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The Profitability from Technical Trading Strategies: Evidence from Kase-100 Index of Pakistan Stock Exchange (PSX)*

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Abstract

This study has investigated two simple but very well-known trading rules, simple moving average (SMA) and trading range break (TRB), by looking at a time series daily data of KSE-100 Index over 20 years, from January 1997 to February 2018. In order to avoid data-snooping biases, the study has applied the outcome of sample tests in addition to the traditional tests to check the validity of the trading rules. Our results show (1,50) trading rules outperforms over the 20 years testing period. These average returns from the simple moving average rules are higher than the actual returns for the sample period. Furthermore, the VMA (1,50) rules performs better than the FMA(1,50) rules due to the fact that it includes the first nine days information into consideration in the investment decision. Keeping in view the nine days flexible period to buy or sell out of the outperform stock, the VMA (1,50) rules has generated excess returns than the FMA (1,50) rules. However, the overall returns of the TRB rules were found small. The overall result suggests that trading strategies can be used to earn excess returns in the KSE-100 index of Pakistani Stock Exchange.
***Keywords*:** Variable Moving Average, Fixed Moving Average, Fixed Moving Average, KSE-100 Index, Pakistan Stock Exchange (PSX).

Introduction of the Study

Technical analysis uses historical prices and other past statistics for investment decision. Proponent of technical analysis believes that these historical data contain important information on the basis of which future movements of the stock market can be forecasted. It is fact that all major brokers and financial advisory firms publish technical forecast or recommendation reports on the market based on technical analysis. Schwager (1993, 1995)

reported that many of the market top traders and fund managers' use it for forecasting and based their investments policy accordingly. Covel (2005) reported many large and successful funds that use technical analysis exclusively without using any fundamental information for predicting stock market.

Academicians, however, are skeptical in use of technical analysis, instead of its widespread use and adoption by the funds and broker managers. There are perhaps different reasons that academicians ignore the use of technical analysis. Firstly, there exists no theoretical base that demotivate the researchers from using this mode of analysis, but this study attempts to provide theoretical base with wide variety strategies based on theories. Secondly, previous studies used random walk as a theoretical supported approach which rule out profits from technical analysis. Thirdly, most of the studies used graphs and charts that provide results but mostly ambiguous and not to the point. Fourthly, the results of the different studies are mixed such as Cowles (1933) and Fama and Blume (1966). However, recently, Brock, Lakonishok and LeBaron, (1992) and especially Lo, Mamaysky and Wang, (2000) Zhu and Zhou, (2009) and Lam and Cheung, (2007).

Technical strategies found more profitable in emerging markets (e.g., Bessembinder and Chan, 1995; and Coutts and Cheungv, (2000). Pakistan Stock Exchange and other stock market look like inefficient that is why that the trading strategies make a high abnormal average return. From the above results of VMA, FMA and TRB rules, it can be concluded that; Firstly, in case of all methods (1,50,0) rule is more profitable than (1,150,0) and (1,200,0). Secondly, VMA rule perform better than FMA rule for the sample period, thirdly, for the (1,50,0) rule both the VMA and FMA better perform than TRB in forecasting the KSE-100 Index. So, it can be concluded that the VMA (1,50,0) trading rule out perform the other strategy and rules respectively in furcating abnormal returns. The fundamental reason we use the out-of-sample test at the current study to eliminate the data snooping problem. Lo and MacKinlay (1990) highlighted that to avoiding the data snooping biases the best way is to out-of-sample analysis. Our studies analyze the trading rules utilizing both bootstrap and out-of-sample tests.

Literature Review

The efficient market hypothesis explained by Fama (1970) into three different forms, such as weak, semi-strong and strong form .Random walk theory is the second name of weak form market efficient hypothesis in which the price changes are independent. As well as the investor cannot be using the past movement of stock market to predict its future movement. Due to market efficient hypothesis, there are an equal chance that the stock's price might be rise or fall from the current levels. The second type of efficient market hypothesis the semi strong for efficiency. At semi strong form efficiency, the security prices adjust very sharply on the base of new available information .However in this case eliminating the use of technical and fundamental analysis to get higher return. The third type of efficient market hypothesis (EMH) is strong form which state that prices already reflect both publicly available information and inside information. It strong form of market efficiency is not possible to earn access return by any means. When market is strong form efficient neither technical analysis nor fundamental analysis nor inside information can help predict future price movements.

Technical analysis is a forecasting method which forecast on a price movement based on past prices, Osler, Karen (2000). These methods include various tools like chart analysis, cycle analysis, and computerized technical trading. Generally, the academic research focus on technical trading, however, explain everything in mathematical form. Technical trading made to know estimated trend in commodity prices under the expectation the will going on in the future.

For investment decisions used technical analysis and other historical data. On the bases of historical data technical analysis believes on prediction for the future movement of the stock market. Technical trading could know the change in trend at the early stage. And keep it up the investment strategy till to the weight of the evidence show that the trend has reversed (Gencay, 1998). So, Barber and odean (2000) include that the trading is risky for investor's wealth.

Investor's wealth may reduce by trading as every investor would like to increase its value. It may face some psychological biases that cause investors to trade excessively and subsequently reduce value overconfidence (Glaser & weber, 2007: Statman, Thorly & vorking, 2006). Sensation seeking (Grinblatt & Keloharju, 2009), Attribution bias (Gino & pisano, 2011), and disposition effect (Dhar &Zhu, 2006) are such psychological causes of excessive trading.

That is why a single investor loses value when they get away from rationality, and later let their intuition determine their trading strategy.

Park and Irwin (2007) tested multiple trading strategies on profitability. At the early 1990's the have found certainly positive returns for technical trading strategies. Also tested in 2000 the artificial neural networks technical trading strategies on the general index of the Madrid stock market (Fernandez-Rodriquez, Gonzalez-Martal & Sosvilla-Rivero, 2000). They have find-out from their studies that the simple technical trading rule based on Artificial Neural Networks .Which is on the top to the buying and hold strategy during stable market period, in the absences of trading costs. During the bull markets the strategy does not good perform its benchmark. Potvin, Soriano, and Valle (2004) come to various results. Trading rules are generally useful when the market down or when it is stable and not when the market is rising. Gencay (1998a) find out that the moving average rule gives at least 10 % forecast improvement in the volatile years of the great depression. On the other way, when there is no clear trend, it means positive or negative direction is same or little bit increase or decrease then the performance of technical trading rules is more moderate. Gencay (1998b) at the end that technical trading rule with nonparametric models provide positive abnormal returns after transaction costs are considered.

Gunasekarage and power (2001) in south Asian market found abnormal returns for the investor by using moving average strategy. Here mention some trading strategies, like moving average, Bollinger bands, RSI, SMA, TRB, SMI and CMI, are beneficial technics for trading analysis (Kannan, Sekar, Sathik & Arumugam 2010). Gehrig and Menkhoff (2006) argue that estimating prices is not astrology, it focuses to analyzing the existing demand and supply of commodities, indices, stocks, futures, or any tradable instrument. For assessing future price movement technical analysis involve putting stock information, volumes and open interest on a chart and applying different patterns and variable to it.

Technical analysis is implemented on the time frame. it ranges from intraday (five minutes, ten minutes, fifteen minutes, thirty minutes or hourly), daily, weekly, or monthly price data of many years. Fundamental and technical analysis is the two essential methods of analyzing investment opportunities in the security market. The fundamental information of the company is financial and non-financial aspects, but technical information focuses on actual price movements it may be used. Technical analyst believes that technical trading is 90% psychological and 10% is logical. Technical analysis is a mean of evaluating securities by analyzing the statistics generated by market activity, like past prices and volume.

Technical analysis assumes those changes in the price of a security and how it trades in the market due to available information, Donald, and Durham (1964). Technical analysts neither concern with the factors that fundamental analysts consider such as price to earnings ratio, shareholder equity, return on equity and so on. Technical analysts consider period that can help to capture the prices random movement. The investors probably make profit at bull market, when buy low prices and sell at high prices during an upward trend or by selling short during a downward trend (bear market). It is possible to adjust the length of time when market analyzes in both short- and long-term trends.

The literature shows that both developed and underdeveloped countries used trading strategies and reporting abnormal returns. Early studies show the small abnormal returns can earn in US on the bases of filter rules (Alexander (1961, 1964). Example, in US studies find that there is positive autocorrelation of weekly returns on portfolio of NYSE stocks (Lo and MacKinlay (1988) and Conrad and Kaul (1989), and negative autocorrelation on individual stocks (Fama and French (1988), Poterba and Summers (1988), and Lehmann (1990), Jegadeesh (1990) finds negative serial correlation at least for two months and positive correlation for longer time. Other reported market inefficiencies such as market overreaction, the January effect, the Monthly effect, the Weekend effect, and the holiday effect. These indicate that stock prices do not necessary follow random walk in US. The findings of the literature seem to show that the daily and weekly stock returns can be predicted from past stock returns and financial variables.

At Asia, study six Asian markets, Bessembinder and Chan (1995) replicate Brock et al; (1992). They have proved that the trading rules are successful in the emerging markets of Thailand, Malaysia, and Taiwan. But less explanatory power in different developed markets likes Japan and Hong Kong. (VMA) Variable length Moving Average predictability examined by Ratner and Leal (1999). this trading rule implementing in ten emerging Latin American and Asia stock markets from (1982-1995). And find that in various countries like Taiwan, Thailand, and Mexico the VMA trading rule may be profitable. As well as cheung (2000). Study the trading rule profitability in Hong Kong stock market. And find that the rules fail to provide positive abnormal returns after transaction costs.

Found in Europe market inefficiency evidence, like in the Swedish stock market found autocorrelation (Frennberg and Hansson (1993)). At London Stock Exchange are found weekend and seasonality effect (Reinganum and Shapiro (1987) and jaffe and Westerfield (1985). At the Athens stock exchange found the weak-form inefficiency (Spyrou (1998), Kourtmos, Negakis and Theodossiou (1993), and Kavussanos and Dockery (2000)).

The studies show in Asian stock markets, found that in six stock markets non-trivial first order autocorrections. Such as Hong Kong, Japan, Korea, Malaysia, Thailand, and Taiwan (Bailey, Stulz and Yen (1990), Pan, Chiou, Hocking and Rim (1991), and Bessembinder and Chan (1995)). Along with this effect of January explain by (Gultekin and Gultekin (1983) and Kato and Schallheim (1985)). Effect of weekend explains by (Lee, pettit and Swankoski (1990). New Year Effect explain by (McGuinness (2005)) which are found in different Asian countries like, Taiwan, Thailand, Japan, Korea and Malaysia. But in Europe the trading rules can be generate the excess returns, but they vanish after transaction costs. However, test result shows that the most major Asian markets are in weak form inefficient, individual and portfolios of stock. But studies at Hong Kong find positive abnormal returns on the bases of two simple trading rules. Such as Simple moving average (SMA) and trading range break (TRB). These trading rules implemented on series of data from 1972-2006 on Hang Seng Index, SMA trading rule Average return is higher rather than US market (Brock et al., 1992). As well as TRB rule also find out consistent trading profits at HIS.

There is enough evidence that the hedgers and speculators in future market give an importance role to the technical analysis. Hedge fund manager and commodity trading advisors believe in, on computer based technical trading systems (Billingsley and Chance 1996; Fung and Hsieh 1997). In many future markets the total trading volume present these traders on large portion (e.g., Irwin and Holt 2004) Agricultural sector, market advisory services .Which a specific hedging advice to the farmers about the livestock and marketing crops and make the important use of technical systems. For instance, currently prominent service start offering a “systematic hedger program” Moving average of 9 and 18 day give a hedge signal (Doane’s Agricultural Report, 2004).

An investor tries to invest his wealth optimally between a riskless asset and a risky one at stock .And focus to get profit for that reason using the most popular technical trading rule that is moving average (MA). Which make opportunity for investors to purchase the stock when its present price above its average price over a given period. Here one question is rising when MA gives a positive signal. According to previous studies which show that when MA says buy then investor must invest 100 percent of his wealth into stock. The usefulness of the MA rule is more apparent when uncertainty present about which model truly governs the stock price. In the real world, the true model is unknown to all investors. The optimal MA can be predication easily while the optimal trading strategy relies on a complete specification of the true model. While the wrong model is used to derive the optimal trading strategy, we show it show that the estimated optimal MA outperforms it substantially.

The market efficiency was illustrated, in the earlier years by many, as a random walk model for the stock price. For any technical trading rule to be profitable, the stock return must be predictable. and so, the use of the random walk model rules out any value of technical analysis. However, lo and MacKinlay (1988) Provide a variance ratio specification test that completely rejects the random walk model. Supporting studies, such as Fama and Schwert (1977) and Campbell (1987). that various economic variables can forecast stock returns due to time varying risk premiums. A huge literature is available on stock predictability. Current examples of which are Ferson and Harvey (1991), lo and Mackinlay (1999), Goyal and welch (2003), and Ang and Bekaert (2006). Current studies, such as Campbell and Thompson (2008), Cochrane (2008), Rapach, Strauss, and Zhou (2009) provide further evidence even on out of sample predictability. In addition, various asset pricing anomalies, for which Schwert (2003) provides an excellent survey, suggest predictable patterns of the stock returns, the predictability of stock returns allow for the possibility of profitable technical rules.

Research Design and Methodology

Nature of Study

The study is descriptive in nature as it investigates the different technical strategies and to test that any technical strategy may give abnormal returns.

Population

Population of the study is Pakistan Stock Exchange (PSX) KSE-100 Index.

Sample and Sampling Techniques

The study used convenient sampling techniques for daily data collection, for a sample period of January 1, 1997 to February 1, 2018.

Statistical Analysis

The study used simple moving average (SMA) and trading range break (TRB) rules as these methods generates buy and sell signals very clearly as compared to head and shoulders and Elliot waves methods that require trader's interpretation and are not uniform (Brock et al.,1992; and Bessembinder and Chan, 1995) . The SMA can be computed by adding specific period data and then taking average. If SMA is computed for less than 20 days is considered as short term simple moving average, if it is computed for the period between 20 to 50 days, it is known as medium term simple moving average and if it is computed for more than 50 days is considered as long-term moving average. There is further categorization of SMA into variable moving average (VMA) and fixed moving average (FMA). This study has considered five types of variations in the trading rules such as (1, 50), (1,150), (1,200), (2,200), (5,150) as used by (Brock et al., 1992; Bessembinder & Chan, 1995; and Cheung & Lam, 2007). The 1st number in each set of rules show the short-term moving average, while the 2nd number shows the long-term moving average period of each set of rules. Furthermore, all the trading rules are evaluated with the bands ranging from 0% to 3% making a total of twenty individual rules.

$\sum Rit/S > (1+X)\sum Rit\_i/L = Buy$ eq-1
$\sum Rit/S < (1+X)\sum Rit\_i/L = Sell$ eq-2

Whereas X show bands such as 0%, 1%, 2% and 3% and Rit represents daily return on KSE-100 index and computed as $Rit = (Pit - Pit\_i)/Pit - i$

In trading range break TRB the study considered 50, 150 and 200 days with the bands ranging from 0% to 3% respectively. The buying and selling decision are decided through the following equations and 10 days abnormal returns are reported after respective decision.

$\mathrm{Pt} > (1 + \mathrm{X})\max(\mathrm{Pt}-1, \ldots, \mathrm{Pt}-\mathrm{m}) = \mathrm{Buy}$ eq-3
$\mathrm{Pt} < (1 + \mathrm{X})\min(\mathrm{Pt}-1, \ldots, \mathrm{Pt}-\mathrm{m}) = \mathrm{Sell}$ eq-4

Whereas Pt is the closing KSE-100 index at time t which is 50, 100 and 200 days and X represents bands ranging from 0% to 3% respectively. The maximum and minimum value represents maximum and minimum values in 50, 100 and 200 days, respectively.

Results and Discussion on Results

The below tables show the results of raw returns, variable moving average, fixed moving average, and trade range break strategy results of the KSE-100 Index of Pakistan Stock Exchange (PSX). The results of Table 4.1 shows that mean return for the sample period is 0.08% while maximum return is 13.16 and minimum return is -12.38%. Whereas the autocorrelation coefficient is significant and large at 1st lag of the series which shows that there is serial correlation of order (I) in the KSE-100 Index daily returns.

Table 4.1 Shows KSE-100 Index Raw Returns

Variable	Obs	Mean	Std.Dev.	Min	Max
R	7555	.08%	.015	-12.38%	13.61%
Serial correlation					
ð(i)	0.1450*				
ð(ii)	-0.0456				
ð(iii)	-0.0096				
ð(iv)	-0.0079				
ð(v)	-0.0015				

R stands for market returns and is computed as difference of the two days trading closing KSE-100 index scaled by last day price multiplied by 100. ð shows coefficient of autocorrelations with lag from 1 to 5.

The Table 4.2 shows the KSE-100 Index returns of variable moving average computed in tradition way. On average for short term trading rule (1, 50,0) trading rule 69.40% buying days i.e., 5245, while 31.60% selling days i.e., 2312 which are highest if compared with the medium-term range (1,150,0) and long-term rule i.e. (1,200,0). Furthermore, the highest level of returns from the buy decision is 0.17% and is statistically significant for the short-term trading rule as compared to the other medium- and long-term rules i.e., 0.12% and 0.01% respectively. These results suggest that overall market is going up in the sample period. Moreover, on the sell side return is -0.09% at (1, 50, 0) negative and statically significant and in line with the assumption and is best strategy to earn profit. The P(Buy>0) and P(Sell>0) show the probability of gain from buying and selling. The result shows that there exists probability of gain from trading with short term strategy for almost 51% to 59%. The Buy-Sell shows the returns are positive and on average from all buy and sell strategy the returns are 0.100% which is significant and positive and more than 0 suggesting that these strategies do help the investors to outperform the market.

Table 4.3 show Out-Of-Sample returns computed through Variable Moving Average of KSE-100 Index. The result show that on average daily returns computed through (1,50,0) trading rule is 0.19% which is positive and statistically significant. This return is higher than the average raw mean returns i.e.,0.08%. Furthermore, in case of short selling the return is negative -0.09% and is statistically significant and more than the average market return i.e., 0.08%. The Buy-Sell difference is also highest for the trading rule (1, 50, 0). Thus, the out of sample results are consistent with the traditional variable moving average.

Table 4.2 Shows KSE-100 Index returns with Variable Moving Average VMA

Time	**Tests**	**N(Buy)**	**N(Sell)**	**Buy**	**Sell**	**P(Buy>0)**	**P(Sell>0)**	**Buy-Sell**
1997-2018	(1,50,0)	5245	2312	0.17%	-0.09%	0.59	0.51	0.27%
				3.34**	3.74**			5.34***
	(1,150,0)	5100	2457	0.12%	0.002%	0.52	0.49	0.12%
				0.34	1.4			2.34**
	(1,200,0)	4700	2857	0.01%	0.003%	0.51	0.46	0.07%
				0.25	0.45			1.25
	Average			**0.099%**	**0.003%**			**0.100%**
				0.95	**-1.62**			**3.95*** **

Table 4.3 Shows KSE-100 Index returns with Variable Moving Average VMA (Out of sample test)

Time	Tests	N(Trades)	N(Buy)	N(Sell)	Rules	Chose n Rule	Buy	Sell	Buy-Sell
1997-2018	0%	506	5245	2312	1	(1,50)	0.19%(3.67)**	-0.09%(-3.17)**	0.219%(4.67)**
	1%	290	5010	2547	1	(1,50)	0.16%(2.97)**	-0.06%(-3.17)**	0.204%(4.97)**
	2%	180	4600	2957	1	(1,50)	0.13%(2.12)**	-0.03%(-2.12)*	0.18%(3.12)**
	3%	135	4100	3457	1	(1,50)	0.11%(1.67)	-0.01%(-2.47)**	0.11%(3.67)**
					Average		0.20%	0.00%	0.14%
							1.09	-1.67	2.49**

The Table 4.4 shows the KSE-100 Index returns of fixed moving average computed in tradition way. On average for short term trading rule (1, 50,0) trading rule 71.24% buying days i.e., 5384, while 29.76% selling days i.e., 2173 which are highest if compared with the medium-term range (1,150,0) and long-term rule i.e. (1,200,0). Furthermore, the highest level of returns from the buy decision is 0.16% and is statistically significant for the short-term trading rule as compared to the other medium- and long-term rules i.e., 0.10% and 0.07% respectively. These results suggest that overall market is going up in the sample period. Moreover, on the sell side return is -0.06% at (1, 50, 0) negative and statically significant and in line with the assumption and is best strategy to earn profit. The P(Buy>0) and P(Sell>0) show the probability of gain from buying and selling. The result shows that there exists probability of gain from trading with short term strategy for almost 56% to 51%. The Buy-Sell shows the returns are positive and on average from all buy and sell strategy the returns are 0.100% which is significant and positive and more than 0 suggesting that these strategies do help the investors to outperform the market.

Table 4.5 show Out-Of-Sample returns computed through fixed moving average of KSE-100 Index. The result show that on average daily returns computed through (1,50,0) trading rule is 0.18% which is positive and statistically significant. This return is higher than the average raw mean returns i.e.,0.08%. Furthermore, in case of short selling the return is negative -0.07% and is statistically significant and more than the average market return i.e., 0.08%. The Buy-Sell difference is also highest for the trading rule (1, 50, 0). Thus, the out of sample results are consistent with the traditional variable moving average.

Table 4.4 Shows KSE-100 Index returns with Fixed Moving Average FMA

Time	**Tests**	**N(Buy)**	**N(Sell)**	**Buy**	**Sell**	**P(Buy>0)**	**P(Sell>0)**	**Buy-Sell**
1997-2018	(1,50,0)	5384	2173	0.16%	-0.06%	0.56	0.51	0.26%
				3.34**	-3.74**			4.34***
	(1,150,0)	5200	2357	0.10%	0.00%	0.52	0.48	0.12%
				1.34	-1.4			2.34**
	(1,200,0)	4950	2607	0.07%	0.001%	0.51	0.49	0.07%
				0.45	-1.25			1.25
	Average			**0.093%**	**0.007%**			**0.100%**
				0.95	**-1.52**			**3.75*** **

Table 4.5 Shows KSE-100 Index returns with Fixed Moving Average FMA (Out of sample test)

Time	Tests	N(Trades)	N(Buy)	N(Sell)	Rules	Chosen Rule	Buy	Sell	Buy-Sell
1997-2018	0%	498	5145	2412	1	(1,50)	0.18%(4.17)***	-0.07%(3.47)**	0.259%(5.67)***
	1%	315	4910	3547	1	(1,50)	0.14%(3.07)**	-0.06%(3.57)**	0.276%(3.97)**
	2%	210	4500	3057	1	(1,50)	0.12%(2.22)**	-0.03%(2.12)*	0.17%(4.12)***
	3%	148	4200	3357	1	(1,50)	0.09%(2.67)**	-0.01%(2.47)**	0.15%(2.67)**
					Average		0.10% 1.45	0.00% -1.67	0.12% 3.29**

The Table 4.6 shows the KSE-100 Index returns of trading range break computed in tradition way. On average for short term trading rule (1, 50,0) trading rule 69.40% buying days i.e., 5245, while 31.60% selling days i.e., 2312, which are highest if compared with the medium-term range (1,150,0) and long-term rule i.e. (1,200,0). Furthermore, the highest level of returns from the buy decision is 0.12% and is statistically significant for the short-term trading rule as compared to the other medium- and long-term rules i.e., 0.01% and 0.02% respectively. These results suggest that overall market is going up in the sample period. Moreover, on the sell side return is -0.00% at (1, 50, 0) negative and statically significant and in line with the assumption and is best strategy to earn profit. The P(Buy>0) and P(Sell>0) show the probability of gain from buying and selling. The result shows that there exists probability of gain from trading with short term strategy for almost 58% to 51%. The Buy-Sell shows the returns are positive and on average from all buy and sell strategy the returns are 0.030% which is significant and positive and more than 0 suggesting that these strategies do help the investors to outperform the market.

Table 4.7 show Out-Of-Sample returns computed through fixed moving average of KSE-100 Index. The result show that on average daily returns computed through (1,50,0) trading rule is 0.17% which is positive and statistically significant. This return is higher than the average raw mean returns i.e.,0.08%. Furthermore, in case of short selling the return is negative -0.09% and is statistically significant and more than the average market return i.e., 0.08%. The Buy-Sell difference is also highest for the trading rule (1, 50, 0). Thus, the out of sample results are consistent with the traditional variable moving average. From the above results of VMA, FMA and TRB rules, it can be concluded that; Firstly, in case of all methods (1,50,0) rule is more profitable than (1,150,0) and (1,200,0). Secondly, VMA rule perform better than FMA rule for the sample period, thirdly, for the (1,50,0) rule both the VMA and FMA better perform than TRB in forecasting the KSE-100 Index. So, it can be concluded that the VMA (1,50,0) trading rule out perform the other strategy and rules respectively in furcating abnormal returns.

Table 4.6 Shows KSE-100 Index returns with Trading Range Break TRB

Time	**Tests**	**N(Buy)**	**N(Sell)**	**Buy**	**Sell**	**Buy>0**	**Sell>0**	**Buy-Sell**
1997-2018	(50,0)	5245	3312	0.12%	-0.00%	0.58	0.51	0.17%
				1.25	-1.49			4.34***
	(150,0)	4900	4457	0.02%	0.07%	0.53	0.50	-0.02%
				0.24	-1.23			-2.34**
	(200,0)	5100	2457	0.017%	0.001%	0.52	0.49	0.04%
				0.56	-0.55			0.35
	Average			**0.079%**	**0.005%**			**0.03%**
				0.75	**-0.63**			**0.95**

Table 4.7 Shows KSE-100 Index returns with Trading Range Break TRB (Out of sample test)

Time	Tests	N(Trades)	N(Buy)	N(Sell)	Rules	Chosen Rule	Buy	Sell	Buy-Sell
1997-2018	0%	506	5245	2312	1	(1,50)	0.17%(3.67)**	-0.09%(-3.17)**	0.219%(4.67)**
	1%	290	5010	2547	1	(1,50)	0.16%(2.97)**	-0.06%(-3.17)**	0.216%(4.97)**
	2%	180	4600	2957	1	(1,50)	0.13%(2.12)**	-0.03%(-2.12)*	0.18%(3.12)**
	3%	135	4100	3457	1	(1,50)	0.11%(1.67)	-0.01%(-2.47)**	0.11%(3.67)**
					Average		0.20%	0.00%	0.14%
							1.09	-1.67	2.49**

Conclusion

This study has investigated two simple well-known trading rules i.e., variable simple moving average (VMA), fixed simple moving average (FMA) and trading range break (TRB), by looking at a time series daily data of KSE-100 Index over 20 years, from January 1997 to February 2018. The study has avoided data-snooping biases and applied the out-of-sample tests in addition to the traditional tests of VMA, FMA and TRB to check the validity of the different trading rules.

The results show that (1,50) trading rules outperforms over the 20 years testing period across all methods (VMA, FMA and TRB). These average returns from the simple moving average rules are higher than the actual returns for the sample period. Furthermore, the VMA (1,50) rules performs better than the FMA(1,50) rules due to the fact that it includes the first nine days information into consideration in the investment decision. Keeping in view the nine days flexible period to buy or sell out of the outperform stock, the VMA (1,50) rules has generated excess returns than the FMA (1,50) rules. However, the overall returns of the TRB rules were found small. The overall result suggests that trading strategies can be used to earn excess returns in the KSE-100 index of Pakistani Stock Exchange.

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