The impact of mean reversion model on portfolio investment strategies: Empirical evidence from emerging markets ☆

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ABSTRACT

Investors use mean reversion model to make decisions on which stocks should be taken in their portfolios according to their mean values. The first goal of the paper is to test the validity of the mean reversion model in emerging markets. Second, it aims to determine the best portfolio investment strategy on the validity of the mean reversion model. As a result of panel regression analysis, we find that the mean reversion model is valid in all of the emerging countries in the sample. This result implies that emerging markets are not efficient even in weak form. On the validity of the mean reversion model, we find that Max3–Min3 portfolio has recorded the best performance and contrarian portfolio is the best portfolio investment strategy. The paper makes contribution to the literature in terms of providing the information about which portfolio investment strategy has the best performance on the validity of the mean reversion model.

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1. Introduction

Efficient market hypothesis assumes that the prices of assets reflect all available information and so one cannot consistently gain abnormal returns from investments (Fama, 1970). However, researchers assert that none of the markets can be fully efficient because if investors cannot profit from the undervalued equities, trading will stop and no information comes into the market. In this context, the situation in which the stock prices follow a mean reverting process indicates that the assumptions of the efficient market hypothesis is not acceptable. Mean reversion model, one of the stock price behavior models, assumes that stocks have an average price in the long run and so an investor can identify a trading range for their investments by estimating this average price level. According to the mean reversion model, if the current market price is less than the average price, the stock is considered attractive for purchase, with the expectation that the price will rise. If the current market price is above the average price, the market price is expected to fall.

In inefficient markets, on the validity of the mean reversion model, investors (institutional or individual investor) can get abnormal returns by using different portfolio investment strategies some of which are buy and hold, contrarian and momentum portfolio strategies. In buy and hold strategy, investors buy stock for long run and they do not consider rise and fall in the stock price and adopt passive portfolio strategy. In the contrarian strategy, investors buy stocks for lower prices and sell them when their prices increase. In other words, contrarian strategy states that "try to do the opposite of the market so that when the prices turn to average value, your profit will increase" (Sauer and Chen, 1996). According to the contrarian strategy, stock prices will turn to their average value definitely and due to not selling stocks for lower prices and not buying for higher prices will provide sufficient profit from the investments. On the other side, momentum strategy focuses on the general trend of the market rather than the average values of stock prices. Investors buy stocks in higher prices and sell when they are decreasing so that they catch up to the current trend. Therefore, if investors can combine the mean reverting behavior with accurate portfolio strategies, it is possible to get abnormal returns on investments.

The purpose of the paper is to test the validity of the mean reversion model in the emerging markets and then identify the best portfolio investment strategy on the validity of the mean reversion model. In consequence of the research, investors will decide which stocks they should include in their portfolios in the emerging markets and have knowledge of the best portfolio investment strategy. In this context, the paper makes the following contributions to the existing literature. First, the main hypothesis of the paper has not been tested before in Turkey as emerging markets. Second, the subject of the paper has not been examined before in the emerging markets literature.

The paper is organized as follows. Section 2 summarizes the literature. Section 3 defines the dataset, Section 4 describes the methodology applied. Section 5 discusses the empirical findings. Section 6 concludes.

2. Literature

In the literature, there are many studies that examine the mean reversion model and portfolio investment strategies from the different perspectives. The papers concerning money markets investigate the validity of the mean reversion models for exchange rates, interest rates, gross domestic product and inflation rates by linking to purchasing power parity. Besides, the papers on capital markets investigate the validity of the mean reversion model in the financial markets and they link the findings to the efficiency of markets or the arbitrage and investment opportunities provided by mean reversion model.

The papers related to money and capital markets have broad application field both in emerging and developed markets. In money market related studies, researchers mostly test the purchasing power parity. If real exchange rates tend to return to average value and do not have stochastic trend, the purchasing power parity hypothesis is accepted (Campa and Wolf, 1997; Cerrato and Sarantis, 2006; Chortareas and Kapetanios, 2004; Choudhry and Luintel, 2001; Dara, 2010; Flood and Taylor 1996; Frankel and Rose, 1996; Gill-Alana, 2000; Hasan, 2004; Hooi and Smyth, 2007; Jorion and Sweeney, 1996; Lothian and Taylor, 1996; Razzaghipour et al., 2001; Taylor and Peel, 2000; Taylor et al., 2001; Wu, 1996; Wu and Zhang, 1996). On the contrary, if real exchange rate series do not tend to return average value, the purchasing power parits hypothesis is rejected (Abuaf and Jorion, 1990; Aggarwal et al., 2000; Cooper, 1994; Hyrina and Serletis, 2010; Korap, 2009).

A vast majority of the capital market related studies test the validity of the mean reversion model and give an idea about the efficiency level of the financial markets. Although the findings of the papers differ according to methodology used, it is common view that the mean reversion model is valid in most of the countries and so these markets are not efficient (Chaudri and Wu, 2004; Chowdhury, 1999; Cochran and Defina, 1994; DeBondt and Thaler, 1985; Elam, 2000; Fama and French, 1988; Kasa, 1992; Kim et al., 2000; Lo and MacKinlay, 1988; Malliaropulos and Priestley, 1999; McQueen, 1992; Mobarek, 2009; Poterba et al., 1988; Risager, 1998; Serban, 2009; Spierdijk et al., 2010; Urrutia, 1995). Different from those, some papers do not find evidence for the validity of the mean reversion model (Kawakatsu and Morey, 1999; Zhu, 1998).

There are also papers that relate the mean reversion model to portfolio investment strategies in the literature. These studies find that contrarian portfolio investment strategy is the best on the validity of mean reversion model in developed markets. (Balvers et al., 2000; Gropp, 2004; Koijen et al., 2009; Sauer and Chen, 1996; Serban, 2009; Stevenson, 2002).

Table 1 presents the existing literature in more detail.

3. Data

The validity of the mean reversion model is tested in 18 emerging markets[1] for the period 1995–2010 by using the monthly closing price of stock market index in U.S. dollar currency. The reason why we use the monthly returns is that the mean reversion model occurs in the long run and daily or weekly returns remain incapable to identify this effect. For the date specified, the dataset consists of 179 observations

[1] Argentina, Brazil, Chile, China, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Poland, Russia, South Africa, Thailand and Turkey.

Table 1
Comprehensive literature on mean reversion model.

Study	Period	Methodolgy	Result
Poterba et al. (1988)	1926–1985	Varyans Rasyo Test	+
Lo and Mackinlay (1988)	1962–1985	Varyans Rasyo Test	−
Kim et al. (2000)	1926 öncesi dönem 1926–1946 1946 sonrası dönem	Varyans Rasyo Test ve Çoklu Otokorelasyon Testi	+
McQueen (1992)	1926–1987	Regresyon GLS	−
Kasa (1992)	1871–1987		+
	1974–1990	Birim Kök Testi	+
Cochran and Defina (1994)	1969–1989	Eşbütünleşme Testi	+
		Regresyon Analizi	+
Bessembinder ve diğ (1995)	1982–1991		+
Urrutia (1995)	1975–1991	Varyans Rasyo Test	+
Sauer and Chen (1996)	1919–1990		−
Risager (1998)	1922–1995	Varyans Rasyo Test	+
Richards (1997)	1969–1995	Panel Regresyon Testi	
Zhu (1998)	1958–1995	Panel Birim Kök Testi	−
Chowdhury (1999)	1982–1995	Panel regresyon/SUR testi	+
Balvers et al. (2000)	1969–1996	Panel Regresyon Testi	+
Elam (2000)	1973–1981	Regresyon Analizi-OLS	+
		Birim Kök Testi/ADF	+
Kim et al. (2000)	1926–1996	Jegadeesh'n basit regresyon modeli, markov switching model	+
			+
Stevenson (2002)	1977–2000	Birim Kök Testi ADF	−
		Varyans Rasyo Test	+
Hillebrand (2003)	1901–2002 1982–1991	Regresyon testi (Ornstein-Uhlenbeck model)	+
Hakim ve Neaime (2003)	1995–2000	Varyans Rasyo Test GMM model	+
Gropp (2004)	1963–1998	Panel veri Regresyon	+
Chaudri and Wu (2004)	1985–2002	Panel veri Regresyon testi	+
Narayan ve Prasad (2007)	1988–2003	Panel Birim Kök Testleri (Levin Lin, MADF, SUR)	−
Narayan (2007)		Panel Birim Kök Testleri	−
Manzan (2007)	1871–2003	STAR Model	+
Mobarek (2009)	2000–2007	Birim Kök TestiPanel Birim Kök Testi	+
Spierdijk et al. (2010)	1900–2008	Panel Veri Testi	+
Serban (2009)	1978–2001	Regresyon Analizi	+

of the closing prices of 18 emerging markets. The data is obtained from Datastream.

4. Methodology

4.1. Panel data analysis methodology

Panel data analysis includes both time series and cross section dimensions, and it is advantageous over time series and cross sectional analysis (Wooldridge, 2002). Panel data analysis to check individual heterogeneity and panel data is able to increase a number of observation. So, multicollinearity problem doesn't occur and increasing degree of freedom causes increasing efficieny in estimations (Baltagi, 2005).

First we identify whether the model is one way or two way. One-way model examines only one-way impact of time series or cross section dimension. However, two-way model examines both impact of time series and cross section dimension. One and two-way models' impacts may be fixed or random. Fixed effect model assumes that slope coefficients are fixed and try to explain differences in cross-sectional unit through differences in constant terms. The existence