Buy & Hold vs. EMA: A COMPARATIVE PERFORMANCE ANALYSIS OF TRADING DISCIPLINES ON BORSA İSTANBUL NATIONAL STOCK INDICES
Al & Tut vs. EMA: BORSA İSTANBUL ULUSAL HİSSE SENEDİ ENDEKSLERİNDE ALIM SATIM DİSİPLİNLERİNİN KARŞILAŞTIRMALI PERFORMANS ANALİZİ

Mustafa ÖZYEŞİL
Dr. Öğr. Üyesi, İstanbul Aydın Üniversitesi, mozyesil@aydin.edu.tr, ORCID: orcid.org/ 0000-0002-4442-7087

ABSTRACT
The main purpose of this study is to examine effects of the selected trading approach on investor's return. Therefore in this study, the performance of Buy & Hold and Exponential Moving Averages (EMA) investment trading disciplines are compared through back test analysis. During the analysis period that covers 30.05.2010 - 24.05.2020, both trading techniques are applied on the 3 biggest national stock indices of Borsa Istanbul (BIST). The series used in the analysis consist of the weekly closing prices of these indices and total number of the observation is 1566. Based on the test findings, it is observed that the Buy & Hold investment strategy provides higher returns to investors in all three indexes of BIST. According to the results of the analysis, it can be concluded that it is better strategy for the investors to apply Buy & Hold strategy to obtain higher returns based on given analysis period and sample structure.

Keywords: EMA, Borsa İstanbul, Stock Investment, Trading Disciplines, Back test, Moving Averages, Portfolio Management, Technical Analysis, Fundamental Analysis.
JEL Codes: G10, G11

ÖZET
Bu çalışmanın temel amacı, seçilen alım satım yöntemlerinin (trading disiplinleri) yatırımcının getirisi üzerindeki etkilerini incelemektir. Bu nedenle bu çalışmada, Satın Al & Tut ve Üstel Hareketli Ortalamalar (EMA) yatırım disiplinlerinin performansı back test analizi ile karşılaştırılmıştır. 30.05.2010 - 24.05.2020 tarihlerini kapsayan analiz döneminde, Borsa İstanbul'un (BIST) en büyük 3 ulusal hisse senedi endeksinde her iki işlem tekniği de uygulanmaktadır. Analizde kullanılan seriler bu endekslerin haftalık kapanış fiyatlarından oluşmakta olup toplam gözlem sayısı 1566'dır. Test sonuçlarına göre Al & Tut yatırım stratejisinin BIST'un her üç endeksinde de yatırımcılara daha yüksek getiri sağladığı görülmektedir. Analiz sonuçlarına göre, mevcut analiz dönemi ve örneklem yapısına göre yatırımcıların daha yüksek getiri elde etmesi için Al & Tut yatırım stratejisinin daha başarılı bir strateji olduğu sonucuna varılmaktadır.

Anahtar Kelimeler: EMA, Borsa İstanbul, Hisse Senedi Yatırımı, Trading Disiplinleri, Back Test, Hareketli Ortalamalar, Portföy Yönetimi, Teknik Analiz, Temel Analiz.

1. Introduction
Investment evaluation process have been getting more complicated and difficult than ever. Investors are dealing with both technical issues and behavioral matters as well as other investor's reactions. During the investment valuation process, there are two major type of questions as "What" and "When" that investors should answer properly. As their names imply, question "What" refers to type of the financial instrument that should be acquired by the investors while the question "When" is for timing for this trading. In order to get acceptable rate of return and maintain it, all these questions should be covered properly.

In portfolio management field, there are 2 main financial analysis techniques used by investors to give a correct, accurate and timely answers for these questions. The first one is Fundamental Analysis, which indicates what kind of financial instrument should be purchased into portfolio basket, and the second one is technical analysis, which provides signals and financial clues about timing of purchasing and disposal of this financial instrument.

Technical analysis tries to determine the expected price or price range for the future periods by using some statistical indicators and graphic formations based on historical price movements. Some of the statistics used are trend-following indicators, while others are indicators showing excessive buy and sell levels (oversold

and overbought). In summary, technical analysis attempts to predict future price movements on a financial instrument's past price information and statistical indicators derived from related price information.

There are many technical indicators and graphic formations used in technical analysis. Some of the most well-known technical indicators can be outlined as RSI, MACD, ATR, STOCHASTIC OSCILLATOR etc. Indicators are calculated taking into account certain periods and statistical information (average, minimum, maximum, increase / decrease, etc.). However, it is impossible to find a perfect technical indicator that always works correctly and produces the perfect signal. Therefore, technical indicators should be customized for each instrument depending on the following criteria such as characteristics of the instrument that the investors are working on, the maturity of the investment, the size of the trading volume and legal regulations in the relevant financial market. For instance, the RSI indicator is calculated on 14-day moving averages. However, in order for the RSI indicator to give the correct signal on time, this period can be increased and decreased according to the feature of the financial instrument studied. In addition to this, since the RSI indicator is more successful in the markets with a flat course, different indicators may be required when the markets have an upward or downward trend.

Many studies in the existing literature have tested whether the trading rules created by analysts give a successful buy-sell signal. It is observed that some trading rules produce successful signals according to criteria such as the stock exchange, financial instrument and investment term, while others produce only lagged signals.

In this study, in order to contribute to the existing literature, the success of the buy and hold investment strategy and the EMA investment strategy that is applied according to whether the related instrument's price is above its exponential moving average is compared through the back test model. This model comparison has been tested on the Bist-100, Bist-50 and Bist-30 stock indices, which are the national stock indices of BIST. According to the results of the analysis, it is determined that the buy and hold strategy yields higher returns than the EMA investment strategy that suggests buying related financial instruments when its current price gets above its exponential moving average.

The flow of this paper can be summarized as follows: in the second part of the study, the current literature is examined and previous studies on this subject will be discussed in detail. In the third part, the analysis of the study will be performed and the results obtained will be interpreted.

2. Literature Review

Allen and Karjalainen (1999), conducted genetic algorithm to find out trading rules for the S& P. They studied on daily prices for the 1928-1995 period. Based on their findings, they found out that when excluding transaction costs, the established trading rules do not provide stable abnormal return than traditional buy & hold strategy in other periods. They established rules that identify periods when returns become positive and volatility is low. The results of the analysis reveal the reasons for the systematic relationship between the signals produced by the trading rules and the volatility. They state that results of the trading rules can be explained by investors' reaction to changes in expected volatility.

Panha and Scott (2014), studied profitability performance of the trading rules applied in Southeast Asian tiger cub stock index future markets. They applied trading rules during and after global financial crisis thus they saw comparative results before and after global crisis. They conducted analysis based on daily closing data range from 2007 to 2012. They used exponential moving averages (EMA) and moving average convergence divergence (MACD) indicators. Their sample includes Indonesia, Malaysia, the Philippines and Thailand. According to results of the analysis, they stated that investors cannot obtain abnormal returns through the buy and hold strategy. They also concluded that in long run trading disciplines are determined as more successful.

Arévalo et.al. (2017), suggest a new trading model called a dynamic window scheme. This model ensures investors to update stop loss and take profit transactions based on quarter basis. They combined flag pattern with EMA indicator. Thus, they developed technical indicator which is calculated for 15-min and 1 day that

take both short and medium periods into accounts at the same time. They filtered flags by range and they limited loss of each transaction by 100 points. They applied their new trading model to the DJIA index in 91.309 observations. Based on the findings they concluded that the proposed trading disciplines improved results of the buy and hold strategy.

Gold (2015), tested viability of the technical indicators which have been mostly used by the investors, such as MACD, AROON, Relative Strength Index, Accumulation Distribution Line, Stochastic Oscillator, and On-Balance Volume. They developed multi-dimensional performance measures. They observed that returns efficiency is improved by combining volume with trend and momentum indicators.

Dzikevicius and Saranda (2010), contributed to existing literature by investigating technical analysis performance to estimate values for OMX Baltic Benchmark Index. They compared exponential smoothing method and simple moving average rule on S&P 500 and OMX Baltic Benchmark Index. They analyzed results by systematic error and tracking signal evaluation, bias distribution estimation. It was observed that more accurate results were obtained from EMA method with lower absolute error level. It was confirmed that EMA method could predict new data series with lower losses. It was also confirmed by descriptive statistics that EMA approach has lesser standard deviation which meant less risky results were received.

Gunasekarage and Power (2001), studied performance of trading disciplines that they developed on South Asia capital markets include Bombay Stock Exchange, Colombo Stock Exchange, Dhaka Stock Exchange and Karachi Stock Exchange. They also analyzed findings in terms of weak form of efficient market hypothesis. Analysis results show that technical analysis rules have ability to predict in South Asian markets and investors who trade in these market can earn abnormal returns.

3. Comparison of Buy and Hold Investment Strategy and EMA Investment Strategy
This study investigates comparative trading performance of buy and hold strategy and EMA investment strategy that allows investors to buy if the current price is above its exponential moving average.

3.1 Dataset and Methodology
In this study, weekly closing data of the Bist-100, Bist-50 and Bist-30 indices, which are the Borsa Istanbul's national stock indices are used. The analysis period covers 30.05.2010-24.05.2020 period. The number of observations used in the analysis are 1566. Closing price data used in the analysis are obtained from the tradingview.com and comparative analysis is performed through Excel 2016 version.

Descriptive statistics of the sample used in the study are shown in Table 1 as follows.

Table 1: Descriptive statistics of the sample

Basic Descriptive Statistics	BIST - 100	BIST - 50	BIST – 30
Min	50.182,53	48.796,86	60.285,82
Max	122.141,75	115.868,46	147.880,19
# of Obs	522	522	522
Average	81.625,41	78.697,92	100.297,79
Median	79.105,52	76.193,45	97.519,05
Range	71.959,22	67.071,60	87.594,37
Standart Deviation	16.749,11	15.690,95	20.672,82
Variance	280.532.822,54	246.205.802,50	427.365.516,57

The price performances of the indices used in the analysis are shown in the charts in Appendix 1.

The main purpose of the study is to compare the success of the two investment strategies with the back test method. The first investment strategy is the buy and hold investment strategy that is preferred especially by investors focusing on long-term investments. The second alternative investment strategy is to buy the index if its current price is above its exponential moving average. In this study, this strategy is called as EMA hereinafter.

Exponential moving average (EMA) is mostly used to produce signal for timing trading activities and it is described as a linear transformation of time series to smoother one (Grebenkov and Serror : 2014).

EMA formula can be shown in Equation 1 as follows:

$$EMA = C - P * \frac{2}{n+1} + P \qquad (1)$$

The notations in the formula are described below.

C: Current Data Point

P: Previous Data Point (simple average is used for the first period)

n: Number of Days

2: Smoothing Factor

EMA formula can be also expressed in Equation 2 as follows:

$$EMA\ Today = Price\ Today * \left(\frac{Smoothing}{1 + Days}\right) + EMA\ Yesterday * \left(1 - \left(\frac{Smoothing}{1 + Days}\right)\right) \qquad (2)$$

The investment methodology of 2 strategies can be outlined in Table 2 as follows.

Table 2 : The investment methodology of 2 strategies

Investment Strategy	Investment Methodology
Buy & Hold	Regardless price movement resulted in increase or decrease, hold financial instrument until the maturity or for a long-run purposes.
EMA	If Current Price > Its EMA Then Buy Else Do Nothing.

3.2 Test Results and Findings

During the 30.05.2010 – 24.05.2020 period, Buy & Hold and EMA investment trading strategies are applied to the weekly closing prices of 3 national stock indices include Bist-100, Bist-50 and Bist-30 respectively and results obtained are shown in following tables.

Table 3 : The Results of Comparative Trading Strategies for BIST-100

Summary of Comparative Trading Strategies Results for BIST-100	Buy & Hold	Buy Above EMA
Gross Profit	7.670	3.152
Gross Loss	-7.080	-3.120
Net Profit	590	32
Number of Winning Trades	271	145
Number of Losing Trades	220	128
% Winning Trades	55%	53%
Largest Profitable Trade	105	58
Largest Losing Trade	-212	-144
No. Years Trading Strategy	9,44	9,44
Percentage Profit pa	5,0%	0,3%

According to Table 3, it can be stated that Buy & Hold investment strategy would provide higher returns to investors if it was selected. Based on findings, investors who applied Buy & Hold investment trading strategy would earn annually %5 while other investors who selected EMA would only gain annually %0,3. If inflation effect is excluded from returns it will be observed that investors applied EMA would have negative real return. It can be concluded that based on given analysis period and sample structure, the investors should choose Buy & Hold investment trading strategy.

Table 4 : The Results of Comparative Trading Strategies for BIST-50

Summary of Comparative Trading Strategies Results for BIST-50	Buy & Hold	Buy Above EMA
Gross Profit	7.615	3.399
Gross Loss	-7.106	-3.329
Net Profit	509	70
Number of Winning Trades	269	142
Number of Losing Trades	222	125
% Winning Trades	55%	53%
Largest Profitable Trade	104	72
Largest Losing Trade	-193	-159
No. Years Trading Strategy	9,44	9,44
Percentage Profit pa	4,5%	0,7%

Table 4 indicates similar results with Table 3. Buy & Hold would provide higher returns than EMA. Buy & Hold would provide %4,5 return annually basis while EMA could provide only %0,7. Similarly after elimination of inflation effect, real return would be negative for the investor applied EMA investment trading strategy. According to results, it can be concluded that since investors would earn higher returns by applying Buy & Hold, therefore this investment trading strategy should be selected.

It should be also highlighted that investors applied EMA, would receive higher return in Bist-50 than Bist-100. This results can be explained by the different investors' perception for the Bist-100 and Bist-50 indices.

Table 5 : The Results of Comparative Trading Strategies for BIST-30

Summary of Comparative Trading Strategies Results for BIST-30	Buy & Hold	Buy Above EMA
Gross Profit	7.949	3.506
Gross Loss	-7.453	-3.528
Net Profit	495	-22
Number of Winning Trades	262	137
Number of Losing Trades	229	132
% Winning Trades	53%	51%
Largest Profitable Trade	114	71
Largest Losing Trade	-185	-160
No. Years Trading Strategy	9,44	9,44
Percentage Profit pa	4,4%	-0,2%

Results shown in Table 5 also confirm results of the 2 tables above. For Bist-30, investors would have higher returns when they applied Buy & Hold investment strategy compared to EMA. Through Buy & Hold they would gain %4,4 annually basis return while it turned to negative when EMA was applied.

4. Conclusions and Recommendations

When investors are investing in the capital market, they try to make an accurate forecast about the future movements by analyzing the current price information of the related financial instrument and both financial and operational performance of its issuer company. According to the accuracy rate of their predictions, they modify the analysis techniques that are used for estimation when necessary. As stated in the relevant sections, there are 2 main analysis techniques used subsequently by investors in the investment process. The analysis technique called fundamental analysis is used for determining which instrument should be included in the portfolio. After this decision is made, subsequent analysis technique called technical analysis should be used to ascertain timing for trading of this target instrument. As shown, analyzes are performed in a certain order. First, fundamental analysis is performed and portfolio components are determined. Then, technical analysis is conducted to make optimal timing for trading.

In this study, the investment strategies used by investors in technical analysis are analyzed comparatively with back test method. For this purpose, the returns of buy and hold and EMA strategies, which are among the most used investment strategies of investors, are compared.

EMA is a moving average calculated on the closing prices of the relevant instrument. The difference from the simple arithmetic mean gives more weight to the closest current closing prices while estimating. The rationale here is that the most up-to-date prices reflect investors' most up-to-date psychology. For this reason, it gives smoother and reliable results compared to simple arithmetic and weighted average methods. Therefore, it is one of the most used moving averages in technical analysis.

To compare performance of these trading disciplines, a sample within a period of approximately 10 years include 1566 observations, which consist of weekly closing data of the 3 largest national stock indices of BIST, are examined.

According to the results of both strategies applied on Bist-100, Bist-50 and Bist-30, which are the selected national stock indices of BIST, for all 3 indexes it is observed that the investors who applied Buy & Hold strategy would earn higher returns than other investors who applied EMA. According to the results of the analysis, it would be more reasonable for stock investors to apply the Buy & Hold strategy for the long term in BIST.

If this study is conducted in the form of a comparative analysis on the stock market indices of different countries, more reliable and explanatory results that will shed light on international stock investors will be obtained.

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Appendix
Appendix.1 Price Performance Charts of Indices Used in the Analysis

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EMA (20) & Closing Prices - BIST 30