



The long-run relationship between the spot and futures markets under multiple regime-shifts: Evidence from Turkish derivatives exchange

Efe Çağlar ÇAĞLI*, Pınar Evrim Mandacı¹

Dokuz Eylül University, Faculty of Business, Department of Finance, Kaynaklar Campus, Buca-İZMİR, Turkey

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ABSTRACT

The paper examines the long-run relationships between the spot and future prices of Istanbul Stock Exchange 30 index (ISE-30) and foreign currencies including the Turkish Lira-US Dollar (TL/USD) and Turkish Lira-Euro (TL/EUR). We analyze the weekly data covering the period from February 9, 2005 to October 17, 2012. Considering structural breaks is important for our analysis since our period consists of recent financial crisis. Therefore, we employ the unit root tests developed by Carrion-i-Silvestre et al. (2009) and the Maki's (2012) cointegration test allowing for an unknown number of breaks. We find that spot and the futures prices are cointegrated in the long-run after we consider structural breaks in our data. Our results indicate that the markets are efficient.

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1. Introduction

Although it has begun its operations only a few years ago, the Turkish Derivatives Exchange (TDEX) has become one of the fastest growing emerging futures market in the world.² There are a variety of futures contracts in TDEX; i.e., equity index futures on ISE 30 and ISE 100 indices, currency futures on US Dollars and Euro, commodity futures on gold, cotton, wheat and live cattle and energy futures on base-load electricity. However, among them index contracts have the highest trading ahead of the currency futures in the second place. While index contracts from 88.38% and 97.20% of the total number of contracts traded and the total trading value for 2010, currency contracts follow them with 11.38% and 2.58% respectively.

Investors make use of stock index futures to speculate on the performance of the entire market; if they expect an improvement in the economy, they will buy the index; otherwise they will short the index. They can also use currency futures to speculate on the value of currencies thereby taking long position in futures contract on that currency or vice versa. Index futures contracts are used in speculative way in the TDEX as frequently as in the most of index futures in the world, yet investors may also use them to hedge their spot equity portfolio against the price declines by going short at the futures market. Here, it is important for the investors to

determine their optimum hedge ratio by considering the correlation between the prices of futures and spot positions.³ Similarly, traders, particularly importers and exporters, can use currency futures to hedge their foreign exchange positions by taking a long or a short position on currency futures. In addition, arbitrage is another aim of involving into the futures contracts. Arbitrageurs make transactions in both spot and futures market for the same asset and make profit when the price of the futures contract gets out of line with its spot price. These can be summed up as the main reasons motivating the researchers to investigate the relationship between the spot and future prices.

According to the efficient market hypothesis, generally in the financial markets all relevant information is always efficiently processed and reflected simultaneously into both the spot and futures prices, hence arbitrage opportunities would always be limited. Brooks, Garrett, and Hinich (1999) argue that in a perfect market with non-stochastic interest rates and dividend yields, they are perfectly contemporaneously correlated and no lead-lag relationship would exist. The relationship between the spot and futures prices can also be explained by the price discovery hypothesis. Accordingly, if the markets are efficient and frictionless, then price discovery would be instantaneous and contemporaneous. Otherwise, price discovery would occur in one market and the other market would follow it. The normal and theoretically correct relationship between the spot price and its futures can be explained by the “cost of carry model” or the “spot-futures parity theorem”. The

* Corresponding author. Address: Dokuz Eylül Üniversitesi, İktisat Fakültesi, Kaynaklar Yerleşkesi, Buca, İZMİR - Türkiye. Tel.: +90 232 4535060; fax: +90 232 4535062.

E-mail addresses: efe.cagli@deu.edu.tr (E. Çağlar ÇAĞLI), pinar.evrim@deu.edu.tr (P. Evrim Mandacı).

¹ Tel.: +90 232 4535060; fax: +90 232 4535062.

² TURDEX has been operating since February 2005. Its trading value was only 3,029,588,946 TL in 2005 and was reached to 431,681,986,516 TL in 2010.

³ For instance, if there is a high correlation between the prices of futures and spot positions, the hedge ratio will be closed to unity. The equation of the hedge ratio is; $h_t = \rho_t \left(\frac{s_t^f}{s_t^s} \right)$ where ρ is the correlation coefficient between the portfolio and futures return and σ is the standard deviation over the hedging horizon.

parity for the index futures can be stated as:

$$F_0 = S_0(1 + r_f - d)^T \quad (1)$$

where F_0 is the future price at time 0, S_0 is the spot price at time 0, r_f is the risk-free rate, and d is the dividend yield on the stock portfolio. It is called the “cost of carry relationship” because it defines a setting in which futures price must exceed the spot price by the net cost of carrying the asset until maturity date T (Bodie, Kane, & Marcus, 2009: 775). However, in practice one should take into account some market imperfections such as asymmetric information, transaction costs, short-selling, margins, and liquidity, which might cause deviations from that parity. Those deviations might induce lead-lag relationships between the spot and futures markets and enhance the arbitrage chances for investors trading in both of these markets.

There are a considerable number of studies depicting that futures market leads the spot market due to deviations such as high liquidity, low transaction costs, easy availability of short positions and low margins of the futures market (e.g. see, Chan, 1992; Kwallner, Koch, & Koch, 1987; Stoll & Whaley, 1990 and Abhyankar, 1998; Pizzi, Economopoulos, & O'Neill 1998). On the other hand, Brooks, Rew, and Ritson (2001) argue that the lead-lag relationship between spot and futures markets do not last for more than half an hour and argue that the parity holds in the long-run. In the same line, Maslyuk and Smyth (2009) argue that the theoretical relationship between spot and futures prices is a long-run, rather than short-run because in the short-run, there might be deviations between spot and future prices however in the long-run they are driven by the same macroeconomic indicators. Following to these studies, in this paper our aim is to examine the long-run relationship between the spot and futures prices of both the ISE 30 and foreign currencies in order to find out whether these markets are efficient.

This paper provides three contributions to the existing literature: First, many empirical studies examining the long-run relationship between the spot and futures prices have adopted the vector auto regression model (VAR) or cointegration methods proposed by Engle and Granger (1987) (EG) and Johansen (1988) (e.g. see, Ghosh, 1993; Wahab & Lashgari, 1993; Brenner & Kroner, 1995; Pizzi et al., 1998 and Brooks et al., 2001) but, none of these studies have allowed for a structural break in the cointegrating vector. Therefore, different from the previous studies we employ the unit root tests developed by Carrion-i-Silvestre, Kim, and Perron (2009) and the Maki's (2012) cointegration test allowing for an unknown number of breaks. Considering structural breaks is important for our analysis since our period consists of the effects of the recent financial crisis. Second, many of the previous studies examine the developed futures markets but this paper analyze TDEX which is an emerging market in its early stages but has become one of the top 30 futures exchanges in the world after just eight years. Third, our data consist of the index (TDEX-30) and currency futures (TDEX-USD and TDEX-EUR) which are mostly traded contracts representing almost the whole market for the period from February 9, 2005 to October 17, 2012 covering the whole life of TDEX.

Existence of the long-run relationship indicates that the markets are efficient in the long run and eliminate the diversification benefits in portfolios that consist of the stock index and its futures as well as the currencies and their futures for a long period. Our results are important for the investors and portfolio managers holding both spot and their futures to provide diversification or hedging, for security analysts to determine fair values of spot and futures and policy makers to arrange some rules and regulations in order to provide efficiency and liquidity in these markets.

The remainder of this study is organized as follows. Section 2 gives a brief summary of literature. Section 3 describes the methodologies employed. Section 4 shows the data and the empirical results, and in Section 5 we draw our conclusions.

2. Literature review

A large number of studies analyzing the relationship between the spot and its futures market mostly focus on the short-run relationships by applying the modified and non-modified Granger Causality (GC) tests with the intraday data. Since our focus is the long-run interactions between these markets here we will just give a review on studies using cointegration techniques most of which employ Error Correction Models (ECM) and GC tests after they find the evidence of cointegration. Among them, Ghosh (1993) applies EG cointegration test to analyze the long-term equilibrium relationship between S&P 500 index prices and futures prices covering the time period from June 12, 1986, through December 31, 1989. He finds that there exists a cointegration relationship between futures and spot markets, in addition he estimates short-run relationship between them and argues that future prices Granger-Cause cash prices in the case of the S&P 500 index. Similar to this study, Wahab and Lashgari (1993) examine the long-run relationship between the futures and spot markets of S&P 500 and FTSE 100 over the period from 1988 to 1992 by using daily closing prices and applying the same methodology and find that they are cointegrated. However in contrast to Ghosh (1993), they indicate that spot returns contribute more than future returns.

Tse (1995) examines the relationship between the spot and futures price of the Nikkei stock exchange by using daily data from December 1988 through January 1993 and find that the series are cointegrated. Pizzi et al. (1998) examine the price discovery in S&P 500 cash index and its futures using intraday data for the period from Jan 1987 to March 1987 applying the EG methodology and find that they are cointegrated indicating market efficiency. In addition, their results show that the spot prices lead the futures prices. Brooks et al. (2001) employ the EG method to test cointegration between the FTSE 100 index and its futures by using 10 min data for the period from June 1996 to 1997 and find a strong relationship between them. They also find that changes in spot index depend on the lagged changes in the spot index and futures price, while the lead-lag relationship between spot and futures markets do not last for more than half an hour.

Chai and Gou (2009) examines five International stock index spot and futures data including S&P 500 index futures, Dow Jones index futures and NASDAQ 100 index futures in the USA, Nikkei 225 index futures in Japan, Hang Seng index futures in Hong Kong of China, to verify whether there exists long-term steady relationship between the index spot and futures prices. They apply the EG cointegration method and based on the cointegration theory and ECM, conclusions are drawn that index spot and futures are cointegrated in most cases and it is possible to do the corresponding short term dynamic adjustment for reaching new equilibrium in next period.

Nieto, Fernandez, and Muñoz (1998) apply the Johansen cointegration test to examine the relationship between Spanish stock index and its futures by using daily data from March 1, 1994 through Sep 30, 1996. They find a long-run relation between them indicating that the cost of carry model holds in the long run. Pattarin and Ferretti (2004) study the relationship between the Italian MIB30 index and futures log-prices with a bivariate ECM and apply the Johansen cointegration test by using daily observations beginning from November 28, 1994 to September 19, 2002 and find that the relationship is hold in the long-run.

Very little work has investigated the impact of stock index futures trading in the emerging markets. Among them, Cheng and

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