

Pairs Trading and Stock Returns: An Evidence from Pakistan Stock Exchange

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ABSTRACT

In Pairs Trading strategy, a pair of stocks are identified that have co-moment. At the time of observing two linked stocks, stocks that showed similar moments in the past are opted. Therefore, with the increase of the spread between two stocks, it is recommended to purchase the cheap stock and vendor the higher-priced stock. In the case of the repetition of history, with the occurrence of convergence in prices, the arbitrageur will benefit from profits. Risk mitigation is major significance of this concept. Market Efficiency Hypothesis includes the strong, semi-strong and weak form of efficiencies that exists in the market. Weak form of efficiency states that future price of the stocks cannot be determined by using past prices in any way. But there exists Arbitrage Pricing Theory which states that profits can be attained by selling over-valued stocks and buying the under-valued stocks. This research focused on the stock returns from different sectors of Pakistan Stock Exchange for a period of seven years from 2009 to 2016. Using the distance approach proposed by Gatev et al., 2006; Bolgun et al., 2010; Kanamura, 2008; Pizzutelo, 2013 and Perlin, 2008, pairs are formed by minimum squared distance between pairs and then traded. Evidence has been found regarding the high stock returns ranging upto 18.48% and 27.93% per annum using pairs trading.

INTRODUCTION

Pairs trading a market neutral strategy that is used widely. Stocks having similar trends are being invested in by the investors as a statistical arbitrage approach having similar trends in their historical data in order to gain low risk profit (Lin et al., 2021). Various studies are already carried out to find out how profit is earned in the stock exchange with trading and how the returns on investments are maximized. Recently, using artificial intelligence stocks from US equities market to target profitability through rolling window training approach find positive excess profits using pairs trading trading for finding buying and selling signals (Lin et al., 2021). In 2009, Atsalakis and Valavanis documented soft computing anticipating techniques to highlight the returns on the stock in the stock markets. Different procedures and methods of forecasting, computing, calculating, and assessing the performance were used. Dutch markets used technical analysis to estimate and forecast future price differences, and it was done by reviewing previous price changes in the 17th century. Homa Moneasia started technical analysis in Asia in the 18th century. The technical analysis method became very popular, and the researchers were convinced by this method. Another concept is “Pair Trading” which was presented in 1980s, among different concepts.

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Over the past decades, as a function of market-neutral investment strategy, pairs trading gained attention among hedge fund traders and institutions. Advancement in internet and technology is useful for trade. Real-time data availability and the affordable tools have made the trade easier for individual investors (Perlin, 2009). According to Smith and Xu (2017), pairs trading is based on a distance approach for profitability, whereas pairs are selected to show a high closeness in the past. Behind the concept of pairs trading, there is a theory of Arbitrage pricing. Contrary to the law of one price, the arbitrage opportunities state that investors can gain profits by selling overvalued stocks and purchasing undervalued stocks (Lamont & Thaler, 2003).

Profits can be gained without capital by the investors, and without investing capital, there is no risk of loss; the arbitrage trading strategy makes all this possible. The investors would realize that the profit is risk-free due to the arbitrage strategy. Arbitrager purchases from the markets where the prices are comparatively low and then sell them at higher rates and hence make profits because of this difference in prices, in case the market shows Purchasing Power Parity as nil. Suppose an investor buys a security from A market of price 10 and sells it in market B at rate 15, he makes a profit easily without any risk of loss or market sifting. This shows that investors will earn profits if they buy stocks of low prices and sell them at high prices, and after sometimes, these stocks will revert. Today's financial world is progressing day by day. Investors are well informed now. They always want to have maximum return with the least chance of risk. Still, they ask a question about how they should invest and in which stock? How much profit can they earn from the stock into which they invest? Which stock will be lucrative? Do investments give the maximum returns? Researchers are attempting to answer such concerns.

Objectives of the study are as below:

- Pairs trading impact on Stock returns is analyzed in the financial and non-financial sector of Pakistan Stock Exchange.
- Pairs trading returns evaluation is done based on the risk-adjusted model.

This research has significant positive and realistic contributions to the literature. This research reflects an analytical addition to the literature. This work is mainly a study of the relationship in comparison with pair trading and returns on the stocks in financial and non-financial companies of the country, engaged within the Pakistan Stock Exchange. This research also analyzes if a substantial amount of profit is earned or not and how the pair trading is efficient if the risk-adjusting method is used. This is beneficial for investors. Risk is managed largely by pair trading. According to this approach, one stock works as a shield against another. The focus is to put this strategy into work in Pakistan and introduce this concept in the equity market of Pakistan. As the performance of the two stocks is relative, the direction of the market does not matter. Additionally, this research is helpful for the investors in a way that they would be able to identify the pairs in which they could trade mitigating the risk of loss. The

practitioners also have the same advantage. Hence, using this concept all stakeholders including investors, practitioners and writers can get advantage of enhancing their investing abilities.

LITERATURE REVIEW

Pairs Trading, a strategic part of Wall Street investment was tested by Gatev et al., (2006). At first, a pair of stocks were identified that have co-moment. At the time of observing two linked stocks i.e. stocks that showed similar moments in the past, traders were recommended by the authors, the manner of gaining maximum returns. Therefore, with the increase of the spread between two stocks, it is recommended to purchase the cheap stock and vendor the higher-priced stock. In the case of the repetition of history, with the occurrence of convergence in prices, the arbitrageur will benefit from profits. Profitability has some hurdles as well, such as the risk of bankruptcy and the lack of getting profits by the arbitrageurs due to limited knowledge. Data ranging from 1962 to 2002 was selected, and it was of daily closing prices. The formation period of 12 months was taken, and pairs trade took place in the duration of the following six months. The diminishing of the stocks unused for over a day or more and the assessment of stocks was part of the pair's formation. The matching partner for the stock was observed by the authors while utilizing the security that reduces the squared deviation method when comparing two price cycles, which are normalized. Once the pairs are formed, the trading starts. When pair prices diverged, the positions of the long and short pair were opened and subsequently closed with the convergence of the pair prices. The profits are observed once the process is concluded. With returns on employed capital and committed capitals, the excess returns were extracted. In comparison with the S&P 500 index prices, annual returns of about 11% were obtained as a result of pairs trading. On the investor, short selling cost is also applicable. This cost has an extremely low effect on the profits yielded through pairs trading when it comes to big investors and hedge funds.

The U.S Real Estate Investment Trust was compared with the U.S General Stock between the period of 1987 to 2008 by Mori and Ziobrowski (2011). The Center of Research in Security prices was chosen to provide the Ziman Real Estate Data series, which included REIT data, on a daily basis and between January 1987 to December 2008, the daily stock data from CRSP was utilized. For the observation of co-movements of a pair stock and to identify them, the distance method was utilized in which the sum of the squared differences between two cumulative total return indices was calculated. To form a pair for each stock, a similar stock was chosen. Twelve months was the duration of the formation period. Just one of these is included when two similar pairs are created. The trigger was at two standard deviations. In order to get succeeded pairs, those stocks were eliminated that did not show any trade for more than two trading days. Only liquid stocks were used.

According to Smith and Xu (2017), pairs trading is based on a distance approach for profitability, whereas pairs are selected when they show a high closeness in the past. Another method is the cointegration approach with vast usage, and it is supported theoretically; however, its implementation is

difficult. A trading period of 6 months was conducted after the formation of standard 12 and 9 months. Data used by authors comprised of CRSP daily prices from January 1980 to December 2014. Pairs were selected based on previous 12 months data in which trades were traded were initiated when two standard deviations were the price spread divergence and further closed once the convergence of the price occurred.

Cozier and Watson (2019) scrutinized the co-moments for NYSE and CARCOM stock exchanges through the usage of a methodology known as Coupla-Garch. Co-moments of stock prices were investigated by authors in comprising of Thailand, Barbados, and Jamaica stock exchanges and for the financial integration, co moment variable was used. Within the CARICOM stock markets, co-moments were observed in stock prices, but the aforementioned three exchanges did not show co-moments. Given that NYSE existed at this time the results depicted that regional exchanges are not closely integrated with it.

Namwong et al. (2019) discovered modern trading signal theory. Data ranging between the time frame January 2016 – December 2017 was analysed. On a hundred liquid stocks, the MACRO switching GARCH model was used on the data of the Thailand stock exchange for the pairs trading strategy. Two variances were used by that model and the trading signal was their average. It was the observation of the author that by utilizing the proposed trading signal, 14.27% returns were generated.

Huand et al. (2018) analyzed the definition of an automatic trade method. Several authors have referred to it as an algorithmic trading program in which computer programs are used and it is for massive results. The information system (EIS) used this decision-making concept. These systems are used for the analysis and modeling of big data. Different models were developed to analyze market moments and other variations and the future price prediction problem was addressed by these models. The analyst has categorized the research and has employed classical approaches and machine learning algorithms on technical analysis to exploit previous data of the market. Moreover, analysts used textual evidence to analyze fundamental analysis, which is focused at intrinsic stock value and past performance. For making decision-making easy, another technique known as high-frequency trading (HFT) was evaluated by the author. This technique involves mainly the optimization of telecommunications and hardware to allow the trading system for greater demands in order.

Evaluation of the stock portfolio management performance using Sharp ratio and Jensen alpha models, which are risk-adjusted models, was performed by Sedeghi et al., (2019). Ten-year data spanning between 2007-2017 was applied by the analyst Tehran Stock Exchange comprising of a set of 50 firms. Sharp Ratio, Jenson alpha, and Treynor Ratio models which are risk-adjusted was preferred by the author in comparison to classical methods. Additionally, by utilizing these models, he examined the forecasting techniques. The Sharpe index assesses the risk in the portfolio by computing Standard Deviation while the Treynor Ratio is the standard deviation risk metric, i.e., the portfolio's overall risk is substituted by

the beta. Jensen Alpha, on the other side, protects the overall performance and introduces methods of reducing risks. Portfolio predictive skills are used in this method to achieve better output from an area that involves risks. In, CAPM this model is used. If sufficient return is received by the portfolio on the level of risk, then in such circumstance, Jensen Alpha's worth is positive and high. It is the ability to produce a return on a standard assessment by effectively forecasting the price.

H1: In Pakistan stock market, it is hypothesized that significant stock returns are generated due to pairs trading.

H2: Based on the risk-adjusted model, it is hypothesized that pair tradings generate significant returns.

METHODOLOGY

Data set and Sample

Data is collected from the Pakistan Stock Exchange, and its nature is secondary. Samples are gathered from financial and non-financial sectors. Various commercial banks and many cement firms were selected for research purposes. Commercial bank's performance is vital in the growth and development of the country. Some of the benefits of commercial banks are capital accumulation or growth, investment production, self-sufficiency achievement, market and business development. The cement sector falls in the category of the non-financial sector. Stocks should be liquid in pair trading, so such stocks are included in the research, and their co-moment and previous prices are also noted. Stock details of the cement and baking sector are used. The Pakistan Stock Exchange's data of seven years is collected from January 2009 until June.

Estimation technique

As pairs trading involves the trading of two paired stocks, so there arises a question that which method may be used to form that pairs. Some studies used cointegration method but in this study we use distance method. As evaluated by (Lucey et al., 2011), the distance method is used in this paper because it can increase the returns of the stocks. Even at price level, this approach exploits the statistical relationship of a pair. As the approach is normative and economic free, it has the advantage of not being exposed to model mis-specification and misestimation (Huck & Afawubo, 2015). Jensen Alpha's risk-adjusted model is used to examine the returns. Past studies showed findings which demonstrate the benefits and productivity of the distance approach. Distance, cointegration, and copula methods show the mean monthly return of 91, 85, and 43 bps, respectively (Rad et al., 2016). Here we can see that the distance method shows the highest mean i.e., the highest return. It is due to the distance method that we can find the maximum correlation between the pairs.

Pairs trading has two steps: one is pair formation. Different methods can do it. Here, the distance approach is used to recognize pairs by using a minimum squared distance rule. The second step is named a trading period, and it has open and close pairs.

Pairs formation

Different steps are involved in forming pairs in distance approach. First of all, the distance approach is bringing the price to unity by normalizing them at the start of the formation period. T_{fp} is the number of trading days. When a trading day is towards closing and each stock's normalized price is $t = 1, 2, T_{fp}$, then:

$$P_t^i = \prod_{\tau=1}^t (1 + r_{\tau}^i)$$

Where r_{it} is the stock's daily return, including the received dividends.

The distance between two stocks is calculated in 2nd step during the time of formation. Distance is denoted by, $D_{i,j}$, and is calculated as below:

$$D_{i,j} = \frac{\sum_{t=1}^{T_{fp}} (P_t^i - P_t^j)^2}{T_{fp}}$$

Let suppose N stocks are present, then there are $(N \times (N - 1))/2$ distances. The last phase is to select and arrange a pair of stocks according to the distances and select pairs with the slightest distance to create pair portfolios.

Opening a pairs trade

After selecting pairs during the formation phase, a basic unit with which all prices are normalized to unity is created, and for each pair, spread of standard normalized prices is noticed. Whenever threshold value is exceeded by the spread of normalized prices, trade of pair named "trigger" is initiated. The opening of a pair includes purchasing one-unit stock that is underpriced and shorting of one-unit of the stock of high price. Trade begins when

$(P_t^i - P_t^j) > \text{trigger}(i, j)$, where

$\text{Trigger}(i, j) = n \times \text{stdev}(i, j)$.

Formation time is used to measure the spread of normalized prices. That means the standard deviation is (i, j) . It can be seen that both cases show normalized prices so that it can be recorded as:

$$\text{stdev}(i, j) = \sqrt{\frac{1}{T_{fp} - 1} \sum_{t=1}^{T_{fp}} [(P_t^i - P_t^j)^2 - D_{i,j}]^2}$$

The standard value for trigger n is $n = 2$.

Closing a pairs trade

The closing of a pairing position, on the other side, implies non-positive value in the distribution of normalized prices. The position is considered as closed towards the end of the trade period if there are still no non-positive values observed.

Parameterization of the trading system

On the specification of the parameter values, there comes the phase of the implementation of the distance approach. Parameterization includes the length of formation period, period of trading, trigger value, and several pairs that are part of the portfolio. Gatev et al. (2006) used the most recommended parameterization that is single parameterization, and it is used in distance approach. Standard parameterization gets complete when there is a six month formation period and the trigger value is two. For the purpose of forming portfolios, the study used 5, 10, 15 and 20 pairs.

Pakistan Stock Exchange's data from Jan 2009 to June 2016 is used for this study. Pairs are formed with a Distance approach. January 2009 is the period when the pairs are made, and in July 2009 pairs are created again. This indicates that for one month, both the formation and the trade period would rollover.

Calculation of return on pairs trading

To calculate returns by portfolio, the method which is mentioned has been used in Gatev et al., (2006) (and following literature), called the “fully-invested return” or “return on capital employed”. Suppose for a pair $k, p^k = \{l^k, s^k\}$ indicates an equally long and short 1-unit place in two stocks in pair k , where indicators are l^k and s^k and both indicators then signify the value 1 and 0 if the trade happens. If we suppose that d_k was a day when trade was opened in a trading period on pair k , then $d_k \in \{1, 2, \dots, T_{tp}-1\}$, where T_{tp} is the number of days in a trading period. If $R_t(l^k)$ and $R_t(s^k)$, respectively, signify 1-day returns on the pair's long and short positions, then the pair trade daily return is as below:

$$R_t(p^k) = R_t(l^k) - R_t(s^k)$$

The daily return on a portfolio of N_t^* pairs is:

$$R_t^{port} = \sum_{k=1}^{N_t^*} W_t^k R_t(p^k)$$

Where W_t^k = equally weighted

Where $W_t^k = W_t^k / \sum_{j=1}^{N_t^*} W_t^j$ and

$$w_t^k = [1 + R_{t-1}(p^k)] \times [1 + R_{t-2}(p^k)] \times \dots \times [1 + R_{d^{k+1}}(p^k)]$$

$t >$ is equal to $dk+2$ and $w_t^k=1$ for $t=dk+1$. In order to calculate the portfolio's daily returns, open pairs held on day t are used, which is equal to the equally-weighted average return of the pairs. Because this pair trading strategy relies on a long-short position of 1 segment/unit, the excess return is represented in the portfolio. Numerous researches used similar approaches to calculate returns by way of the Capital asset Pricing Model, which are calculated as:

$$R_{it} - R_{ft} = a_i + b_i(R_{mt} - R_{ft}) + E_{it}$$

This research uses the Capital asset pricing model CAPM for risk-adjusted returns. So, the CAPM will be utilized to adjust the raw return.

RESULTS

This part of the study throws light on the returns and how they are impacted by pair trading, for financial, and non-financial segments.

Furthermore, for reducing the chance of risk Jensen Alpha is used. It a technique for adjusting risks and it is discussed here. First of all, the distance approach has been used to form the pairs of data ranging from July 2009 to June 2016. Portfolios of five, ten, fifteen and twenty are composed for the non-financial sector as in Gatev et al., (2006). Six months formation period, one-month trading period and the trigger value "two" is selected. High significance results are produced and they are separated into two parts i.e., descriptive analysis and regression analysis.

Descriptive analysis

The descriptive analysis shows the main points of the data in the research and includes central tendency and variation measurements, here it means "spread." Mean, median, and mode, standard deviation, the minimum, and maximum variables are measured. Trigger value is "two," and the formation period of pairs trading is six months. Furthermore, the distance approach is used in this study. Descriptive analysis statistics are used to analyze the portfolios, and these portfolios are divided into the top five, top ten, top fifteen, and top twenty taking into account the minimum distance for two stocks. The findings indicate that the top 5 portfolios, of the non-financial sector, mean is positive, and 1.4% is the value for the mean. Standard deviation is closed to mean, and its value 1.39% shows that the facts are authentic. The same goes for other portfolios. The mean in the financial sector shows a positive value of 0.97%. The value of the standard deviation is 0.77% and is closed to the value of the mean; it indicates that findings are authentic. The same is the trend for the top 10, top fifteen, and top twenty portfolios of the financial sector.

Table 1: Descriptive analysis of the non-financial sector

Pairs	Top 5	Top 10	Top 15	Top 20
Trigger	2	2	2	2
Formation Period	6	6	6	6
Minimum	(0.0117)	0.0008	0.0036	0.0020
Maximum	0.0757	0.0617	0.0677	0.0826
Mean	0.0149	0.0180	0.0206	0.0233
Median	0.0137	0.0171	0.0170	0.0189
SD	0.0139	0.0126	0.0144	0.0171

Table 2: Descriptive analysis of the financial sector

Pairs	Top 5	Top 10	Top 15	Top 20
Trigger	2	2	2	2
Formation Period	6	6	6	6
Minimum	(0.0026)	0.0005	0.0037	0.0020
Maximum	0.0544	0.0486	0.0779	0.0685
Mean	0.0097	0.0124	0.0146	0.0154
Median	0.0079	0.0106	0.0116	0.0124
SD	0.0077	0.0082	0.0117	0.0103

Regression analysis

Tables three and four represent the regression analysis of the financial and non-financial sectors. The distance approach is used and the data is ranging from January 2009 to June 2016. The non-financial sector, which is the cement sector, shows positive returns by pair trading. It is 17.84% per annum for the top five portfolios. Furthermore, 0.00 is the p-value. Top 10 Non-financial sector portfolios show positive annual returns of 21.61%, whereas the top 15 portfolios show yearly returns of 24.67%, and annual returns are 27.93% in the top 20 portfolios. Top 20 portfolios generated maximum returns, so it can be said that for profitability, the number of portfolio matters. The financial sector shows positive returns and non-financial sectors differ in returns. Studying the 5 top portfolios, we get to know that the percentage of annual returns is 11.70%, returns are 14.91%, in the top 15 it is 17.53% per annum, and for the top 20 portfolios, the percentage is 18.488% annually. The distance approach played an important role in improving and increasing the percentage of return. In the studies of Gatev et al. (2006), it was seen that the distance approach maximized the returns, and the return was 11% surplus. Deaves et al. (2013) produced a 6.6 percent return when he was analyzing the data of the Canadian Stock market from 1983 to 2011. Boulgun et al. (2010) analyzed 3.36% average daily returns while trading pairs using distance approach. As a result, the first hypothesis H1 of the research is considered as correct because it generates positive returns by using pair trading, where 0.00 is the p-value, and the t-statistics value is more significant than zero which dismisses the P0 argument null. Moreover, the pair trading strategy is exposed to market risk. CAPM model is used and the results show that they produced noticeable positive values for non-financial sector i.e., cement sector in top 20 portfolios i.e. in 5 top portfolios it is 1.4%, in top ten portfolios it is 1.76%, in top 15 portfolios it is 2.01%, and for top 20 portfolios it is 2.3%. While, in the banking sector, these are positive values i.e., for the top five portfolios, it is 0.96%; for the

top ten portfolios, it is 0.12%; whereas for the top 15 portfolios it is 0.14%, and for top 20 portfolios it is 0.15%. In financial and non-financial sectors market beta value is less than one which is the indication that as compared to the market, the volatility of returns of stock pairs is increased. The results of the study indicate that hypothesis H2 of the study “returns from pairs trading based on risk-adjusted model i.e., Jensen Alpha are significant” is accepted as 0.00 is the p-value while the t-statistics value is more significant than zero Which dismisses the P0 argument null.

Table 3: Regression analysis of the non-financial sector

Pairs	Top 5	Top 10	Top 15	Top 20
Trigger	2	2	2	2
Formation Period	6	6	6	6
Portfolio Average Returns	0.0149	0.0180	0.0206	0.0233
SD	0.0139	0.0126	0.0144	0.0171
t-statistic	5.83	7.12	7.10	6.48
p-value	0.00	0.00	0.00	0.00
Jensen’s alpha	0.0148	0.0176	0.0201	0.0228
Standard Error	0.0016	0.0014	0.0016	0.0019
t-statistic	6.3833	7.3985	7.3885	6.7924
p-value	0.00	0.00	0.00	0.00
Market beta	0.0066	0.0369	0.0373	0.0422
Standard Error	0.0307	0.0276	0.0316	0.0376
t-statistic	0.2160	1.3372	1.1818	1.1233
Average per annum	0.1784	0.2161	0.2467	0.2793

Table 4: Regression analysis of the financial sector

Pairs	Top 5	Top 10	Top 15	Top 20
Trigger	2	2	2	2
Formation Period	6	6	6	6
Portfolio Average Returns	0.0097	0.0124	0.0146	0.0154
SD	0.0077	0.0082	0.0117	0.0103
t-statistic	6.68	7.83	6.41	8.71
p-value	0.00	0.00	0.00	0.00
Jensen’s alpha	0.0096	0.0122	0.0139	0.0149
Standard Error	0.0008	0.0009	0.0013	0.0011
t-statistic	6.0717	8.31143	7.7262	7.9790
p-value	0.00	0.00	0.00	0.00
Market beta	0.0111	0.1637	0.0533	0.0428
Standard Error	0.0169	0.0181	0.0253	0.0223
t-statistic	0.6549	0.9025	2.1034	1.9196
Average per annum	0.1170	0.1491	0.1753	0.1848

Results are different for both financial and non-financial segments. Their different closing prices are a reason for the difference in their returns. Because closing prices are taken for pairs formation, and then these pairs are traded.

CONCLUSION AND RECOMMENDATION

Finding of the study

The distance approach is used in this study to extract stock pairs in pair trading strategy and to achieve profitability from trading pairs. The distance approach as mentioned in this research suggests that it is a successful strategy for creating profits and for producing statistically substantial returns both in the non-

financial and financial sectors, and higher yields are seen in non-financial sectors i.e., cement sector. Even though the financial sector i.e., the banking sector, shows low returns, yet they are statistically substantial and decisive. Investors can get to achieve profitability by investing in liquid stocks. The study found positive returns based on data collected from the Pakistan Stock exchange, and the pair trading approach was used for this purpose. Furthermore, using a risk-adjusted model like the Jensen Alpha, substantial risk-adjusted returns are created. So, the hypothesis that stock returns are increased through pair trading in Pakistan and stock returns are increased through pair trading depending upon the risk-adjusted method is hence proved.

Policy implication

In stock trading, there is a risk of loss. Within this study in order to overcome the chance of loss, the technique of pairs trading has been utilized. Pakistan Stock Market can be affected by multiple factors due to unstable market position. Pairs trading strategy helps to achieve profitability in this regard. The research results claim if the investor wants to earn maximum profit, the investment must be made in highly liquid stocks, after pairs of stocks have been created, the distance method should be used for pair formation. Pairs traders are not much dependent on the market direction as the bullish or bearish investors. Directional risk is involved in short and long positions, but in pairs trading strategy, the directional risk is eliminated. In view of this study's results, an investor can invest in stocks to minimize risks. A trader does not depend totally on the market and generates his way for earnings. It is far easier for an investor to predict that two assets that have shown an excellent historical correlation will converge again after a divergence than that a particular asset should reach a certain specific level. This paper contributes to the literature by proposing a distance approach to parameterize pairs trading with a view to incorporate theoretical considerations into the strategy as opposed to basing it purely on statistical history, as inherent in existing methods. The use of a distance approach has advantage of not being exposed to model mis-specification and mis-estimation. A technical contribution of this paper lies in the selection of pairs using minimum distance approach and finding maximum profit generating pairs.

Future Research directions

The analysis gives plenty of recommendations for future research. Other sectors can also be selected to see the difference in profitability using the distance approach. The value should be altered, apart from this trigger, and the duration of the formation period should be considered. The formation period of six months is observed in this study, which prospective studies can also improve. Since various findings have been reviewed (Krauss & Stubinger, 2017), finally, it is easy to see that pair trading is better and ideally tailored to different market circumstances. Further work will yield further surprising findings in this regard. Also, in future research, additional details may be included in the data set.

REFERENCES

- Atsalakis, G. S., & Valavanis, K. P. (2009). Surveying stock market forecasting techniques—Part II: Soft computing methods. *Expert Systems with Applications*, 36(3), 5932-5941.
- Bolgiin, K. E., Kurun, E., & Güven, S. (2010). Dynamic pairs trading strategy for the companies listed in the Istanbul stock exchange. *International review of applied financial issues and economics*, (1), 37-57.
- Campbell, J. Y., & Shiller, R. J. (1987). Cointegration and tests of present value models. *Journal of political economy*, 95(5), 1062-1088.
- Chen, Z., & Knez, P. J. (1995). Measurement of market integration and arbitrage. *Review of financial studies*, 8(2), 287-325.
- Cozier, J. G., & Watson, P. K. (2019). Co-movement in Stock Prices in Emerging Economies: The Case of the Caricom Region. *International Economic Journal*, 33(1), 111-127.
- Deaves, R., Liu, J., & Miu, P. (2013). Pairs trading in Canadian markets: Pay attention to inattention. *Canadian Investment Review, Analysis and Research*.
- Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The journal of Finance*, 25(2), 383-417.
- Figuerola Ferretti, I., Paraskevopoulos, I., & Tang, T. (2018). Pairs trading and spread persistence in the European stock market. *Journal of Futures Markets*, 38(9), 998-1023.
- Gatev, E., Goetzmann, W. N., & Rouwenhorst, K. G. (2006). Pairs trading: Performance of a relative-value arbitrage rule. *Review of Financial Studies*, 19(3), 797-827.
- Huang, B., Huan, Y., Xu, L. D., Zheng, L., & Zou, Z. (2019). Automated trading systems statistical and machine learning methods and hardware implementation: a survey. *Enterprise Information Systems*, 13(1), 132-144.
- Huck, N., & Afawubo, K. (2015). Pairs trading and selection methods: is cointegration superior?. *Applied Economics*, 47(6), 599-613.
- Kanamura, T., Rachev, S. T., & Fabozzi, F. J. (2008). The application of pairs trading to energy futures markets. Technical Reports, *Karlsruhe Institute of Technology*, 2008.
- Lamont, O. A., & Thaler, R. H. (2003). Can the market add and subtract? Mispricing in tech stock carve-outs. *Journal of Political Economy*, 111(2), 227-268.
- Lin, T. Y., Chen, C. W., & Syu, F. Y. (2021). Multi-asset pair-trading strategy: A statistical learning approach. *The North American Journal of Economics and Finance*, 55, 101295.
- Liu, B., Chang, L. B., & Geman, H. (2017). Intraday pairs trading strategies on high frequency data: the case of oil companies. *Quantitative Finance*, 17(1), 87-100.
- Lucey, M. E., & Walshe, D. P. (2011). European Equity Pairs Trading: The Effect of Data Frequency on Risk and Return.
- Mori, M., & Ziobrowski, A. J. (2011). Performance of pairs trading strategy in the US REIT market. *Real Estate Economics*, 39(3), 409-428.
- Namwong, N., Yamaka, W., & Tansuchat, R. (2019, January). Trading Signal Analysis with Pairs Trading Strategy in the Stock Exchange of Thailand. In International Conference of the Thailand Econometrics Society (pp. 378-388).
- Perlin, M. S. (2009). Evaluation of pairs-trading strategy at the Brazilian financial market. *Journal of Derivatives & Hedge Funds*, 15(2), 122-136.
- Broel-Plater, J., & Nisar, K. (2010). A Wider Perspective on Pairs Trading.
- Qazi, L. T., Rahman, A. U., & Gul, S. (2015). Which pairs of stocks should we trade? Selection of pairs for statistical arbitrage and pairs trading in Karachi Stock Exchange. *Pakistan Development Review*, 54(3), 215.
- Rad, H., Low, R. K. Y., & Faff, R. (2016). The profitability of pairs trading strategies: distance, cointegration and copula methods. *Quantitative Finance*, 16(10), 1541-1558.
- Sedighi, M., Jahangirnia, H., & Gharakhani, M. (2019). A New Efficient Metaheuristic Model for Stock Portfolio Management and its Performance Evaluation by Risk-adjusted Methods. *Int. J. Financ. Manag. Account*, 3, 63-77.
- Smith, R. T., & Xu, X. (2017). A good pair: alternative pairs-trading strategies. *Financial Markets and Portfolio Management*, 1-26.