I. (2001), "Unit Root Tests for Panel Data" Journal of International Money and Finance", April, 20 (2), 249–272.

COOPER, R. V. L. (1974), "Efficient Capital Markets and the Quantity Theory of Money", Journal of Finance, 29 (3), 887-908.

DARRAT, A. F., MUKHERJEE, T. K. (1986), "The Behavior of Stock Market in a Developing Economy", Economics Letters, 22, 273-278.

ELY, D. P., ROBINSON, K. J. (1994), "Are Stocks a Hedge Against Inflation? International Evidence Using Co-integration Analysis", Federal Reserve Bank of Dallas, Financial Industry Studies Working Paper, No: 94-3.

FAMA, E. F. (1970), "Efficient Capital Market: A Review of the Theory and Empirical Work", Journal of Finance, May, 25 (2), 383-417.

FAMA, E. F. (1981), "Stock Returns, Real Activity, Inflation and Money", American Economic Review, 71 (4), 545-564.

FRENNBERG, P., HANSSON, B. (1993), "Random Walk Hypothesis on Swedish Stock Prices: 1919-1990", Journal of Banking and Finance, February, 17, 175-191.

GONZÁLEZ, F., LAUNONEN, S. (2005), "Towards European Monetary Integration, the Evolution of Currency Risk Premium as a Measure for Monetary Convergence Prior to the Implementation of Currency Unions", European Central Bank Working Paper, No: 569, December.

HOLTZ-EAKIN, D., NEWEY, W., ROSEN, H. S. (1988), "Estimating Vector Autoregressions with Panel Data", Econometrica, 56 (6), 1371-1395.

HOMA, K. E., JAFFEE, D. M. (1971), "The Supply of Money and Common Stock Prices", The Journal of Finance, December, XXVI (5), 1045-1065.

IM, K. S., PESARAN, M. H., SHIN, Y. (2003), "Testing for Unit Roots in Heterogeneous Panels", Journal of Econometrics, 115 (1), 53–74.

KAO, C. (1999), "Spurious Regression and Residual Based Tests for Cointegration in Panel Data", Journal of Econometrics, 90 (1), 1–44.

KILIC, S. B. (2005), "Test of the Weak Form Efficient Market Hypothesis for the Istanbul Stock Exchange by Markov Chains Methodology", Journal of Çukurova University Institute of Social Sciences, 14 (1), 333-342.

KWON, C. S., SHIN, T. S. (1999), "Co-integration and Causality between Macroeconomic Variables and Market Returns", Global Finance Journal, 10(1), 71-81.

LEE, B-S. (1992), "Causal Relations among Stock Returns, Interest Rates, Real Activity, and Inflation", The Journal of Finance, September, XLVII (4), 1591-1603.

LEVIN, A., LIN, C. F., C. CHU. (2002), "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties", Journal of Econometrics, 108(1), 1–24.

MADDALA, G. S., S. WU. (1999), "A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test", Oxford Bulletin of Economics and Statistics, 61, 631–52.

MOOKERJEE, R. (1987), "Monetary Policy and the Informationally Efficiency of Stock Market: the Evidence from Many Countries", Applied Economics, 19, 1521-1532.

MUBAREK, A., KEASEY, K. (2000), "Weak-Form Market Efficiency of an Emerging Market: Evidence from Dhaka Stock Market of Bangladesh", OSLO ENBS Conference, May.

MURADOĞLU, G., ÖNKAL, D. (1992), "Türk Hisse Senedi Piyasasında Yarı-Güçlü Etkinlik", ODTÜ Gelişme Dergisi, 19 (2), 197-207.

PALMER, M. (1970), "Money Supply, Portfolio Adjustment and Stock Prices", Financial Analysts Journal, July-August, 19-22.

PEDRONI, P. (1999), "Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors", Oxford Bulletin of Economics and Statistics, 61 (4), 653-670.

PEDRONİ, P. (2004), "Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis", Econometric Theory, 20, 3, 597–625.

POSHAKWALE, S. (1996), "Evidence on Weak Form Efficiency and Day of the Week Effect in the Indian Stock Market", Finance India, September, X (3), 605-616.

RAPACH, D. E. (2001), "Macro Shocks and Real Stock Prices", Journal of Economics and Business, 53 (1), 5-26.

ROZEFF, M. S. (1974), "Market Efficiency and the Lag in Effect of Monetary Policy", Journal of Finance Economics, 1 (3), 245-302.

THORNTON, J. (1993), "Money, Output and Stock Prices in the UK: Evidence on some (none) Relationships", Applied Financial Economics, 3, 335-338.

ZENGIN, H., KURT, S. (2004), "IMKB'nin Zayıf ve Yarı Güçlü Formda Etkinliğinin Ekonometrik Analizi", Marmara Üniversitesi Öneri Dergisi, 6 (21), 145-152.