Impact of EU membership process on equity market integration: the case of Turkey

Halil Kiymaz
Rollins College

Abstract

This paper examines the linkages and dynamic interaction among Turkey and eleven original European Union (EU) countries during the full membership journey of Turkey to EU. The study period ranges from January 1986 to December 2007 and consists of pre- candidacy, candidacy, and accession negotiation sub-periods. The results suggest the starting accession negotiation in 2005 has resulted in greater integration between Turkish and European equity markets as measured by the number of significant cointegrating vectors. The documented changes in integration imply that risk reduction may be less effective in Turkish market which is viewed as one of the fastest growing emerging market. The results imply closer ties with major European equity markets after Turkey became official candidate for membership for European Union.

Keywords: Turkey, European Union, Integration

Introduction

Turkey formally applied to join the European Community (now, the European Union) on April 14, 1987. It was officially recognized as a candidate for membership on December 10, 1999. The hope of joining the EU has driven major reforms in Turkey, including economic liberalization, human rights protection, and greater civilian oversight of the military. In 2002, the EU outlined the political and economic conditions that Turkey would have to satisfy before formal accession talks could begin. The criteria required that Turkey have a functioning market economy and stable institutions that guarantee democracy, the rule of law, and human rights.

Since commencing its official candidacy for membership in the EU, Turkey has pursued reforms involving liberalizing the political system and relaxing restrictions on freedom and human rights. Turkey has also started economic and financial reforms leading to reduced hyperinflation, a more fairly valued currency, lower interest rates, and a decreasing amount of past-due loans which used to account for more than 20 percent of all banking system credit. With $39.5 billion of assistance from the International Monetary Fund, it has shrunken the pension system, downsized the public sector, and reformed bankruptcy law. By 2007, inflation was reduced to below 10 percent, its lowest level in almost 35 years, and Turkey's GDP growth for 2006 was around 4 percent. Turkey officially started accession negotiation on October 3, 2005.

The finance literature examines the extent of world stock market integration by evaluating the evolution of equity market correlations, the extent to which common stochastic trends emerge, and the specification of dynamic paths towards greater integration between the returns on equities by testing the extent and determinants of changes in the correlation or cointegration structure of markets. One area of literature examines the stability of equity market correlations, suggesting that instability, in general, and increased correlation, in particular, are consistent with increased integration. Correlation evidence reported by Longin and Solnik (1995), Wahab and Lashgari (1993), and Madura and Soenen (1992), among others, documents instability and attributes the effect to real economic linkages.

Cointegration measures are also used to assess the degree of equity market integration. Results reported by Gilmore and McManus (2002) for US- Central European markets, Ratanapakorn and Sharma (2002) for Southeast Asian, European, and US markets, Kearney (1998) for Irish-European markets, and Hung and Cheung (1995) for Asian markets, like the correlation evidence, is suggestive of increased integration. The results are not uniform, however, because Kanas (1988) and Fratzscher (2002) suggest incomplete integration.

The purpose of this paper is to investigate the market integration of Turkey with countries in European Union during its journey to full membership by using cointegration methodology. The data period ranges from 1993 to 2007. The entire period is divided into three sub-periods: Pre-candidacy period (1993 to 1999), candidacy period (1999 to 2005), and accession negotiation period (2005-2007). Specifically, this paper examines integration among stock price indexes in eleven original members of European Union countries and Turkey and two major non-European equity markets.

The results indicate there are at most two cointegrating relationships between the returns on European equity market indexes and Turkish index during the pre-candidacy period. Similarly, the results show there are at most two cointegrating vectors during the Euro transition period, while the number of cointegration vectors increases to 11 during the accession negotiation period. This would imply closer ties to European equity market movements as a result of Euro progress in membership process. Furthermore, the multivariate test results for eleven European equity markets and two other major markets, including equity markets in Japan and US during pre-candidacy, candidacy, and accession negotiation period suggest there are closer ties in market movement between European equity markets, Turkish market, and other major markets after 2005. Specifically, the number of cointegrating vectors between 11 European equity markets and the markets in Japan and the United States increased after the start of accession negotiations.

The remainder of this paper is organized as follows. Section 2 provides a brief literature review. Section 3 describes the data and methodology, while Section 4 describes the results. Concluding remarks are presented in Section 5.

Literature Review

The relationships between equity markets in developed and developing countries are extensively examined in prior empirical studies because of trade liberalization and the resulting global flow of goods, services, and financial, physical and human capital. For example, earlier studies make a strong case for international portfolio diversification since diversification either reduces total portfolio risk or provides potential for enhanced portfolio performance. Moreover, the lack of interdependence across national stock markets is presented as evidence suggestive of the benefits of international portfolio diversification. For example, Agmon (1972), using monthly return data, finds no significant leads or lags among the common stocks of Germany, Japan, the UK and US. Other studies by Lessard (1976) and Jorion and Schwartz (1986), using regression models to test for the existence but not the degree of market segmentation, suggest market segmentation does exist in some national equity markets.

The stock market crash of 1987 provided new insights into the financial economics of stock market globalization. Dwyer and Hafer (1988), using daily data for seven months before and after the October 1987 crash, show no evidence that the levels of stock price indexes for the US, Japan, Germany and the UK are related. However, they report statistical evidence that changes in the stock price indexes in these four markets are generally related. Eun and Shim (1989) and Von Furstenberg and Jeon (1990) also examine stock price indexes around the stock market crash of 1987 and report a substantial amount of interdependence among national stock markets.

The stock markets of European countries have been examined for interdependencies by Mathur and Subrahmanyam (1990), Arshanapalli and Doukas (1993), and Malliaris and Urrutia (1992), among others. Many of these papers use the concept of Granger causality, as well as cointegration and error correction models to analyze the linkages and interactions among stock prices. For example, Choudry (1996) examines the linkages among the markets of Spain, France, Italy, Sweden, Czechoslovakia, and Poland between 1925-1936 and finds cointegration during the period 1925-1929 but no cointegration between 1929-1936. Friedman and Schachmurove (1997) investigate co-movements of stock markets of major European countries from 1988 to 1994. The results indicate that stock markets of UK, France, Germany and Netherlands are highly related. Kasa (1992), Chan et al. (1992), and Allen and Macdonald (1995) report results consistent with the hypothesis that major international equity markets are not integrated. Similarly, Gallagher (1995) finds no evidence of cointegration between Irish and German or UK equity markets, while Arshanapalli and Doukas (1993) and Chan et al. (1997) suggest equity market integration decreased during the 1980s. Syllignakis and Kouretas (2010) show that the financial linkages between the CEE markets and the world markets increased with the beginning of the EU accession process. Furthermore, the CCE stock markets are partially integrated, while there is also evidence that the emerging stock markets of CEE together with the German and the US markets, have a significant common permanent component.

Recent studies by Fratzscher (2002) and Yang et al. (2003) suggest large European Monetary Union (EMU) markets are more integrated after EMU. Kim et al. (2005) updates the analysis by using a bivariate exponential generalized auto-regressive conditional heteroskedasticity (EGARCH) model to focus on conditional correlations during and after the establishment of EMU and suggest EMU was necessary for European stock market integration because monetary union facilitated real economic integration.

This paper contributes to the literature by using cointegration methodology to examine long-term linkages between European Community (EC) member equity markets, Turkish market, and major non-European equity markets during the membership process of Turkey to European Union.

Data and Methodology

The data consists of the weekly equity market indexes in eleven European Countries, Turkey, and two developed non-European equity markets, US and Japan. The market indexes are expressed as logarithms and obtained from *Datastream*. Since conversion of local currency returns to U.S. dollar returns may confuse the effects of exchange rates and market returns, local currency returns are typically used to test for market integration. Specifically, the tests for market integration follow the accepted procedure of using local currency returns in cointegration analysis to examine long run relationships between stock index series.

According to Engle and Granger (1987), if two variables are cointegrated, then there is an underlying long-run relationship between them. If the two variables, X_t and Y_t, are nonstationary in levels but stationary in first differences, then X_t and Y_t are integrated order of one, I(1), and their linear combination would be:

$$Z_t = X_t - \phi Y_t \tag{1}$$

If there is an "ϕ" such that Z_t is integrated order of zero, I(0), the linear combination of X_t and Y_t is stationary and the two variables are said to be cointegrated. These variables may drift apart in the short run but they have tendency to move toward a long - run equilibrium.

The first step in this analysis is to test for the presence of unit roots in variables. Two commonly used tests are the Augmented Dickey-Fuller and Phillips-Perron tests. The first test uses a regression of the first differences of the series against the series lagged once, X_{t-1} and lagged difference terms. It may include a constant term α and trend term δ_t as follows:

$$\Delta X_t = \alpha + \beta X_{t-1} + \sum_{i=1}^{m} \gamma_i \Delta X_{t-i} + \delta t + e_t \tag{2}$$

The test for a unit root has the null hypothesis that β=0. If the coefficient is statistically different from zero, the hypothesis that X_t contains a unit root is rejected. The Phillips-Perron test corrects the test statistic for possible time dependencies in the series by using non-parametric techniques. Phillips-Perron (1988) developed a generalized version of the Dickey-Fuller (1979) test.

$$X_t = \beta_0 + \beta_1 X_{t-1} + \beta_2 (t-T/2) + \mu_1 \quad (3)$$

where T is the number of observations and the error term μ_1 is such that $E(\mu_1) = 0$. The critical values used in the Dickey-Fuller tests are also employed in the Phillips-Perron test.

Two typical approaches used to test the existence of cointegration relationships are the Engle-Granger (1987) methodology and the Johansen (1988) procedure. Essentially, both approaches test the series for the presence of a unit root and determine the order of integration. This paper employs Johansen's procedure to test for cointegration between series. This procedure avoids the use of two-step estimation as used in the Engle-Granger methodology and tests for the presence of multiple cointegrating vectors. By avoiding two-step estimation, an error term introduced in first step estimation would not be carried into the error correction mechanism.

The Johansen approach relies on the relationship between the rank of a matrix and its characteristic roots and estimates long term relationships between nonstationary variables using a maximum likelihood procedure. The Johansen tests are on the rank of the coefficient matrix Π of the equation of the following form (Johansen and Juselius, 1990):

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \mu + \varepsilon_t \quad (4)$$

The null hypothesis for r conintegrating vectors is

H_0: Π has a reduced rank, r<k

where X_t is a k x 1 vector of I(1) variables of $\Gamma_1 .... \Gamma_{k-1}$. Π is k x k matrices of unknown parameters Π. The coefficient matrix contains information about long term relationships. The reduced rank condition implies that the process ΔX_t is stationary and X_t is nonstationary. Three cases are possible for Π. First, if Π is of full rank, all elements of X are stationary, and none of the series has a unit root. Second, if the rank of Π=0, there are no combinations which are stationary and there are no cointegrating vectors. Finally, if the rank of Π is between r and k, then the X variables are cointegrated and there exist r cointegrating vectors.

The presence of distinct cointegrating vectors can be obtained by determining the significance of the characteristic roots of Π. The Trace test is used to test the significance of the number of characteristic roots that are not different from unity. The trace test is expressed as follows:

$$\lambda_{trace}(r) = -T\Sigma \ln(1-\lambda_i) \quad (5)$$

where λ_i is the estimated values of the characteristic roots obtained from the estimated Π matrix, r is the number of cointegrating vectors, and T is the number of observations. The critical values for these tests are tabulated in Johansen and Juselius (1990) and Osterwald-Lenum (1992).

Empirical Results

The first step in investigating the long-term relationship among series is to test for stationarity. The autocorrelation does not die out gradually indicating the possibility of a unit root and nonstationarity. The tests of unit roots are performed using the Augmented Dickey-

Fuller (ADF) and the Phillips-Perron (PP) tests. The null hypothesis is that the national stock indexes have unit roots, against the alternative that they do not. The models used in the unit root analysis include a constant term. The Akaike Information Criterion (AIC) is used to choose the lag length.

The results of unit root tests are presented in Table I. Panel A reports both the ADF and the PP tests of stationarity in the levels and first differences of market indexes. The critical values of the test statistics are tabulated in MacKinnon (1991). Both the ADF and the PP tests show that the null hypothesis of a unit root cannot be rejected at 1% confidence level for the

levels of series. However, there is no evidence of a unit root in the first differences of the series. Specifically, the null hypothesis of a unit root in first differences is rejected for all series. The implication of these test results is that taking the first difference of series leads to stationary series.

Descriptive statistics for data series are also presented in Table 1. Specifically, the statistics in Panel B of Table 1 indicate that among the European markets, Turkey's equity market returns have the highest volatility followed by Greece's equity market returns while UK's equity market returns have the lowest volatility. Moreover, almost all equity market series have negative skewness and all series are leptokurtic.

The results of cointegration tests among Turkish and European markets during the each of the three sub-periods are reported in Table 2. Panel A reports the cointegration relationship in pre-candidacy period (1993-1999). The results indicate the null hypothesis of no cointegrating vector (H_0: r = 0) is rejected at the 5% level with the trace test. Specifically, the trace test has a value of 334.9 (critical value at 5% is 322.1). Moreover, the trace test suggests the null hypothesis that the number of cointegrating equations is less than or equal to 1 can be rejected at the 5% level of statistical significance. Thus, the trace test results suggest there are two cointegrating vectors in the pre-candidacy period.

Panel B of Table 2 shows the cointegrating relationships during the candidacy period (1999 and 2005) period. The trace test has a value of 363.4 which suggests the null hypothesis of no cointegrating vector is again rejected at the 5% level. Moreover, the trace test results suggest the null hypothesis that the number of cointegrating equations is less than or equal to 1 can be rejected at the 5% level. Thus, these results suggest there are 2 cointegrating vectors among Turkey and European equity markets during the candidacy period.

Panel C of Table 2 reports co-integration findings for the accession negotiation period (2005-date) and demonstrates the null hypothesis of no cointegrating vectors is rejected at the 1% level. In addition, the results in Panel C suggest there are at least 8 co-integrating vectors at the least 5% level in the accession negotiation period.

A comparison of cointegration results from the pre-candidacy, candidacy, and accession negotiations periods for eleven European markets and Turkey suggests there are closer ties in market movements because the number of significant relationships at highly significant levels, using the trace test has increased from two in the pre-candidacy and candidacy period to at least eight in the negotiation accession period. The implication of these results is that market integration has increased because the results demonstrate the number of cointegrating vectors has increased in the accession negotiation period relative to the pre-candidacy or candidacy periods.

The results of cointegration tests among European markets and two other major markets during three sample sub-periods (pre-candidacy, candidacy, and accession negotiation periods) are reported in Table 3. Specifically, Panel A of Table 3 contains the results of the Johansen cointegration test among the European equity markets and the US, Turkish, and Japanese equity markets for the pre-Euro sample period. The Trace test has a value of 555.26 (critical value at 5% is 374.9). These results suggest the null hypothesis of no cointegrating vector is rejected least at the 5% level. The hypothesis that the number of cointegrating equations is less than or equal to three at the 5% level of statistical significance using the trace test is also rejected.

Panel B of Table 3 shows cointegrating relationships during the candidacy period. Specifically, the results suggest that the hypothesis that the number of cointegrating equations is less than or equal to 2 at the 5% level of statistical significance using the trace test can be rejected. Similarly, Panel C of Table 3 reports co-integration findings for the accession negotiation period. The trace test results for the post-Euro sample period indicate the null hypothesis that the number of cointegrating vectors is less than or equal to 11 can be rejected at least at the 5% level.

A comparison of the results from the three sample periods reported in Table 3 suggests closer relationships exist between European, Turkish, and other major market movements between the pre-candidacy and candidacy periods and the accession negotiation period because the number of cointegrating vectors has increased in the latter period. Specifically, the results suggest there are at most three cointegrating vectors among European markets and the Turksih, US and Japanese markets in the pre-candidacy period and at most 11 cointegrating vectors among European, Turkish and other major markets in the accession negotiation period.

I further test the robustness of the results in Table 3 by reporting the results of the Johansen cointegration test among European markets, Turkish market and each of other developed markets (US and Japanese markets) separately, for the each sub-periods. Panel A of Table 4 contains the results of the Johansen cointegration test among the European equity markets, Turkish market and the US and Japanese equity markets for the pre-candidacy period. The results confirm the previous findings that the level of integration increased sharply after the accession negotiation started.

Conclusion

This study contributes to the European equity market integration literature by using cointegration methodology to examine long-term linkages between European Community (EC) member equity markets and Turkish equity market during the membership process of Turkey to EU. Specifically, this paper examines the linkages and dynamic interactions among stock price indexes in eleven European Community countries and Turkey before, during, and after the candidacy periods using the Johansen multivariate approach, rather than a bivariate approach. The findings report cointegration results between European equity markets and Turkey and between European and major non-European equity markets for three distinct periods: the pre-candidacy period (1993-1999); the candidacy period (1999-2005); and the accession-negotiation period (2005-2007). The results suggest the starting accession negotiation in 2005 has resulted in greater integration between Turkish and European equity markets as measured by the number of significant cointegrating vectors. Moreover, the multivariate test results for eleven European equity markets and other major markets, including equity markets in Japan and the United states during Turkey's membership process suggest there are closer ties in market movement between

Turkish and European equity markets and other major markets after the start of accession negotiations. The documented changes in integration imply that risk reduction may be less effective in Turkish market which is viewed as one of the fastest growing emerging market. Thus, portfolio managers may need to consider other emerging markets investments to achieve diversification objectives.

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Table 1: Unit root tests

Panel A: Unit root tests for levels and first differences of series

Unit root tests are applied using the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests. The critical values are tabulated in MacKinnon (1991)

	Level		*First Differences*	
	PP	***ADF***	***PP***	***ADF***
EU Member Markets				
BEL	-1.88	1.94	-30.83*	-30.91*
DEN	2.54	2.52	-28.63*	-18.79*
FRA	1.45	1.43	-32.82*	-14.89*
GER	1.85	1.73	-30.98*	-14.41*
GRE	1.64	1.59	-26.54*	-18.15*
IRL	2.17	2.29	-27.78*	-18.52*
ITA	1.68	1.59	-27.28*	-12.81*
NET	1.55	1.50	-32.40*	-11.02*
POR	1.64	1.49	-26.54*	-11.62*
SPA	2.76	2.56	-29.84*	-18.29*
UK	1.45	1.58	-32.49*	-11.57*
Non-European Major Markets				
US	2.30	2.64	-31.61*	-31.62*
JAP	0.18	0.18	-28.77*	-28.78*
TUR	3.02	3.18	-27.25*	-14.22*
Critical Values at 1%	-2.56	-2.56	-2.56	-2.56

Panel B: Distributional characteristics

This panel reports the distributional characteristics of the first differences of series.

	Obs.	Mean	Max.	Min.	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.
EU Member Markets									
BEL	779	0.00167	0.1791	-0.1268	0.0252	-0.209	9.892	1547.86	0.00
DEN	779	0.00237	0.1068	-0.1482	0.0245	-0.347	5.632	240.58	0.00
FRA	779	0.00143	0.1662	-0.1292	0.0288	-0.136	6.437	386.06	0.00
GER	779	0.00210	0.1715	-0.1522	0.0307	-0.518	6.644	465.97	0.00
GRE	779	0.00256	0.1447	-0.1401	0.0364	-0.117	4.930	122.75	0.00
IRE	779	0.00223	0.0941	-0.1379	0.0248	-0.586	5.868	311.78	0.00
ITA	779	0.00183	0.1268	-0.1395	0.0284	-0.330	4.926	134.62	0.00
NET	779	0.00175	0.2037	-0.1753	0.0302	-0.470	10.07	1655.44	0.00
POR	779	0.00192	0.1211	-0.1132	0.0248	-0.283	5.809	266.64	0.00
SPA	779	0.00266	0.1098	-0.1181	0.0261	-0.529	4.678	127.77	0.00
UK	779	0.00107	0.1358	-0.1038	0.0221	0.013	6.796	467.83	0.00
Non-European Major Markets									
US	779	0.00174	0.0933	-0.0869	0.0197	-0.2812	5.19488	166.64	0.00
JAP	779	0.00020	0.0931	-0.0933	0.0258	0.0657	3.86690	24.95	0.00
TUR	779	0.00930	0.3232	-0.3283	0.0667	-0.1769	5.80747	259.90	0.00

Table 2: Cointegration between Turkey and European markets

Johansen (1988) test is used to examine the long-run relationship among the Turkish and European markets. The co-integration equation includes intercept term. The Trace test is used. The data includes the market indexes of Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, UK and Turkey. The critical values for the test statistics are tabulated in Osterwald-Lenum (1992), while p-values are from MacKinnon-Haug-Michelis (1999).

Panel A: European market integration in pre-candidacy period (1993 to 1999)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.1861	408.27	374.90	0.0016
At most 1 *	0.1772	334.94	322.06	0.0140
At most 2	0.1403	265.49	273.18	0.1012
At most 3	0.1250	211.66	228.29	0.2245
At most 4	0.0959	164.09	187.47	0.4035
At most 5	0.0879	128.19	150.55	0.4436
At most 6	0.0762	95.42	117.70	0.5268
At most 7	0.0573	67.19	88.80	0.6166
At most 8	0.0439	46.18	63.87	0.5915
At most 9	0.0369	30.20	42.91	0.4904
At most 10	0.0267	16.80	25.87	0.4298
At most 11	0.0198	7.140	12.51	0.3301

Panel B: European market integration in candidacy period (1999 to 2005)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.3044	473.42	374.90	0.0000
At most 1 *	0.2591	363.42	322.06	0.0004
At most 2	0.1549	272.53	273.18	0.0533
At most 3	0.1491	221.53	228.29	0.0984
At most 4	0.1301	172.59	187.47	0.2201
At most 5	0.1008	130.33	150.55	0.3840
At most 6	0.0902	98.11	117.70	0.4379
At most 7	0.0680	69.46	88.80	0.5278
At most 8	0.0559	48.12	63.87	0.4998
At most 9	0.0424	30.69	42.91	0.4618
At most 10	0.0320	17.54	25.87	0.3752
At most 11	0.0250	7.67	12.51	0.2790

Panel C: European market integration in accession negotiation period (2005-date)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.6493	660.32	374.90	0.0000
At most 1 *	0.5969	540.87	322.06	0.0000
At most 2 *	0.5361	437.27	273.18	0.0000
At most 3 *	0.4999	349.71	228.29	0.0001
At most 4 *	0.4093	270.69	187.47	0.0000
At most 5 *	0.3775	210.67	150.55	0.0000
At most 6 *	0.3159	156.63	117.70	0.0000
At most 7 *	0.2865	113.33	88.80	0.0003
At most 8 *	0.2585	74.85	63.87	0.0045
At most 9	0.1527	40.74	42.91	0.0810
At most 10	0.1106	21.85	25.87	0.1461
At most 11	0.0716	8.47	12.51	0.2151

* indicates statistical significant level at 5%.

Table 3: Cointegration between European markets, Turkey and other major markets

Johansen (1988) test is used to examine the long-run relationship among the Turkish and European markets. The co-integration equation includes intercept term. The Trace test is used. The data includes the market indexes of Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, UK, Turkey, Japan and U.S. The critical values for the test statistics are tabulated in Osterwald-Lenum (1992), while p-values are from MacKinnon-Haug-Michelis (1999).

Panel A: European, Turkish and other major markets integration in pre-candidacy period (1993-1999)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None*	0.2236	555.26	374.90	0.0000
At most 1*	0.2078	465.13	374.90	0.0000
At most 2 *	0.1682	382.18	374.90	0.0264
At most 3	0.1361	316.62	322.06	0.0800
At most 4	0.1335	264.50	273.18	0.1100
At most 5	0.1099	213.47	228.29	0.1957
At most 6	0.1034	172.01	187.47	0.2306
At most 7	0.0837	133.13	150.55	0.3116
At most 8	0.0729	102.01	117.70	0.3188
At most 9	0.0654	75.05	88.80	0.3219
At most 10	0.0537	50.95	63.87	0.3724
At most 11	0.0332	31.29	42.91	0.4270
At most 12	0.0271	19.26	25.87	0.2653

Panel B: European, Turkish and other major markets integration in candidacy period (1999-2005)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None*	0.3590	606.31	374.90	0.0000
At most 1*	0.2756	471.55	374.90	0.0000
At most 2	0.2241	373.82	374.90	0.0547
At most 3	0.1680	296.91	322.06	0.3068
At most 4	0.1475	241.17	273.18	0.4813
At most 5	0.1203	192.79	228.29	0.6259
At most 6	0.1162	153.93	187.47	0.6618
At most 7	0.0873	116.48	150.55	0.7684
At most 8	0.0753	88.80	117.70	0.7389
At most 9	0.0640	65.06	88.80	0.6968
At most 10	0.0510	45.02	63.87	0.6460
At most 11	0.0498	29.16	42.91	0.5522
At most 12	0.0237	13.66	25.87	0.6848
At most 13	0.0208	6.371	12.51	0.4146

Panel C: European, Turkish and other major markets integration in accession negotiation candidacy period (1999-2005)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None*	0.7973	975.67	374.90	0.0000
At most 1*	0.7139	793.70	374.90	0.0000
At most 2 *	0.6670	651.02	374.90	0.0000
At most 3 *	0.5580	525.67	322.06	0.0000
At most 4 *	0.5332	432.58	273.18	0.0000
At most 5 *	0.4666	345.72	228.29	0.0001
At most 6 *	0.4498	274.06	187.47	0.0000
At most 7 *	0.3893	205.94	150.55	0.0000
At most 8 *	0.3188	149.72	117.70	0.0001
At most 9 *	0.2715	105.95	88.803	0.0017
At most 10 *	0.1832	69.84	63.876	0.0145
At most 11 *	0.1683	46.762	42.915	0.0197
At most 12	0.1109	25.753	25.872	0.0517
At most 13	0.1026	12.351	12.517	0.0533

* indicates statistical significant level at 5%.

Table 4: Cointegration between European , Turkish, and each of the other major markets

Johansen (1988) test is used to examine the long-run relationship among the Turkish and European markets. The co-integration equation includes intercept term. The Trace test is used. The data includes the market indexes of Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, UK, Turkey, Japan and U.S. The critical values for the test statistics are tabulated in Osterwald-Lenum (1992), while p-values are from MacKinnon-Haug-Michelis (1999).

Panel A: European, Turkish and other major markets integration in pre-candidacy

	US			Japan			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Prob.	Eigenvalue	Trace Statistic	Prob.	0.05 Critical Value
None*	0.2215	482.78	0.0000	0.1972	468.58	0.0000	374.90
At most 1*	0.1937	393.62	0.0084	0.1845	390.36	0.0119	374.90
At most 2	0.1562	316.94	0.0779	0.1410	317.74	0.0728	322.06
At most 3	0.1318	256.46	0.2033	0.1251	263.62	0.1183	273.18
At most 4	0.1156	206.12	0.3266	0.1121	216.01	0.1598	228.29
At most 5	0.1016	162.38	0.4464	0.1042	173.67	0.2012	187.47
At most 6	0.0803	124.23	0.5583	0.0921	134.48	0.2791	150.55
At most 7	0.0671	94.429	0.5599	0.0748	100.05	0.3766	117.70
At most 8	0.0592	69.692	0.5190	0.0673	72.34	0.4175	88.80
At most 9	0.0382	47.942	0.5083	0.0511	47.50	0.5289	63.87
At most 10	0.0366	34.069	0.2853	0.0317	28.81	0.5730	42.91
At most 11	0.0315	20.788	0.1886	0.0268	17.33	0.3903	25.87
At most 12	0.0259	9.3678	0.1589	0.0212	7.66	0.2806	12.51

Panel B: European, Turkish, and other major markets integration in candidacy period

	US			Japan			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Prob.	Eigenvalue	Trace Statistic	Prob.	0.05 Critical Value
None*	0.3442	523.55	0.0000	0.3047	541.23	0.0000	374.90
At most 1*	0.2670	395.67	0.0068	0.2659	431.09	0.0001	374.90
At most 2	0.1554	301.55	0.2353	0.2221	337.43	0.0106	322.06
At most 3	0.1487	250.35	0.3009	0.1571	261.30	0.1424	273.18
At most 4	0.1414	201.54	0.4249	0.1451	209.51	0.2618	228.29
At most 5	0.1075	155.32	0.6273	0.1130	161.98	0.4565	187.47
At most 6	0.1012	120.85	0.6550	0.0919	125.64	0.5171	150.55
At most 7	0.0818	88.50	0.7474	0.0738	96.42	0.4934	117.70
At most 8	0.0638	62.63	0.7802	0.0702	73.17	0.3870	88.80
At most 9	0.0487	42.64	0.7509	0.0565	51.11	0.3655	63.87
At most 10	0.0417	27.49	0.6519	0.0507	33.47	0.3129	42.91
At most 11	0.0250	14.58	0.6088	0.0340	17.70	0.3641	25.87
At most 12	0.0225	6.89	0.3552	0.0234	7.19	0.3242	12.51

Panel C: European Turkish, and other major markets integration in accession negotiation period

	US			Japan			
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Prob.	Eigenvalue	Trace Statistic	Prob.	0.05 Critical Value
None*	0.7196	835.43	0.0000	0.6835	752.27	0.0000	374.90
At most 1*	0.6706	690.47	0.0000	0.6046	621.08	0.0000	374.90
At most 2 *	0.6056	563.84	0.0000	0.5531	515.28	0.0000	322.06
At most 3 *	0.5554	457.76	0.0000	0.5259	423.45	0.0000	273.18
At most 4 *	0.4999	365.34	0.0001	0.4785	338.36	0.0001	228.29
At most 5 *	0.4175	286.33	0.0000	0.4414	264.14	0.0000	187.47
At most 6 *	0.3920	224.72	0.0000	0.3524	197.74	0.0000	150.55
At most 7 *	0.3767	167.99	0.0000	0.3279	148.20	0.0002	117.70
At most 8 *	0.2963	114.08	0.0003	0.2846	102.89	0.0033	88.80
At most 9 *	0.2332	74.00	0.0056	0.1908	64.71	0.0424	63.87
At most 10 *	0.1595	43.73	0.0413	0.1389	40.57	0.0842	42.91
At most 11	0.1151	23.91	0.0859	0.1129	23.51	0.0956	25.87
At most 12	0.0837	9.97	0.1283	0.0828	9.85	0.1339	12.51

* indicates statistical significant level at 5%. There are ten Cointegrating Equation with U.S. and nine co-integrating equation with Japan.