

## The impact of financial distress risk on equity returns: A case study of non-financial firms of Pakistan Stock Exchange

By Sahar IDREES <sup>a†</sup> & Abdul QAYYUM <sup>b</sup>

**Abstract.** This study aims to investigate the relationship of financial distress risk and the equity returns of financially distressed firms listed on Pakistan Stock Exchange (PSX). Several studies have suggested that firm distress risk factor could be behind the book-to-market and size effects. Fama and French three factor Model (1993) is used for examining the relationship among equity returns, financial distress risk, size and book-to-market equity ratio. Non-financial firms listed on PSX are taken from the time-period of 2010-2016. Ohlson's O-Score (1980) "bankruptcy prediction model" is used for the prediction of financial distress risk and forecasted the distress risk firms listed on PSX. The panel (unbalanced) data is used to get the empirical findings and showed that the financial distress risk and book-to-market equity effect are statistically insignificant to explain the stock returns of distress firms due to the inefficiency of market. However, size effect is significant in explaining the stock returns of distress firms. The study also reveals that it is important to predict financial distress risk with a better predictor in order to avoid the uncertainties in PSX.

**Keywords.** Financial distress risk, Equity returns, Book-to-market effect, Size, Pakistan Stock Exchange.

**JEL.** G30, G32.

### 1. Introduction

Financial distress risk generally refers to possibility that a levered firm won't have the capacity to pay principal amount or contractual interest on its debt commitments (Garlappi *et al.*, 2008). Financial distress is observed as costly for the firms because it generates a tendency for the organizations to perform those activities which are averse to the non-financial stakeholders (i.e. suppliers, employees and customers), and debt-holders, increasing the stakeholders' relationships cost and damaging access to loan (Jensen, 1989). Such financial charges are having the priority over distribution of the income to the company's shareholders and therefore, uncertainty of stock returns to equity shareholders rises. This uncertainty of the stock returns to shareholders give rise to the high risk premium required of stocks. It also effects the market value of firm negatively (Pindado & Rodrigues, 2005).

Ferri *et al.*, (1998) stated that problems of the firm's financial structure have been a significant factor in East Asian Corporations in the contribution of Asian Financial Crisis, which lead to bankruptcy of many corporations.

<sup>a†</sup> Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan.

☎. + 051-9248040

✉. saharidrees\_15@pide.edu.pk

<sup>b</sup> Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan.

☎. + 0321-5112374

✉. qayyumdr@gmail.com

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Corporate financial distress has been considered as a serious economic and social issue (Cheng *et al.*, 2007). It usually come up with economic losses to the shareholders, employees, stockholders, and customers, along with a considerable economic and social cost to nation. (Jaikengkit, 2004). In any economy, the corporate sector can be seen as wide representative of producers group. So, its recovery can be seen as getting industrial input and the economy again growing by using new investment, and in return the high rate of production. Therefore, for the economic recovery process, the investment activities in the business must be revived. Therefore, in finance, an accurate and precise prediction of financial distress of firms has become a significant issue (Cybinksi).

In financial markets, the relationship among default risk and the stock returns has significant implication towards risk and return trade-off. In asset pricing model, it is assumed that less risk is rewarded by less and vice versa in case the risk is idiosyncratic risk or systematic risk. In case of un-diversifiable financial distress risk, for putting in a higher stake, earning of investors should be more on financial distressed stock. (Dugan & Forsyth, 1995). Standard execution of CAPM (Capital Asset Pricing Model) might be failed to detect the default-risk premium completely if company's failures are associated with deterioration in investment opportunities (Merton, 1974).

Many other studies have also been highlighted the relationship between equity returns and financial distress risk, thus widening the usefulness of distress risk evaluation to include the equity investors. Anomalous behavior in financial distress risk and stock returns is found by several researchers like Dichev, (1998) and Griffin & Lemmon, (2002). Dichev (1998), Avramov *et al.*, (2009) and Garlappi & Yan (2011) and few more has reported that the firms with high distress risk deliver lower equity returns than the firms with low distress risks thus provides the existence of anomaly<sup>1</sup>.

Other studies show that a company's average equity returns are related to book-to-markets equity, size, past sales growth and cash flow/price (C/P). (Banz, 1981; Basu, 1983; Roseberg *et al.*, 1985 and Lakonishok *et al.*, 1994). Since these patterns in the average equity returns aren't enlightened by Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Linter (1965), so they are typically known as anomalies (Fama & French, 1996). Fama & French (1992, 1993, 1996), Carhart (1997 and Dichev, 1998) has developed multi-factor models by expanding the CAPM with factors relating to book-to-market, size, distress risk.

Fama & French (1992) has introduces three factor model which is highly useful tool for understanding the performance of the portfolio, construction of portfolio, for accessing the impact of active management and estimating future returns. Fama & French (1996) has stated that the shareholders are concerned about the three separate and different risk factors like size, momentum and book-to-market value rather than only market risk. The risks with which systematic prices are attached and that in the combination do best job of explaining the pricing and performance are size, market and the book-to-market value.

Financial distress is a key factor to predict due to its severe consequences to the firms such as loss of significant market share, valuable suppliers, key employees, violation of debt covenants, shareholders lost their trust etc. (Purnanandam, 2008). So, this study plans to measure financial distress risk for firms with a better predictor.

The objective of this study is to determine the relation among FD risk factor on equity returns to confirm the anomalous behavior in case of PSX. Some distinct features of this study are: As Pakistan is an emerging market and with the best of my knowledge, it is not yet identified whether financial distress risk is systematic risk, anomaly or inconclusive. Several researchers have predicted the bankruptcy of different sectors of Pakistan using Altman's (1968) Z-score and other models of

<sup>1</sup>Any deviation from the normal behavior of theory is known as anomaly.

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prediction. But according to my knowledge up till now no one has used Ohlson's (1980) O-Score model as a proxy for the prediction of financial distress. This study will use O-Score as Dichev (1998) found that O-Scores predictions are better than Altman's (1968) Z-score.

### 2. Literature review

To develop the theory of Asset Pricing Models, Sharpe (1964) and Lintner (1965) had worked independently and contributed to evolve Capital Asset Pricing Model. This model was developed over the effort of Markowitz (1952). CAPM is a one factor model and it considers that that market beta is enough to capture all relevant risk which are associated with the given level of equity returns. Sensitivity of equity returns to the market returns is reflected by beta. Jensen, Black & Scholes (1972) and Fama & MacBeth (1973) empirically verified CAPM thus, it became prominent model in quantifying and describing the relationship among risk and return in a simple manner.

Later, some studies had found such patterns that couldn't be explained by the single-market beta. These patterns are termed as anomalies (Fama & French, 1995). Since the work of Lintner (1965) and Sharpe (1964), many anomalies which can't be explained by CAPM have identified. Banz (1981) had studied common stocks of NYSE by using data from 1926-1975. Results showed that after adjusting the risk measures, smaller firms are expected to give high returns as compared to firms with high market value (big firms). This anomaly is referred to as the "size effect" which contradicted the Capital Asset Pricing Model. The size effect when introduced with the market beta, has improved explanatory power of the average returns.

Several researchers had claimed for "default risk factor" among well-known components that had cross-sections of equity returns. This argument inferred that the shareholders or investors must demand for a premium i.e. more return for making investments in the companies with higher financial distress risk and as a result, higher distress risk should be then linked to higher expected stock returns. In general firms with highest distress risk tend to give higher returns as the theory of risk-return tradeoff explains. Chen & Zhang (1998), Boubaker *et al.*, (2016) and many studies had confirmed the above-mentioned conjecture.

By using various bankruptcy prediction model, existing empirical researches have failed to yield the consistent proof for the confirmation of the conjecture mentioned above.

Indeed, many studies had revealed the opposed findings, that is, stocks of the firms with high chances of default generally earn low stock returns. A common explanation of this empirical results states that, when there exists a default risk, financial markets appear as less proficient for complete evaluating the default risk embedded in the firm and don't demand for sufficiently higher risk premium to be compensated for default risk. The popular studies of Dichev (1998), Griffin & Lemmon (2002), Garlappi *et al.*, (2008), George & Hwang (2010) showed lower returns for highest bankrupt firms.

In general, the financially distress firms exhibit low size (market value). This set-up could be because of investors discounting the price of stock in expectation of default risk in order to earn high return in future. As a result, with low market value, the book to market equity of the distressed firm will be high. However, findings of Chan & Zheng (1991), Chan & Chen (1991) and Fama & French (1992, 1995) are consistent to the asset pricing theory. But, the empirical results by Dichev (1998) and Griffin & Lemmon (2002) had suggested that evidence of book-to-market and size effect is still inconclusive.

### 3. Methodology

For the descriptions of the financial distress risk in relation to Book-to-market equity and size effect to observe its impact on the stock returns, Fama & French

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(1993) proposed three factor model. Griffin & Lemmon (2002), Dichev (1998), Garlappi & Yan (2011) Campbell, Szilagyi & Hilscher (2008), and many other scholars had used Fama & French (1993) 3-factor model to find out the association among financial distress and stock returns. Here, this study has also followed Fama & French three factor model.

Fama & French (1993) three factor model is as follows:

$$E(R_i) - R_f = a_i + b_i (R_m - R_f) + s_i E(\text{SMB}) + h_i E(\text{HML}) + E_i \quad (1)$$

Where,

$[E(R_i) - R_f]$  = expected return on portfolio in excess of the risk-free rate, is explained by the sensitivity of its return to three factors:

(i)  $R_m - R_f$  = The market factor, well-defined to be the excess return on a broad market portfolio. A Market portfolio is a theoretical portfolio, with the assumption that diversification of portfolio is set by choosing numerous stocks so that the unsystematic risk of the specific stocks turns out to be irrelevant. The only risk which is exposed to market portfolio is the systematic risk or non-diversifiable risk. (Miller & Modigliani, 1961).

(ii) SMB = The size factor, represented the market capitalization of the stock/firm. It was as:  $\text{Market Capitalization} = \text{Price of Stock} \times \text{Number of Shares Outstanding}$ . SMB represents Small Minus Big, which is the difference amongst the returns of stock on a portfolio of smaller stocks and the equity return on a portfolio of larger stocks and

(iii) HML = The value factor defined as price ratio measured the value factor i.e. book equity to market equity ratio. (HML represents high minus low, which is the difference amongst the portfolio's return of higher book-to-Market equity stocks and the portfolio returns of low Book-to-Market stocks specifically, the expected excess return on portfolio i is,

$$(R_i - R_f) = b_i E(R_m - R_f) + s_i E(\text{SMB}) + h_i E(\text{HML}) \quad (2)$$

Where,

$E(R_i) - R_f$ ,  $E(\text{SMB})$ , and  $E(\text{HML})$  represents the expected premiums, and factor sensitivities i.e.  $b_i$ ,  $s_i$ , and  $h_i$ , slopes in panel data regression.

This study has also used the same model as used by Dichev (1998), to find out the effect of financial distress risk on equity returns along with size and book to market effect.

$$R_{i,t} = \beta_1 + \beta_2 * O + \beta_3 * MV_{i,t} + \beta_4 * B/M + \xi_{i,t} \quad (3)$$

Where,

$R_{i,t}$  = Stock returns, Stock return would be calculated by the Fama (1965) method

$$\text{Log}P_t - \text{log}P_{t-1} = \Delta \text{log}P_t \times 100$$

$O$  = Ohlson (1980) O-score, used as a proxy for Financial Distress Risk.

$MV$  = Market Size, also known as the Market value is defined market capitalization of the firm and estimated as the log of market price of the shares multiplied by number of outstanding issued & paid-up share capital at the end of financial year.

$B/M$  = Book-to-market equity ratio is estimated as the book value of equity at the end of the financial year divided by market value of the equity as at the same financial year end

The  $\beta$  coefficients capture the sensitivity of sorted portfolio returns to the variations in the respective risk factors.

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### 3.1. Measuring financial distress

There are several methods to measure the financial distress risk which was developed by Altman Z-score (1968), Ohlson O-score (1980), Campbell's default score and Merton distance to default modified by Bharat & Shumway (2003).

Dichev (1998) found that O-score predicts the CRSP delisting firms better than the Altman's (1968) Z-score. Griffin & Lemmon (2002), Xu and Zhang also used O-score as a proxy for financial distress. As Ohlson (1980) worked on all the critiques on the Altman's Z-score model. So, this study also focuses primarily on O-score to recognize firms with high distress risk.

### 3.2. Ohlson's O-Score (1980) model

Ohlson (1980) criticizes restrictive assumptions of the Multiple Discriminant Analysis and output of that technique, i.e. a single dichotomous score, which in fact says nothing about the default probability. To overcome such problems, Ohlson has introduced another econometric technique which is based on logistic transformations (Logit Model). Just like discriminant analysis, this logit model weights independent variables and also assigns the scores. However, distinct to the discriminant analysis, this technique computes the probabilities of default for each company present in a sample. The best identified model is Ohlson's Model, which classifies four basic factors that are statistically significant in measuring the probability of bankruptcy within 2 years: (i) company size; (ii) a measure of financial structure; (iii) a measure of company's performance; and (iv) a measure of current liquidity. These 4 factors have been represented by the nine accounting variables in O-Score.

### 3.3. Ohlson's O-Score model is estimated as

$$O = -1.32 - 0.407 \log \left( \frac{\text{Total Assets}}{\text{GNP price-level index}} \right) + 6.03 \left( \frac{\text{Total Liabilities}}{\text{Total Assets}} \right) - 1.43 \left( \frac{\text{Working Capital}}{\text{Total Assets}} \right) + 0.076 \left( \frac{\text{Current Liabilities}}{\text{Current Assets}} \right) - 1.72 \left( 1 \text{ if total liabilities} > \text{total assets, else } 0 \right) - 2.37 \left( \frac{\text{Net Income}}{\text{Total Assets}} \right) - 1.83 \left( \frac{\text{Funds from operations}}{\text{Total Liabilities}} \right) + 0.285 \left( 1 \text{ if net loss for last two years, else } 0 \right) - 0.521 \left( \frac{\text{Net Income}_{t-1} - \text{Net Income}_t}{|\text{Net Income}_{t-1}| + |\text{Net Income}_t|} \right)$$

The probability of bankruptcy is then obtained as:

$$\frac{1}{1 + \exp(-O \text{ score})}$$

For the O-Score, any results larger than 0.5 suggests that the firm will default within two years.

## 4. Results and discussion

40 Joint Stock Companies with the negative book values were identified by Ohlson's O-Score from all the non-financial firms listed on PSX. The sample period of seven years i.e. from 2010-2016 is selected for data collection. This is because both market data and accounting data is readily available in this period. The frequency of the data will be annually. Names of the financially distressed firms are shown in appendix. Stock prices are taken from the website of a financial daily, Business Recorder. The accounting data of companies are taken from the annual reports of the companies<sup>2</sup>, financial statement analysis of the non-financial companies issued by the State Bank of Pakistan<sup>3</sup> and Business Recorder<sup>4</sup>.

<sup>2</sup> Annual reports of distressed companies

<sup>3</sup> [Retrieved from].

<sup>4</sup> [Retrieved from].



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Pearson correlation coefficients which suggests the preliminary evidence related to the association between hypothesized variables.

**Table 1.** *Pearson Correlation of Financially distressed firms*

	O-Score	B-to-M ratio	Size	Returns
O-Score	1.0000			
B-to-M ratio	-0.1495	1.0000		
Size	0.0142	0.4643	1.0000	
Returns	0.0202	0.1916	0.2512	1.00000

Table 1 explains the relationship among hypothesized variables such as stock returns of distress firms, financial distress risk (O-Score), size and B-to-M equity ratio. Pearson correlation matrix shows that there is no relationship between distress risk (O-Score) and the stock returns of distress firms in case of PSX, as the value of correlation,  $r$ , is near to zero i.e. 0.02. This finding is consistent with the findings of Katz *et al.*, (1985) and Opler & Titman (1994) Asquith *et al.*, (1994).

Evidence of negative relationship is found among O-score and Book-to-Market equity ratio which means that firms with the higher distress risk have low or negative book-to-market ratio. This is consistent with the results of Dichev (1998), Griffin & Lemmon (2002) and Zaretzky & Zumwalt (2007).

The positive Pearson correlation between O-Score and Size of 0.0142 indicates that the higher the higher the probability of financial distress risk, the higher the size of the firm due to levered stock.

If size (market value) of the firm and the B-to-Market ratio of a distress firm can be used as proxy for financial distress risk and as a predictor for stock returns, then the stock returns has negative relation with the firm size (i.e. the stock returns must be higher for the firms lower in size), and positively related to B-to-M equity ratio. The positive correlation of the returns and the size of 0.2512 is not consistent with hypothesis of risk and the return. The negative Pearson correlation of B-to-M equity ratio and the stock returns of 0.1916 is also inconsistent with risk-return hypothesis in case of PSX.

Findings are consistent with past studies on size-effect which has suggested that the firm under financial distress exhibit low MV. The negative correlation among O-Score and B-to-M equity ratio of -0.1495 seems to be consistent with the results of on Book to Market Effect.

### 4.1. Panel (unbalanced) data results

Hausman test was applied to check the appropriate model for the study, fixed effect model is appeared to be appropriate for this study. The results of fixed effect model are as follows:

Fama & French (1993) three factor model is as follows:

$$R_{i,t} = \beta_1 + \beta_2 * O_{i,t} + \beta_3 * MV_{i,t} + \beta_4 * B/M_{i,t} + \zeta_{i,t}$$

-0.007	0.456	-0.001
(-0.05)	(8.09)	(-0.64)

We compute the stock returns of the 40 distress firms listed on PSX, on a yearly basis and regress the return on Fama-French three factors variables and O-score, as used by Dichev (1998). The results provide by Fixed Effect (FE) model are provided in Table 2. Consistent with findings of the Campbell *et al.*, (2008), this study finds negative but significant intercept.

The Results of the fixed effect (FE) model of the study tells us that there exist a negative association among O-Score and Stock returns in case of non-financial firms having negative book value. Our result for this variable is consistent with the findings of Dichev (1998), Griffin & Lemmon (2002) and Campbel *et al.*, (2008). However, an examination of the data sample collected of firms listed in PSX and graph (shown in Appendix A) also suggests that the greater the probability value of O-score, lesser or even negative are the stock which shows the existence of

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anomaly in case of PSX. Dichev (1998) argued that the association among financial distress risk and stock returns had two possible reasons. First reason is, assuming the efficient markets, it is suggested that most bankrupt firms have lesser systematic or idiosyncratic risk. Secondly, if there exists a persistent bias in securities pricing (e.g., Shleifer, Lakonishok & Vishny, 1994), it could mean that the available distress-risk information doesn't impounded fully. Therefore, when the negative information is embedded in prices then most insolvent and distress firms earn lower stock returns. Chava & Purnanandam (2010) explained that the negative relation among distress risk and the realized equity returns could be taken as the inefficiency of market.

The result is however not finalized as the probability value of O-Score represents that it's an insignificant variable in case of PSX, suggesting the absence of meaningful relationship between financial distress risk as proxied by Ohlson (1980) O-score and the equity returns. This finding is consistent with the findings of Katz *et al.*, (1985) and Opler & Titman (1994) Asquith *et al.*, (1994). Findings of Opler & Titman (1994), Asquith *et al.*, (1994) revealed that the insolvency or distress risk is commonly because of the risk, which suggested that there must not be significant positive association among expected stock returns and bankruptcy risk. The findings of Katz *et al.*, (1985) depicted that the market was not complete efficient for bankruptcy-prediction model to capture the released information.

Book-to-Market equity ratio has a negative relationship with the stock returns. The return of firms with the high distress risk (large O-score value) generally have high book-to market ratio. However, our data analysis, consistent with the portfolio analysis of Dichev (1998) shows that the firms with the highest distress risk have lower book to market ratio<sup>5</sup>.

The portfolio results of Griffin & Lemmon (2002) and Dichev (1998) had also such anomalous findings, they found that the companies with the higher B-to-M Equity ratio earned lower average stock returns in contrast to the firms with lower B-to-M Equity ratio. It is statistically insignificant at 5% in case of PSX.

Zaretsky & Zumwalt (2007) also suggested that the relationship among distress risk, book-to-market value and stock returns are shown to be inconsistent with BMV factor depicting a premium to the compensation for financial distress risk. Consistent with the evidence of Dichev (1998), like our findings, Agarwal & Poshakwale (2009) also reported lack of any association among B-to-M ratio and distress risk.

Only Size which is representing the market value is statistically significant at 5% level of significance, it is consistent with the past findings of Agarwal & Poshakwale (2009) suggesting that size (MV) could be proxying for the financial distress risk. It is inconsistent with the findings of Dichev (1998). Findings of Dichev (1998) and Griffin & Lemmon (2002), have suggested that evidence of book-to-market equity and size effect is still inconclusive.

## 5. Conclusion

From 560 firms listed on stock exchange 40 distressed firms are identified which is forecasted to be default within 2 years. The results of the study show that relationship among stock returns and financial distress risk appeared to be consistent with the findings of previous studies. However, our findings are inconclusive as the negative coefficient of distress risk found is statistically insignificant which revealed that the distress risk is commonly because of the risk, which suggested that there must not be significant positive association among

<sup>5</sup>As we have selected the firms with negative book value having probability value of score more than 0.5 which depicts the most distressed firms. Therefore, the calculation of book-to-market ratio gave negative values due to distress firms as explained by Dichev (1998). So, we assume high book to market value and low book to market value as less negative and Morenegative book-to market value, respectively.

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expected stock returns and bankruptcy risk. Findings are consistent with past studies which depicted that the market was not complete efficient for bankruptcy-prediction model to capture the released information. Similarly, Book-to-Market equity is also statistically insignificant in our model. Consistent with the evidence of past studies which reported lack of any association among B-to-M ratio and distress risk. Only size (market value) of the firm is appeared to be statistically significant, suggesting that size (MV) could be proxying for the financial distress risk.

From empirical investigations, it is also investigated that theoretical explanation and previous findings of Book-to-Market equity effect on the stock returns does not hold in case of non-financial distressed firms of Pakistan Stock Exchange (PSX). Based on the findings discussed above, it is not conclusive to presume that financial distress risk is systematic risk in case of Pakistan Stock exchange.

The research implications of this study are appropriate to investors, financial and mutual fund managers and academia as corporate financial distress come up with economic losses to stakeholders along with the considerable economic and social cost to nation. Financial Distress Risk is important for the regulator so that a framework be made on forecasting of distressed firms and reporting. Hence, an accurate precise prediction of financial distress of firms has become a significant issue. Ohlson (1980) O-score should be used by the financial managers to predict the financial health of their business, as O-score predicts better than Z-score (Dichev, 1998). This research has identified 40 distressed firms so, it is recommended to their managers to make suitable policies on their sooner recovery and to avoid its cost.

As the financial managers play a key role in analyzing the risk associated to their stocks. One of the reason of financial distress is poor management of the firm. So, the distressed firm along with their sooner recovery should also need to improve their management and efficient employees. However, the investors also should not neglect this risk factor before investing. This will open future areas for the researchers interested in studying financial distress risk and other anomalies in the emerging markets.



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### Appendix

#### List of Financially Distressed Firms Listed on Pakistan Stock Exchange (PSX)

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Adil Textile Mills Ltd	Al-Abid Silk Mills Ltd.
Annoor Textile Mills Ltd.	Crescent Jute Products Ltd.
Chenab Ltd.	Noor Silk Mills Ltd.
D.S. Industries Ltd.	Mirza Sugar Mills
Data Textiles Ltd.	Pangrio Sugar Mills Ltd.
Gulistan Spinning Mills Ltd.	Morafco Industries Ltd.
Gulistan Textile Mills Ltd.	Dewan Salman Fibre
Karim Cotton Mills Ltd.	Mandviwala Mauser Plastic Industries Ltd.
Khurshid Spinning Mills Ltd.	Pakistan PVC Ltd.
Mian Textile Industries Ltd.	Pak Leather Crafts Ltd.
Mohammad Farooq Textile Mills Ltd.	Fateh Industries Ltd.
Mubarak Textile Limited	Balochistan Glass Ltd.
Nazir Cotton Mills Ltd	Dandot Cement Co. Ltd.
Olympia Spinning & Weaving Mills Ltd.	Zeal Pak Cement Factory Ltd.
Paramount Spinning Mills Ltd.	Dewan Farooque Motors Ltd.
Saleem Denim Industries Ltd.	Japan Power Generation Ltd.
Service Fabrics Ltd.	Southern Electric Power Co. Ltd.
Yousaf Weaving Mills Ltd.	Pakistan International Airlines Corporation Ltd.
Amtex Ltd.	Baluchistan Particle Board Ltd.
Fateh Sports Wear Ltd.	Dadabhoy Construction Tech. Ltd.

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