Profitability of Pair Trading: A Case of Islamic Indices in Pakistan

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Abstract:

The pair trading strategy under portfolio construction is one of the profitable strategies. This is first ever study to observe the pair trading strategy using Islamic Index KSE firms. Distance approach is applied in this study by taking firms under KMI-30 Islamic index by using daily data from year January 1, 2012 to year December 31, 2019. These firms are divided into three subcategories, high-cap, mid-cap and low-cap. After formation of pairs, trading algorithm under various parameterizations is used to observe the profitability. The study concluded with positive and significant returns of top 3, 5, 7 and 10 pairs for each category. In addition, this study also witnessed with positive returns after risk adjustment of market factor for the top 3, 5, 7, and 10 pairs of Islamic index's firms. These results are accordance with theories of mean revision and market neutrality. The study is contributing to the literature regarding the profitability of pair trading in Islamic Indices firms in Pakistan. Policy Implication for Islamic fund managers and investors is recommended.

1. Introduction

The pair trading strategy under portfolio construction is one of the profitable strategies, where, two financial assets are taken and the long-run relationship is observed under different methodologies like distance approach, copulas, co-integration, correlation etc. Once, the long-run relationship is occurred, short position is taken for over-priced financial asset and long position is taken for under-priced financial asset (Vidyamurthy, 2004). This is basically statistical arbitrage opportunity that happened the deviations of mean from the relationship of selected pairs. When Pairs converge to their mean, profitability is generated, that is mean reversion theory followed in pair trading. (Gatev, Goetzmann, & Rouwenhorst, 2006).

According to (Krauss & Christopher, 2015), various methodologies are in place to identify pairs of different financial assets like distance approach, price ratio, copulas, and co-integration, etc. (Charles & Darné, 2009) emphasised on market timing for pair selection. Keshavarz Haddad, & Talebi (2023)

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evaluated the effectiveness of distance, co-integration, and copula functions as tools for selecting and implementing trading strategies for pairs in the TSX during the period from January 2017 to June 2020.In pair trading, transaction cost, is the major cost, whereby, profitability is usually abridged (Kanamura, Svetlozar, & Frank, 2011).

The study of Bowen & Hutchinson (2016) is different from other studies of pair trading as they used high frequency data and positive and significant profitability was reported in pair trading strategies. They also reported that this profitability is significantly reduced due to; transaction cost, sensitivity of returns and some additional factors. In the same tune, the results of Jacobs & Weber (2015) studies came with the investor attention, interaction of news, and limitation of arbitrage process factors of pair trading strategies. In the recent studies of Zhang and Urquhart (2019) and Ramos-Requena, Trinidad-Segovia and Sánchez-Granero (2020) different approaches of pair trading are used. They also reported positive returns under this strategy.

In some pair trading strategies different approaches were used. According to (Gizatulina & Hellman, 2019), "constraints on disagreements in the case of different priors and common p-beliefs have also been driven". Similarly, (Baier, Yotov, & Zylkin, 2019) came with the results as "A novel two stage methodology has been used to investigate the experiential factors of the ex post impacts of past free trade agreements. Their results revealed that FTA impacts were not strong for more distant pairs".

Going through extensive literature review, it has been observed that fund managers of hedged funds created tremendous profits by using pair trading strategies, that starts from 1980s and still these strategies are in place. "Tartaglia's group and Bamberger are said to be pioneer of the usage of pair-trading strategies" (Gatev, Goetzmann, & Rouwenhorst, 2006). One of the attractive features of this strategy is getting the positive returns market neutrality (Kanamura, Svetlozar, & Frank, 2011). Islamic indices are based on Sharaih rules hence different from the conventional. The question is to what extent investors use Islamic indices in pair trading and how much returns they are getting. Presently there are dearth of the studies which address this issue and the present study is an attempt to address this gap in Islamic equity markets literature.

In Pakistan, to best of our knowledge, no one study exist to take one of the emerging market like KMI-30 index firms especially and all other firms in general to observe the profitability under the umbrella of pair trading. Therefore, this stud will focus on these objectives:

1. What are the returns of KMI-30 index firms by using distance approach in pair trading?

2. What is the risk adjusted returns of KMI-30 index firms by using distance approach in pair trading?

3. What are the range of returns of KMI-30 index firms under different market capitalization by using distance approach in pair trading?

In this study, distance approach is used for selection of pairs by using daily data of 12 months. This study significantly will contribute the literature by filling the gap on pair trading strategies by taking Islamic Index firms. This study will be especially beneficial for Islamic fund managers, in addition to general fund managers and investors.

2. Literature Review

While going through literate, it seems to be that the pair trading strategies were not be the focussed of researchers till 1980. One of the prominent studies is (Gatev et al., 2006). He used the data from year 1962-2002 in USA and applied distance approach. The annual return of 11% was observed without transaction cost.

Some researchers reported that this strategy is not giving the convincible positive returns while taking transaction cost (Lei &

Xu, 2015). In contrast to (Lei & Xu, 2015), positive returns in the presence of transaction cost have been reported in many studies like (Gatev et al., 2006). The co-integration approach is also one of the approaches in pair trading strategies (Vidyamurthy, 2004). He reported profitability by using co-integration approach and linked APT of (Ross, 1976).

Mori and Ziobrowski (2011) used distance approach and reported profitability in pair trading. In the same line Smith and Xu (2017) also applied distance approach for formations of pairs and reported positive returns. However, Ferretti, Paraskevopoulos, and Tang (2018) used VECM and reported profitability under pair trading. Most recently Namwong, Yamaka, & Tansuchat (2019) reported profitability under pair trading in Thailand.

Bowen & Hutchinson (2016) focussed on high frequency data and reported studies excess returns of portfolios of pair trading. However, they also pointed out sensitivity of return with regard to transaction cost and some other factors. In the same line Jacobs & Weber (2015) also reported profitability of pair trading portfolios and discussed some addition factors like interaction of news, investor attention, and limitation of arbitrage process.

Fung & Hsieh (1999) concluded his study that risk in pair trading is different. The study of Schmidt (2008) was the mean reversion of pair trading.

Pair trading may be categories with reference to different methodologies like "the distance approach (Gatev et al., 2006), Stochastic spread (Elliott, Van Der Hoek, et al., 2005), stochastic residual spread (Do & Faff, 2010) and co-integration approach (Liew & Wu, 2013)". The distance approach is used by Nath (2003), Daeves & Ehrhardt (2016), Yuksel (2010). In all these studies excess returns of portfolios of pair trading have been reported.

Some of the researchers used co-integration methodology like; (Paul &

Vaihekoski, 2012), Lin, Mccrae, & Gulati (2006), (H. Puspaningrum, Y. X. Lin, 2009), Galenko, Popova, & Popova (2012), Caldeira & Moura (2013), and (Krauss & Christopher, 2015). Although some technical aspects were discussed in these studies, however in all these studies excess returns of portfolios of pair trading have been reported.

In some studies, the results of pair trading are compared by using different mythologies like Bodurog (2010), Caldeira & Moura (2013), Lin et al. (2006), Hong & Susmel (2003), Liew & Wu (2013) and Basher & Sadorsky (2016). However, in all these studies excess returns of portfolios of pair trading have been reported.

Based on discussion of the comprehensive literature review in introduction part and literature review, in this study, pairs are formed through distance methodology and portfolio returns are calculated to check the profitability. The main hypotheses of this study are:

H₁: Abnormal returns of top 3, 5 7, and 10 portfolios in pair trading are positive.

H₂: Jensen's alpha of abnormal returns of top 3, 5, 7 and 10 portfolios in pair trading are positive.

3. Research Methodology

This study has taken 30 firms of KMI index and sorted on the basis of market capitalization. These firms are divided into three subcategories, high-cap, mid-cap and low-cap. Each category contains 10 firms. From each categories 45 combinations of pairs are formed, and from each category top 3, 5, 7 and 10 pairs are selected by using distance approach. The daily data from January 2012 to December 2020 is used as less volatility in the stock market is observed during this period.

In this study Gatev, Goetzmann, & Rouwenhorst (2006) methodology is applied that is one of the most prominent approach in pair trading and still used in latest studies like study of Baier, Yotov, & Zylkin (2019), Ramos-Requena, Trinidad-Segovia and

Sánchez-Granero (2020) and Sohail, Raheman, Adil, Rizwan, and Khan (2020) etc. According to this approach the prices of stocks should be normalized. To get the normalized prices the following model is applied. Here, $T_{f\ p}$ is the total number of trading days of formation period of pairs and will take the values t = 1, 2, . . . T_{fp}, at the end of day.

$$1. \quad P_t^i = \prod_{n=1}^t (1 + r_n^i)$$

where r_n^i are the daily stock returns and P_t^i are the normalized prices of the stocks. After P_t^i get the prices normalized the, D $_{i,\ j}$, distance of two stocks i and j is computed as:

$$2. \quad D_{i,\ j} = \frac{\sum_{t=1}^{Tfp} \left(P_t^i - P_t^j \right)^2}{T f p}$$

From the above distances between the stocks are sorted from lowest to highest distances and then top 3, 5, 7, and 10 pair portfolios are selected from 45 pairs of each category under the market capitalization.

The trading period is selected for the period of six months. The most challenging part of this study encounter the problem of trading period. For this, a program is written in visual Basic to calculate the portfolio returns of top 3, 5, 7, and 10 pairs. The absolute value of spread of the trading pairs compared with the trigger value (T) as mentioned in equation (3). Trading would take place as long as it would follow equation (3). The trading strategy would be buying (Long position) for the under priced stocks while selling (short position) for the over priced stocks. Here, S is for standard deviation, calculates in equation (4). The parameterization of T values are 1.5, 2.0, 2.5.

$$3. \quad Abs (P_t^i - P_t^j) \geq T (i , j)$$

where $T (i , j) = n \times S (i, j)$ and n=2.

$$4. \quad S (i, j)$$
$$= \sqrt{\frac{1}{Tfp - 1} \sum_{t=1}^{Tfp} \left[\left(P_t^i - P_t^j \right)^2 - D i, j \right]^2}$$

In the trading period, the returns of these top 3, 5, 7 and 10 portfolios (N_t^*) are calculated by little modification of (Gatev et al., 2006) methodology by assigning equal weights (W_t^k).

$$5. \quad R_t (p^k) = R_t (l^k) - R_t (s^k).$$
$$6. \quad R_t^{port} = \sum_{k=1}^{Nt*} W_t^k R t (p^k)$$

Further, CAPM is also used to observe the risk adjusted performance of these top 3, 5, 7 and 10 portfolios by Jensen's alpha by using equation 7.

$$7. \quad R_t = a_i + b_i (R_{Mt} - R_{Ft}) + \varepsilon_{it}$$

4. Results and Discussion

In pair trading, different portfolio can be formed that is based on methodology, as in this case distance approach is applied. Population of this study is KMI firms. Sample firms is based on distance approach. After the formation of top 3, 5, 7 and 10 portfolios of pairs, the descriptive analysis of all the three categories, high-cap, mid-cap and low-cap are followed by quantitative analysis. These results are discussed under different parametrizations to check whether these results are different or not under these parameterizations.

4.1. Descriptive Analysis

The results of descriptive analysis of all the three categories; high-cap, mid-cap and low-cap are displayed in Table 1 to 3 respectively.

In High-Cap, the average values of these portfolios (3, 5, 7 and 10) for different parametrizations are found to be positive. These results corroborate that pair trading strategy in KMI-30 index is also profitable. The average portfolio returns of top 3-pairs under trigger value of 2.5 is to be observed as 0.0933, which is ever highest amongst all the portfolios in this category.

On the other side, the variability is also higher this top 3-pairs under trigger value of 2.5. These results are consistent with the latest studies of Namwong, Yamaka, & Tansuchat (2019), Zhang and Urquhart (2019), Ramos-

Requena, Trinidad-Segovia and Sánchez-

High-cap	TOP 10			TOP 7		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2: Formation period	12	12	12	12	12	12
Minimum Values	-0.0073	-0.0185	-0.0064	-0.0113	-0.0204	-0.0173
Maximum Values	0.1776	0.204	0.8743	0.2339	0.2706	1.1553
Average Values	0.0383	0.0466	0.0627	0.0455	0.0577	0.0687
Median Values	0.0346	0.0348	0.0429	0.0428	0.042	0.0443
SD	0.0364	0.0406	0.109	0.041	0.0529	0.1261
	TOP 5			TOP 3		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2: Formation period	12	12	12	12	12	12
Minimum Values	-0.0221	-0.0389	-0.0229	-0.0893	-0.1121	-0.0953
Maximum Values	0.2877	0.3774	1.719	0.4061	0.745	3.4046
Average Values	0.0395	0.0569	0.0658	0.0535	0.0742	0.0933
Median Values	0.0336	0.0267	0.0359	0.0281	0.0361	0.0381
SD	0.0543	0.0741	0.1894	0.0756	0.1342	0.3727

Granero (2020) and with other studies.

Table 1:

Similarly, in Mid-Cap, the average values of these portfolios (3, 5, 7 and 10) for different parametrizations are also found to be positive. These results corroborate that pair trading strategy in KMI-30 index is also profitable. The average portfolio returns of top 5-pairs under trigger value of 2 is to be observed as of 0.0698. On the other side, the variability is also second higher of this top 5-pairs under trigger value of 2. These results are consistent with the latest studies of Namwong, Yamaka, & Tansuchat (2019), Zhang and Urquhart (2019), Ramos-Requena, Trinidad-Segovia and Sánchez-Granero (2020) and with other studies.

Table 2:

Mid-cap	TOP 10			TOP 7		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2: Formation period	12	12	12	12	12	12
Minimum Values	-0.007	-0.0006	0.004	-0.0205	0.0009	-0.0039
Maximum Values	0.2133	0.5906	0.6013	0.2105	0.7121	0.7618
Average Values	0.0328	0.0523	0.0517	0.0346	0.0626	0.0555
Median Values	0.0252	0.0271	0.0252	0.0169	0.0337	0.0211

SD	0.0465	0.1071	0.1147	0.0439	0.1418	0.1403
	TOP 5			TOP 3		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2: Formation period	12	12	12	12	12	12
Minimum Values	-0.0147	-0.002	0.003	-0.0284	-0.0391	-0.0041
Maximum Values	0.1684	1.0401	1.1468	0.0876	0.3782	0.1419
Average Values	0.0268	0.0698	0.0606	0.0058	0.0211	0.0028
Median Values	0.0194	0.0215	0.0158	0.0016	0.0012	0.0066
SD	0.045	0.1928	0.2074	0.0193	0.0594	0.023

Under low-cap category, the average values of these portfolios (3, 5, 7 and 10) for different parametrizations are also found to be positive. These results corroborate that pair trading strategy in KMI-30 index is also profitable. The average portfolio returns of top 3-pairs under trigger value of 2 is to be observed as of 0.1196. On the other side, the variability is also higher this top 3-pairs under trigger value of 2. These results are consistent with the latest studies of Namwong, Yamaka, & Tansuchat (2019), Zhang and Urquhart (2019), Ramos-Requena, Trinidad-Segovia and Sánchez-Granero (2020) and with other studies.

Table 3:

Low-Cap	TOP 10			TOP 7		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2: Formation period	12	12	12	12	12	12
Minimum Values	0.0015	0.0011	-0.0044	-0.0032	-0.0078	-0.0073
Maximum Values	0.304	1.4625	1.4538	0.3917	0.7505	0.7508
Average Values	0.0430	0.0915	0.0837	0.0429	0.0730	0.0610
Median Values	0.0235	0.0285	0.0236	0.0169	0.0298	0.0138
SD	0.0589	0.2705	0.25	0.0764	0.1435	0.1468
	TOP 5			TOP 3		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2: Formation period	12	12	12	12	12	12
Minimum Values	-0.003	-0.0144	-0.0069	-0.0139	-0.0291	-0.0217
Maximum Values	0.578	1.1236	1.1233	0.6529	2.1825	2.1886
Average Values	0.0612	0.0958	0.0893	0.0561	0.1196	0.1052
Median Values	0.0237	0.0239	0.0188	0.0196	0.0107	0.0155

SD	0.0975	0.2245	0.2211	0.1249	0.4057	0.3982

The above descriptive analysis show that there is highest profitability in pair trading in the Low-cap category of KMI-30 index companies, while lowest in Mid-cap category. The common thing in these descriptive analyses is showing the recognition of profitability of this strategy for different SDs of 2.5, 2.0 etc.

4.2. Quantitative Analysis

The statistical significance of the profitability of pair trading portfolio is tested by t statistics, while risk adjusted returns of these portfolios are tested by Jensen's alpha under CAPM to answer the research questions.

The results of t statistics and CAPM results of all the three categories; high-cap, mid-cap and low-cap are displayed in Table 4 to 6 respectively.

In High-cap, the average excess portfolio returns under different parametrizations of standard deviations 1.5, 2 and 2,5 are found to be positive and statistically significant. Conforming the profitability of pair trading strategy in KMI-30 index. The highest average excess returns of 0.0933 are to be observed if portfolio consists of top 3 pairs under trigger value of 2.5.

Under CAPM, Jensen's alpha of all the portfolios in pair trading under different parametrizations of standard deviations 1.5, 2 and 2,5 are found to be positive and statistically significant. These results are with accordance to prior studies of pair trading like studies of Namwong, Yamaka, & Tansuchat (2019), Zhang and Urquhart (2019), Ramos-Requena, Trinidad-Segovia and Sánchez-Granero (2020) etc

Therefore, proving the alternate hypothesis that there is significant profitability and significant risk adjusted returns in pair trading strategy in High-cap. The results also validate the market neutrality and mean revision theories.

Table 4:

High-cap	TOP 10			TOP 7		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2:	12	12	12	12	12	12
Portfolio Excess Returns	0.0383	0.0466	0.0627	0.0455	0.0577	0.0687
SD (Port. ER)	0.0311	0.0408	0.1032	0.0379	0.0536	0.1286
t-statistic	11.6227	10.3203	5.3811	10.6711	9.5638	4.9244
Prob.	0	0	0	0	0	0
Alpha (Jensen)	0.0384	0.0515	0.0612	0.0462	0.0599	0.0684
Std. Error	0.0045	0.0058	0.0139	0.0059	0.0063	0.0185
t-statistic	8.5333	8.8877	4.4117	7.8520	9.5079	3.6973
Market Risk (Beta)	0.1755	0.9088	-0.1723	0.3667	1.2565	0.2333
Std. Error	0.2382	0.3311	0.8784	0.3094	0.4335	1.0920
t-statistic	0.7368	2.7452	-0.1962	1.1850	2.8985	0.2136
	TOP 5			**TOP 3**		

Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2:	12	12	12	12	12	12
Porfolio Excess Returns	0.0395	0.0569	0.0658	0.0535	0.0742	0.0933
SD (Port. ER)	0.0497	0.0716	0.1859	0.0760	0.1294	0.3654
t-statistic	7.8867	7.1312	3.2081	6.4557	5.4507	2.3524
Prob.	0	0	0	0	0	0
Alpha (Jensen)	0.0428	0.0635	0.0680	0.0574	0.0876	0.0900
Std. Error	0.0060	0.0109	0.0259	0.0115	0.0183	0.0439
t-statistic	7.1333	5.8257	2.6255	4.9913	4.7817	2.0508
Market Risk (Beta)	0.6352	1.4123	0.0328	0.9302	2.2715	-0.5628
Std. Error	0.3962	0.5803	1.6082	0.6175	1.0700	3.1733
t-statistic	1.6032	2.4337	0.0204	1.5064	2.1230	-0.1774

In the same line, Mid-caps and Low-cap categories are also witnessed with the positive and significant average excess portfolio returns under different parametrizations of standard deviations 1.5, 2 and 2,5. Under CAPM, Jensen's alpha of all the portfolios in pair trading under different parametrizations of standard deviations 1.5, 2 and 2,5 are found to be positive and statistically significant.

These results are with accordance to prior studies of Namwong, Yamaka, & Tansuchat (2019), Zhang and Urquhart (2019), Ramos-Requena, Trinidad-Segovia and Sánchez-Granero (2020) and with other studies. Therefore, proving the alternate hypothesis that there is significant profitability and significant risk adjusted returns in pair trading strategy in Mid-cap and low-cap categories.

Table 5:

Mid-cap	TOP 10			TOP 7		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2:	12	12	12	12	12	12
Portfolio Excess Returns	0.0328	0.0523	0.0517	0.0346	0.0626	0.0555
SD (Port. ER)	0.0402	0.1055	0.1066	0.0453	0.1334	0.1388
t-statistic	7.6110	4.6121	4.1524	7.3653	4.3283	3.5309
Prob.	0	0	0	0	0	0
Alpha (Jensen)	0.0294	0.0476	0.0486	0.0355	0.0545	0.0474
Std. Error	0.0057	0.0138	0.0132	0.0096	0.0168	0.0200
t-statistic	5.1381	3.4457	3.6818	3.6833	3.2440	2.3722
Market Risk (Beta)	-0.3771	-1.2479	-0.3769	-0.3436	-1.8030	-0.9920
Std. Error	0.3174	0.9011	0.9208	0.3666	1.1433	1.1654
t-statistic	-1.1881	-1.3848	-0.4093	-0.9372	-1.5770	-0.8512

	TOP 5			TOP 3		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2:	12	12	12	12	12	12
Portfolio Excess Returns	0.0268	0.0698	0.0606	0.0058	0.0211	0.0028
SD (Port. ER)	0.0396	0.1946	0.2039	0.0189	0.0569	0.0176
t-statistic	6.2156	3.3619	2.7756	2.5438	2.9395	1.4422
Prob.	0	0	0	0	0	0
Alpha (Jensen)	0.0245	0.0596	0.0560	0.0059	0.0133	0.0040
Std. Error	0.0049	0.0225	0.0278	0.0056	0.0073	0.0044
t-statistic	5.0000	2.6489	2.0144	1.0536	1.8219	0.9091
Market Risk (Beta)	-0.1087	-2.3660	-1.4197	-0.1182	-1.3177	-0.0716
Std. Error	0.3209	1.6462	1.7506	0.1240	0.4607	0.1306
t-statistic	-0.3387	-1.4372	-0.8110	-0.9532	-2.8602	-0.5482

Table-6

Low-cap	TOP 10			TOP 7		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2:	12	12	12	12	12	12
Portfolio Excess Return	0.0430	0.0915	0.0837	0.0429	0.0730	0.0610
SD (Port. ER)	0.0595	0.2617	0.2486	0.0688	0.1471	0.1462
t-statistic	7.0353	3.2002	3.1583	5.6877	4.4479	3.7875
Prob.	0	0	0	0	0	0
Alpha (Jensen)	0.0466	0.0867	0.0790	0.0429	0.0649	0.0570
Std. Error	0.0071	0.0330	0.0293	0.0097	0.0187	0.0193
t-statistic	6.5634	2.6273	2.6962	4.4227	3.4706	2.9534
Market Risk (Beta)	0.2490	-0.8438	-0.8811	0.1186	-0.8737	-0.7312
Std. Error	0.4906	2.2863	2.1442	0.5852	1.2463	1.2763
t-statistic	0.5075	-0.3691	-0.4109	0.2027	-0.7010	-0.5729
	TOP 5			TOP 3		
Parameter 1: Trigger	1.5	2	2.5	1.5	2	2.5
Parameter 2:	12	12	12	12	12	12
Portfolio Excess Returns	0.0612	0.0958	0.0893	0.0561	0.1196	0.1052
SD (Port. ER)	0.0930	0.2167	0.2219	0.1223	0.4040	0.3945
t-statistic	5.6577	4.0020	3.6677	4.2454	2.7707	2.4743

Prob.	0	0	0	0	0	0
Alpha (Jensen)	0.0574	0.0912	0.0851	0.0559	0.1162	0.1068
Std. Error	0.0131	0.0269	0.0272	0.0175	0.0512	0.0508
t-statistic	4.3817	3.3903	3.1287	3.1943	2.2695	2.1024
Market Risk (Beta)	0.0923	-0.7685	-1.0509	-0.4387	-1.0574	-0.2130
Std. Error	0.8154	1.8838	1.9170	1.0506	3.4940	3.4432
t-statistic	0.1132	-0.4080	-0.5482	-0.4176	-0.3026	-0.0619

All the three categories provided positive and statistically significant results in pair trading strategy at KMI under the different portfolio construction of top 3, 5, 7, and 10. However, the results of systematic risk under different parameterizations are some significant and some are insignificant.

5. Conclusions

This study invested the profitability of top 3, 5, 7, and 10 portfolios in pair trading at KMI-30 index. This is the first study in Pakistan to take this aspect of trading. For pair formation one-year daily data of 10 stocks selected from the three categories: high-cap, mid-cap and low-cap for the period from 2012 to 2019 is used by applying distance methodology.

Different parameterizations were used for trading system algorithm. The algorithm was written in visual Basic. The trading period was consisting of six months after the formation period. The statistical significance was tested by t statistic while risk adjusted returns were tested by Jensen alpha. Positive and significant returns are generated in all the three categories. Further, positive risk adjusted returns are also be observed in all the three categories. The results also validate the market neutrality and mean revision theories.

The policy implication for investors, Islamic fund managers, conventional fund managers, researchers is recommended. Investors and Islamic fund managers, conventional fund managers and portfolio managers can get positive risk adjusted returns while applying pair trading strategies in the mentioned three categories.

On the other hand, the first limitation of this study is that, only three categories are selected under market capitalization. Second limitation is that in this study only one approach is used. So, future research recommendation is that other companies of sharia compliant should be taken with usage of different methodologies as discussed in the literature and specially machine learning models to grasp the real profitability in pair trading strategies.

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