Testing The Weak Form of Efficient Market Hypothesis on Stock Market: Comparison of Turkey and Hungary

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Abstract: In the study, we aimed to test the weak form of efficıent market hypothesıs on stock market of turkey and hungary. In this context, the observations are monthly closing values of stock market indices for Turkey and Hungary. Observations are taken for the period October 2003 to January 2018. BIST100, BIST30, BISTservice, BISTfinancial and BISTindustrial indices from Turkey; Budapest SE, BUMIX, FTSE Hungary and HTX (HUF) indices from Hungary were investigated. Unit root tests were used to test the market efficiency in the study. Carrion, I.Silvestre et all. (2005) Multiple Break Test KPSS, Pesaran (2007) CADF and CIPS, Breuer vd. (2002) SUR ADF, Bai and Ng (2004) Panic and Hadri and Kurozumi (2012) HK Panel unit root tests under cross section dependence were selected for test of unit root. Results of the analyses, The Turkish and Hungarian stock market indeces (except for BUMIX according to KPSS test) appear to dont have a unit root (stationary structure) and we can conclude that the both countries stock markets are not a weakform efficient Keywords: Efficient Market Hypothesis, Stock Markets, Unit Root Tests.

1 Introduction

Business organizations understand the importance of stock markets in the economic growth of an country. The stock market is a place where long-term debt securities and securities are traded. It is a platform where business enterprises and governments can collect money against long-term investments of individuals. An important feature of the capital market is that securities prices reflect all available information and that new information quickly adjusts to prices and therefore

investors do not earn more than the use of such information (Nisar and Hanif, 2012: 414).

The Efficient Market Hypothesis is based on the assumption that stock prices are to absorb the most recent stream of information. For this reason, the current prices completely duplicate all available information. This theory does not seem to be able to perform extraordinary performance on the market by practicing any information already known on the stock exchange, and the exception is only a lucky element. In the Efficient Market Hypothesis, any news or information is defined as anything that is unknown in the present scenario and can affect the prices that appear randomly in the future perspective. In the study progresses in the following order. In the second part of the literature review, data and methodology, findings and discussions in the third section are presented in the fourth section and the results are presented in the fifth section.

2 Review of related literatures

The test of the weak form of the market efficiency hypothesis is involved with the foreseeability of historical prices or the returns. For This Reason to test the weak form of the market efficiency hypothesis, we need to look at whether there is a change in security prices or incentives with random walk behavior. There are some studies in charge of examining the validity of the weak form of EMF in countries' stock markets. Findings from some of these studies are explained below. In this context, in the study Conducted by Borges (2010), from January 1993 to December 2007 UK, France, Germany, Spain, Greece and Portugal report the results of weak market performance tests applied to stock market indexes. They found mixed evidence on the efficiency market hypothesis in the results of the study. The hypothesis was rejected because of the first degree positive autocorrelation in the returns, according to daily reports in Portugal and Greece. Furthermore, empirical tests showed that these two countries have been approaching martingale behavior after 2003. France and the UK rejected the efficient market hypothesis. Conducted by Lee et. Al (2010), in the period from January 1999 to May 2007, investigated whether the effective market hypothesis is in stock markets at different levels of economic development. They found that the actual stock price indices were consistent with the efficient market hypothesis. Kim et. Al (2011) aimed to predict and adaptive markets hypothesis from 1900 to 2009. In the results of study, they found that the predictability of returns is smaller than the normal duration of economic bubbles. They also found evidence that return predictability is related to stock market volatility and economic defaults. Nisar and Hanif (2012) aimed to examine the weak form of the efficient market hypothesis on the four major South Asian markets, including India, Pakistan, Bangladesh and Sri Lanka. The conclusion of the analysis, none of the four major

stock markets in south-Asia follows Random walk, and for this reason all of these markets were not the weakest form of productive market. Conducted by Kristouefek and Vosvrda (2013) offered a new measure for capital market efficiency. They found that the Japanese NIKKEI is the most efficient market. In addition, more efficient markets dominated by European stock indices and less efficient markets are predominantly covered by Latin America, Asia and Oceania. Dong et. Al (2013), 44 global financial markets index tested the efficient market hypothesis. They founded that it was a lasting influence on the current levels of historical information from global markets, and that it created this effect consistently in a cyclical order over decades. This finding can be interpreted as a violation of the efficient market hypothesis in weak form. In the study conducted by Hiremath and Kumari (2014), the question of whether the adaptive market hypothesis is better defined as India's emerging stock market behavior. They found that the Indian stock market was moving towards efficiency. Titan (2015) aimed to examine the basis of increasing experimental research on efficient market hypothesis. The conclusion of this article, he found that the tests for market efficiency are difficult and that the probability of developing a new theoretical model to take into account all the changes due to changes in market / economic conditions is high. Noda (2016) aimed to test of adaptive market hypothesis in Japanese stock markets. Also used a time-varying model approach to measure the degree of market efficiency. The empirical results showed that the degree of market efficiency changes over time in the two markets, the level of market efficiency of the TSE2 is lower than that of the TOPIX in most periods and the market efficiency of the TOPIX has evolved. Hamid et al. (2017) aimed to test weak market efficiency of stocks in Pakistan, India, Sri Lanka, China, Korea, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Thailand, Taiwan, Japan and Australia from January 2004 to December 2009. In the results of study, they found that the monthly prices did not come follows random walks in all countries of the Asia-Pacific region

3 Data and methodology

In the study, it was examined the weak form of efficient market hypothesis on stock markets in Turkey and Hungary. In this context, the observations are monthly closing values of stock market indices for Turkey and Hungary. Observations are taken for the period October 2003 to January 2018. BIST100, BIST30, BISTservice, BISTfinancial and BISTindustrial indices from Turkey; Budapest SE, BUMIX, FTSE Hungary and HTX (HUF) indices from Hungary were investigated. Market returns are computed as follows.

$$R_t = \ln (P_t / P_{t-1}) \quad (1)$$

P_t = Market Price at time‘t’

P_{t-1} = Market Price at time‘t-1’

This empirical study of stock returns in Turkey and Hungary conducted to test the weak form of market efficiency. The Unit Root Tests are used to test the hypothesis that the stock market follows a random walk. In the time series of stock price changes in the indices, unit root tests are applied to test the unit root existence. Majorly It is often used to test the stability of time series.

3.1 Cross-sectional dependence

The literature of econometric theory has turned attention to testing and correcting cross-sectional dependence. From this point, in the first step of the econometric analysis, we examine the unit root properties of the data with advanced panel unit root tests. The first generation Panel unit root tests can cause fake results. if significant degrees of positive residual cross-section dependence exist and are ignored. In this context, the implementation of second-generation panel unit root tests is desirable only when it has been established that the panel is subject to a significant degree of residual cross-section dependence. Consequently, it is very important to provide some evidence of the residual cross-section dependency before choosing the appropriate panel unit root test. Pesaran, Ullah ve Yagamata (2008) LMadj test was used to check for crosssectional independence. If the time dimension is too large for the cross section size, this test can be used. Furthermore, this test removes the deviations in the LM test and the correlation of the Pesaran CD test are likely to be zero. The results from the cross-section dependence tests for Turkey and Hungary are reported in Table 1.

Table 1. Cross-Sectional Dependency Test Results for Fixed and Trended Models

Return	**LMadj**			
	Turkey		***Hungary***	
	Ist.	Prob.	Ist.	Prob.
	9.891	0.000	5.430	0.000
Null hypothesis is cross-sectional independence. Statistical significance indicated by * <0.001.				

The cross section dependency tests strongly suggest that the null hypothesis with no cross-sectional dependence is rejected at the 1% significance level. Therefore, we used second-generation panel unit root tests for testing market efficiency.

3.2 Unit root tests

Standard panel unit root tests Prior to applying the transformed series, a series of panel unit root tests allowing cross-sectional dependence have been proposed in the literature using orthogonalization-type procedures to asymptotically eliminate series cross-dependence. In this paper we used second-generation panel unit root tests; Carrion, I.Silvestre et all. (2005) Multiple Break Test, Pesaran (2007) CADF and CIPS, Breuer vd. (2002) SUR ADF, Bai and Ng (2004) Panic and Hadri and Kurozumi (2012) HK Panel unit root tests under cross section dependence.

4 Findings and discussion

The unit root tests are applied to check the stationarity as a necessary condition for Random walk. According to the random walk hypothesis, if the daily price series have a unit root, the return series must be stationary. For this purpose, Carrion, I.Silvestre et all. (2005) Multiple Break Test, Pesaran (2007) CADF and CIPS,

Breuer vd. (2002) SUR ADF, Bai and Ng (2004) Panic and Hadri and Kurozumi (2012) HK tests are used to test the stationary of the time series. In this context, the data includes monthly closing values of stock market indexes for Turkey and Hungary. The data includes monthly observations from October 2003 to January

2018. We first employ the panel KPSS stationarity test with multiple breaks (Carrion-i-Silvestre et al., 2005). The null hypothesis is that there is panel stationarity. The panel KPSS test has many advantages. It allows for n structural breaks; it allows that the number of structural breaks are different between the indices and reports the results for the individual index. In addition to the stationarity test, this test allows the identification of five structural breaks dates in each series. The results for both countries are presented in Table 2.

Table 2. Results for the individual indices from the panel KPSS test

Turkey			
Index	**Statistics**	**Critical Value**	**Structural Breaks**
BIST100	0.078*	0.151	1- November 2006 2- February 2009 3- December 2011 4- January 2014
BIST30	0.077*	0.151	1- December 2006 2- February 2009 3- December 2011 4- January 2014
BISTSER	0.090*	0.148	July 2006 October 2008 December 2011 4- October 2015
BISTFIN	0.075*	0.148	1- December 2006 2- February 2009 3- December 2011 4- January 2014
BISTIND	0.056*	0.150	1- September 2006 2- November 2008 3- April 2011
			4- May 2013
Panel	0.369*	4.147	
Hungary			
BudapestSE	0.134*	0.150	1- November 2006 2- February 2009 3- September 2011 4- January 2015
BUMIX	0.253	0.147	1- November 2006 2- February 2009 3- December 2011 4- February 2014
FTSE Hungary	0.130*	0.150	1- September 2006 2- February 2009 3- September 2011 4- January 2015
HTX (HUF)	0.131*	0.150	1- January 2007 2- February 2009 3- September 2011 4- January 2015
Panel	4.520	3.561	

Notes: Bootstrap critical values are based on a Monte Carlo simulation with 5000 replications. All results presented for a model with an intercept and trend.
*Denotes significance at the 5% level.

Prior to results of the Carrion, I.Silvestre et all. (2005) Multiple Break Test, the null of hypothesis is rejected for the BIST100, BIST30, BISTSER, BISTFIN and

BISTIND at the 5 per cent level for Turkey's indices. When the test results are examined for hungary, the null of hypothesis is rejected for the BudapestSE, FTSE Hungary and HTX (HUF). On the other hand, the null of hypothesis is not only rejected for the BUMIX. For most of the series, break dates fall around five periods for both countries; 2006, 2009, 2011, 2014 and 2015. Consequently, that no one market except for BUMIX is weak form efficient and strongly rejects the null hypothesis. In other words, all indeces except for BUMIX are inefficiency.

The cross-sectionally augmented Dickey Fuller (CADF and CIPS) unit root test developed by Pesaran (2007) and CADF-CIPS tests produce accurate results in the presence of cross-sectional dependence. The null hypothesis is that there is no panel stationarity. Results from the second-generation tests, the CADF and the CIPS, are reported in Table 3.

Table 3. CADF and CIPS Results

Index	**Lags**	**Intercept**	**Intercept and Trend**
		CADF-t Sta.	**CADF-t Sta.**
BIST100	12	-11.647*	-11-636*
BIST30	12	-10.209*	-10-195*
BISTER	12	-10.916*	-10-952*
BISTFIN	12	-10.274*	-10.319*
BISTIND	12	-8.998*	-9.121*
Panel (CIPS)		-10.409*	-10.444*
BudapestSE	12	-7.711*	-7.753*
BUMIX	12	-7.396*	-7.437*
FTSEHungary	12	-8.174*	-8.196*
HTX(HUF)	12	-7.193*	-7.237*
Panel (CIPS)		-7.618*	-7.656*

Note 1: The max lag order considered is 12. Indicates lag order selected by the Schwarz information criterion.

Note 2: CADF, Intercept -3.22 (%5) (Pesaran 2007, table I(b), p:275); Intercept and Trend -3.69 (%5) (Pesaran 2007, table I(c), p:276). **CIPS**, Intercept -2.32 (%5) (Pesaran 2007, table II(b), p:280); Intercept and Trend -2.83 (%5) (Pesaran 2007, table II(c), p:281). **Note 3:** Denotes significance at the 5% level.

The results from the nonlinear unit root test in Table 3 indicate that, for series, the null hypothesis of the unit root can be rejected for the all indeces. The results show that the Turkish and Hungarian stock market indeces appear to dont have a unit root (stationary structure) and we can conclude that the both countries stock markets are not a weak form efficient. The SURADF test developed by Breuer vd. (2002) for the null hypothesis of stationarity in the panel, cross-sectional dependence in the form of a common factor in the disturbance. The SURADF unit root test results reported in Table 4 for both countries indeces.

Table 4. Breuer et all. (2002) SURADF Test Results

	Intercept			Intercept and Trend		
	Lags	SURADF t-stat	5%	Lags	SURADF t-stat	5%
BIST100	12	-21.4943*	3.5831	12	-21.7821*	-4.5518
BIST30	12	-21.5634*	-4.0833	12	-21.8565*	-5.4195
BISTSER	12	-16.8693*	-3.5604	12	-17.2132*	-4.5945
BISTFIN	12	-20.5620*	-3.9519	12	-20.8740*	-5.1050
BISTIND	12	-18.0755*	-4.0434	12	-18.2953*	-5.4336
BudapestSE	12	-16.3848*	-3.7540	12	-16.4147*	-4.5890
BUMIX	12	-10.1253*	-3.1594	12	-10.1831*	-3.8412
FTSEHungary	12	-15.9626*	-3.3644	12	-15.9879*	-4.3430
HTX(HUF)	12	-16.2193*	-3.1800	12	-16.2522*	-4.1183

*The max lag order considered is 12. Indicates lag order selected by the Schwarz information criterion.
Bootstrap critical values are based on a Monte Carlo simulation with 1000 replication
ADF test was carried out including both intercept and trend.
* indicate rejection of the null hypothesis at 5% levels of significance, respectively.

Prior to results of the SURADF test, the null hypothesis of the unit root be rejected for the all indeces. The Turkish and Hungarian stock market indeces appear to dont have a unit root (stationary structure) and we can conclude that the both countries stock markets are not a weak form efficient.

Conclusions

The test of the weak form of the market efficiency hypothesis is involved with the foreseeability of historical prices or the returns. For this reason, the current prices completely duplicate all available information. In the Efficient Market Hypothesis, any news or information is defined as anything that is unknown in the present scenario and can affect the prices that appear randomly in the future perspective.

In the study, it was examined the weak form of efficient market hypothesis on stock markets in Turkey and Hungary. In this context, the observations are monthly closing values of stock market indices for Turkey and Hungary. Observations are taken for the period October 2003 to January 2018. The Unit

Root Tests are used to test the hypothesis that the stock market follows a random walk. we used second-generation panel unit root tests; Carrion, I.Silvestre et all. (2005) Multiple Break Test, Pesaran (2007) CADF and CIPS, Breuer vd. (2002) SUR ADF, Bai and Ng (2004) Panic and Hadri and Kurozumi (2012) HK Panel unit root tests under cross section dependence. Results of the analyses, The Turkish and Hungarian stock market indeces (except for BUMIX according to KPSS test) appear to dont have a unit root (stationary structure) and we can conclude that the both countries stock markets are not a weakform efficient.

Investors need to consider that these markets are ineffective when investing in the capital markets of Turkey and Hungary. The study can be developed by comparing the capital markets of different countries and using different methods.

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