

# Chapter 46

## Testing Random Walk Hypothesis in Turkish Foreign Exchange Market

**Levent Çıtak**

*Erciyes University, Turkey*

**Veli Akel**

*Erciyes University, Turkey*

**Murat Çetin**

*Namık Kemal University, Turkey*

### ABSTRACT

*This chapter revisits the empirical validity of the weak-form efficient market hypothesis for Turkish foreign exchange markets. The random-walk hypothesis in foreign-exchange rates market is one of the most researched areas, particularly in developed economies. This chapter applies ADF and PP unit root test, Lo and MacKinlay's (1988) conventional variance ratio test and Ljung-Box  $Q$  tests to examine the validity of the random-walk hypothesis in the Turkish foreign-exchange market. The chapter utilizes weekly nominal TRY/USD exchange rate for data from January 2000 to December 2013. The results provide evidence rejecting the random walk hypothesis for weekly nominal exchange rate series.*

### INTRODUCTION

The validity of the random walk hypothesis has long been the focus of financial research. The random walk hypothesis of exchange rates, stock prices and prices of other financial assets suggest that past prices has no memory in predicting the future prices in a consistent way.

Random walk hypothesis has been tested most widely for stock prices. Price movements of stocks are a means of transmitting financial information, which leads them to share similar characteristics with other financial instruments. Therefore, for financial instruments other than stocks, inferences can be drawn from the observed empirical patterns of the stock markets (Yen and Lee, 2008). Within this perspective, validity of the random walk hy-

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pothesis suggests that markets are efficient and stock prices at any point in time will represent good estimates of intrinsic or fundamental values (Fama, 1965b). Efficient markets are regarded as fully reflecting all available and relevant information. In a weak-form efficient market, which implies a random walk, it is not possible to predict future prices based on information about past prices. If stock prices follow a random walk, there will be no use in trying to predict the future prices and beat the market consistently. On the other hand, if stock prices are mean-reverting (series of them are serially correlated), then it is possible to predict future prices. Studies done by most finance academicians, in the '60s and '70s suggest that stock prices follow a random walk, at least for the weak-form efficiency. Fama (1965a) and Fama (1970) support the random walk hypothesis. Fama and Blume (1966) find dependence in price changes so small that their findings are in favor of the random-walk model as an adequate description of stock price behaviour. Hong (1978) also supports random walk hypothesis for stock returns.

However, studies done in the recent past do not seem to support efficient market hypothesis as strongly as their counterparts in the 60s and 70s (Yen and Lee, 2008). A strong rejection of the random walk hypothesis may not mean that the market is completely inefficient. "Without a more explicit economic model of the price-generating mechanism, a rejection of the random walk hypothesis has few implications for the efficiency of market price formation" (Lo and MacKinlay, 1988: 42).

In an efficient foreign exchange market, investors cannot generate abnormal returns from foreign exchange transactions and regulatory institutions rarely need to interfere with it. In an inefficient exchange market however, investors can predict exchange rate movements and benefit from abnormal returns. Within this perspective, the purpose of this study is to examine whether the exchange rate of Turkish Lira relative to US Dollar (TRY/USD) follows a random walk process. We applied

unit root tests, variance ratio tests and Ljung-Box Q tests to verify the hypothesis that the Turkish foreign exchange market follows a random walk.

The rest of the paper is organized as follows. Section 1 and Section 2 presents literature review and characteristics of data, respectively. Section 3 reports the empirical results. The conclusion is drawn in Section 4.

## **LITERATURE REVIEW**

As far as the literature on efficient markets and random walk hypothesis is concerned, we aim to review selected papers on the validity of efficiency and random walk in foreign exchange markets with a special emphasis on variance ratio test.

"The random walk is usually supported in the existing literature either because a unit root component is detected in the exchange rate series or because the increment in the exchange rate is found to be serially uncorrelated" (Liu and He, 1991: 773). For example, Meese and Singleton (1982) and Baillie and Bollerslev (1989) find a unit root component in the exchange rate series that they analyze, while Logue et al. (1988) and Hsieh (1988) find the increments in the exchange rates to be serially uncorrelated. However, such traditional random walk tests applied on financial asset returns may be problematic due to possible time-varying volatilities and non-normality of the series. To avoid such problems in testing of random walk hypothesis, Lo and MacKinlay (1988, 1989) developed tests based on both homoscedasticity and heteroscedasticity assumptions. Lo and MacKinlay (1988) variance ratio test does not require the data to be normally distributed and allows heteroscedasticity in the data. Besides, Lo and MacKinlay (1989) argue that under the null hypothesis that heteroscedastic series follow a random walk; the variance ratio test is superior to the Box–Pierce Q test and the Dickey–Fuller unit root test.

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