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Financial leverage and stock returns: evidence from an emerging economy

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ABSTRACT

The aim of this research was to examine the propositions of Campbell et al. and Mirza et al. on pricing of leverage in stock returns using a comprehensive set of firms listed on the Karachi Stock Exchange (KSE) over a period of 13 years. Our results suggest that while size, value and, more importantly, financial leverage are systematic in nature, market risk premium is not a relevant factor. The results confirm the notion of leverage premium and have important implications for financial managers, investment analysts and other market participants who use asset pricing frameworks for investment appraisals. These findings have global relevance, notably for other emerging and developing economies where default risk is of importance due to cyclical nature of cash flows and low recovery rates owing to weaknesses of legal structure.

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1. Introduction

The capital structure of a firm refers to the financing mix. It reflects the sources of external financing in the form of debt, equity and internal financing through retained earnings. Given the importance of sources of funding, the capital structure of a firm is viewed as its financial muscle and its flexibility can enable firms to easily recourse to external financing. The equity portion of the capital structure represents contributions by the shareholders. It includes paid up capital and retained earnings that have been accumulated overtime. The equity capital has a residual claim on earnings and assets of the firm. The residual claim embedded in equity capital is viewed positively by other stakeholders, especially creditors, since it provides a cushion to those with superior claims.

Debt capital is contributed by the external creditors of a firm and is treated as a liability as there is an obligation to repay. Debt financing is regarded as leverage of a firm. However, there is a caveat to the concept of the leverage. The leverage can be operational as well as financial in nature. Debt financing is the financial leverage of a firm and is more sensitive for

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the solvency of the firm. This includes short-term debt, current portion of long-term debt, long-term debt, operating leases and redeemable preferred shares. It is worth noting that operating leases and pension projected benefits are off balance sheet but they also contribute similarly to that of financial leverage of the firm and require servicing of the obligation.

The use of debt in capital structure is not inherently considered bad since it increases the available financing that can be used to support growth and expansion. The key to use of leverage is that the firm is likely to generate superior revenues compared to its cost of debt financing and can service its debt commitments. Although, there is no optimal debt to equity proportion, the key is that the firm should hold as much debt as it can honour and which does not adversely impact its financial flexibility. If a firm is unable to pay its obligations, the creditors can force it to seek bankruptcy. Therefore, financial leverage is the key source of credit risk for a firm.

In this study, we aim to mimic the high leverage minus low leverage (HLMLL) factor for Pakistan to assess if financial leverage is priced in Pakistan's stock markets. Primarily, we follow the same definition of leverage as was adapted by Mirza, Saeed, and Rizvi (2013) based on long-term debt to total assets ratio. However, high financial leverage does not always translate into high risk, especially when firms have adequate coverage from business productivity and cash flow. Therefore, to judge the robustness of the leverage factor, we introduce a new measure for portfolio sorting that is based on a forward-looking probability of default. This probability of default will be estimated using the Black, Merton Scholes methodology that is an *ex ante* reflection of financial distress. Our findings confirm the presence of leverage (and financial distress) premium in Pakistan's market. The rest of the article is organised as follows. Section 2 will provide a brief literature review, section 3 explains our research methodology, results are reported in section 4 and section 5 will offer some tentative conclusions.

2. Literature review

The asset pricing models have their roots in seminal papers by Markowitz (1952), Tobin (1958), Sharpe (1964) and Lintner (1965). These propositions were largely based on a single explanatory factor for returns that provided academicians opportunity to explore the dynamics of asset pricing. The notable extensions to this early work include zero beta Capital Asset Pricing Model (CAPM) by Black (1972), Intertemporal asset pricing by Merton (1973), a consumption-based model by Breeden (1979) and arbitrage pricing theory by Ross (1976). While, these extensions explored new dimensions of asset returns, none of these examined the systematic nature of firm specific factors. Therefore, despite the relevance of financial leverage in capital structure, its role in asset pricing is not exhaustively explored. Fama and French (1992, 1995) criticised Sharpe (1964) and Lintner's (1965) single factor asset pricing model and proposed two additional systematic risk factors, namely size and value premium. They contended that these factors implicitly account for financial leverage. There has been mixed evidence on size and value premium. Some researchers like Kothari, Shanken, and Sloan (1995) and Conrad, Michael, and Gautam (2003) attribute the success of the model to survivorship bias and sorting procedures, while others like Beltratti and Di Tria (2002), Griffin (2002), etc. supported the existence of size and value premium. Al-Horani, Pope and Stark (2003) analysed the performance of a three factor model in the UK and concluded that research and development along with size and value risk factors are relevant variables for

explaining returns in the UK. However, Vassalou and Xing (2004) and Campbell, Hilscher, and Szilagyi (2008) rejected the notion of leverage pricing through size and value premium. They noted that stocks that were financially distressed offered low returns despite having higher factor loadings on market, size and value factors.

Findings by Wah Ho, Strange, and Piesse (2008) and George and Hwang (2010) reported evidence of anomalous returns for firms with high financial leverage than can be explained by traditional asset pricing models. Peterkort and Nielsen (2005) analysed the factors that could have contributed towards the existence of value premium returns. They argued that book to market is a proxy of risk premium because of its expected relationship with financial leverage.

Mirza et al. (2013) constructed a leverage factor, mimicking size and value factors sorted on the basis of financial leverage. The factor HLMML was the difference between stocks with high leverage and low leverage. Since, leverage is a source of financial risk; investors will require higher returns for investing in companies with greater financial leverage warranting a positive HLMML factor. The sample comprised of nine European countries between 1989 and 2008 and the study reported significant leverage premium for the sample stocks. The biggest challenge to size and value proposition has been from Fama and French (2015) who tested a five factor model that is augmented for profitability and investment pattern. They reported that five factor model better explain average returns of their sample portfolios compared to a three factor model.

3. Research methodology

This research is primarily aimed at evaluating the pricing of financial leverage in stock returns therefore we estimate a leverage augmented four factors model to explain variation in returns of Pakistani firms. The traditional Fama and French factors model can be represented as follows:

$$R_i - R_f = \alpha_i + (R_m - R_f)\beta_1 + SMB_t\beta_2 + HML_t\beta_3 + \varepsilon_t \quad (1)$$

where, $R_i - R_f$ denote excess returns for stock i above risk free rate, $R_m - R_f$ is the market risk premium, SMB (small minus big) captures the size premium and HML incorporates risk premia associated with growth firms. By introducing a leverage factor, the relationship between excess returns and risk factors is modelled as:

$$R_i - R_f = \alpha_i + (R_m - R_f)\beta_1 + SMB_t\beta_2 + HML_t\beta_3 + HMLL_t\beta_4 + \varepsilon_t \quad (2)$$

The HLMML factor is the difference between returns on stocks with high and low financial leverage. If financial leverage is priced, this risk factor should have significant factor loading. As only stock prices are observable we will compute daily returns for every firm in the sample. The stock returns will take the following form:

$$R_i = LN \left[\frac{P_t}{P_{t-1}} \right] \quad (3)$$

3.1 Sample selection and criteria limitation

The sample period is 13 years, from January 2001 to December 2013. The choice of this period is driven by the fact that data for Karachi Stock Exchange (KSE) is available in digital

form only for this period. Further, the active trading in KSE also took place in this period and in prior years the market was highly illiquid. For sample selection we considered all listed firms excluding financial stocks as they exhibit substantially different characteristics on book to market and leverage compared to industrial firms. The following criteria were applied for final sample selection:

1. The firms should be non-financial and must be listed for a period of two years before inclusion in the sample.
2. To avoid non synchronous returns that may bias empirical results, only those firms are considered that have at least 90% of non-zero returns in one trading year.
3. Daily market data (stock prices, market cap) and fundamental information on financials should be available.
4. To have meaningful book to market variable, all firms with negative equity will be excluded.

Based on these criteria, the distribution of sample firms for each year is presented in Table 1. These firms are comparable on the basis of asset composition, ownership structure (none of these firms are having a foreign stake of more than 10%) and business operations. This ensures that we do not have to control for any significant variation in these characteristics.

3.2 Sources of data

As returns are not directly observable, daily prices are collected from the KSE website. To estimate returns, we use a *typical price* which is the average of opening, closing, high and low for a trading day. From this average price, intraday returns will be computed for each firm during the sample period. The theoretical definition of market return includes return on a market portfolio that includes every asset. However, certain assets (like human resource) are not marketable. Therefore, to estimate market return we use a synthetic proxy (common in asset pricing literature) of KSE 100 Index. The rationale for using market index is that it is sensitive to almost all macroeconomic factors and hence any fundamental variation will result in a change in market index. The daily index prices are also populated from the KSE website. For a risk free rate we use daily overnight repo rates that have the lowest risk after government securities. We do not use treasury rates primarily because the yields on these instruments are available fortnightly and hence do not match our returns frequency. The fundamental data is extracted from published financial reports.

Table 1. YoY Sample Size 2001 to 2013.

Year	No. of Firms
2001	430
2002	452
2003	473
2004	500
2005	500
2006	480
2007	480
2008	475
2009	475
2010	508
2011	508
2012	512
2013	512

Source: Authors' estimates.

3.3 Portfolio formation

In principle this study assesses the explanatory power of a four factor model including market risk premium, size and value premium and a leverage premium. As size, value and leverage premium are the difference between small and big stocks that will have high or low book to market with high or low leverage, this will require a three-way sorting. The sorting procedure starts by estimating the median of market capitalisation. The firms above median are large firms and vice versa. Simultaneously, the same firms will be segregated into three groups for value premium sorting, with the highest 30% being classified as high, the next 40% as medium book to market, and the bottom 30% as low book to market stocks. Lastly, they will be sorted on the basis of leverage factor (both net debt to total assets and probability of default) with the median as the middle point. This will result in 2x3x2 (12) portfolios based on the three characteristics. These will be Big, High and High Leverage (BHHL), Big, High and Low Leverage (BHLL), Big, Medium and High Leverage (BMHL), Big, Medium and Low Leverage (BMLL), Big, Low and High Leverage (BLHL), Big, Low and Low Leverage (BLLL), Small, High and High Leverage (SHHL), Small, High and Low Leverage (SHLL), Small, Medium and High Leverage (SMHL), Small, Medium and Low Leverage (SMLL) and Small, Low and Low Leverage (SLLL). The stocks that are big with high book to market and high gearing are classified as BHHL. Similarly, BLLL and SMLL respectively represent firms that are big in size, low book to market, low leverage and small in size, medium book to market and low in leverage. These portfolios will be rebalanced every year based on the changes in their characteristic factors. The portfolio construction procedure is summarised in Table 2.

The number of firms in each portfolio is presented in Table 3 that is based on net debt to assets ratio and Table 4 that represents sorting on probability of default.

3.4 Variable construction

Dependent variable

In traditional asset pricing models, dependent variable is excess return, which is defined as the difference between individual (or portfolio) stock returns and risk free rate. The rationale for taking excess return is to capture the impact of taking risk since with no risk any investment should yield at minimum a return equal to the risk free rate. Any excess return should be a function of associated risk factors. The excess return will be captured as $R_i - R_f$. We use KSE 100 index returns as proxy for market portfolio.

Table 2. Portfolio construction procedure.

Market Capitalisation	Book to Market	Leverage	Portfolios
Big MV	High B/M	Low Leverage	BHLL
		High Leverage	BHHL
	Medium B/M	Low Leverage	BMLL
		High Leverage	BMHL
	Low B/M	Low Leverage	BLLL
		High Leverage	BLHL
Small MV	High B/M	Low Leverage	SHLL
		High Leverage	SHHL
	Medium B/M	Low Leverage	SMLL
		High Leverage	SMHL
	Low B/M	Low Leverage	SLLL
		High Leverage	SLHL

Source: Authors' estimates.

Table 3. Distribution of factors sorted portfolios (using financial leverage).

Year	BHLL	BHHL	BMLL	BMHL	BLLL	BLHL	SHLL	SHHL	SMLL	SMHL	SLLL	SLHL	Total
2001	31	30	35	37	42	35	45	40	45	35	30	25	430
2002	36	37	38	42	40	39	41	38	42	36	33	30	452
2003	38	40	38	42	40	39	43	42	45	42	35	29	473
2004	41	40	40	38	44	43	46	48	50	45	36	29	500
2005	41	40	40	38	44	43	46	48	50	45	36	29	500
2006	39	41	40	40	42	42	44	46	42	38	36	30	480
2007	39	41	40	40	42	42	44	46	42	38	36	30	480
2008	38	40	39	38	41	40	42	45	40	40	40	32	475
2009	38	40	39	38	41	40	42	45	40	40	40	32	475
2010	43	46	42	44	44	44	43	42	44	42	42	32	508
2011	43	46	42	44	44	44	43	42	44	42	42	32	508
2012	44	47	40	43	44	45	42	44	42	42	44	35	512
2013	44	47	40	43	44	45	42	44	42	42	44	35	512
Total	515	535	513	527	552	541	563	570	568	527	494	400	

Source: Authors' estimates.

Table 4. Distribution of factors sorted portfolios (using probability of default).

Year	BHLL	BHHL	BMLL	BMHL	BLLL	BLHL	SHLL	SHHL	SMLL	SMHL	SLLL	SLHL	Total
2001	35	32	34	39	40	32	46	37	43	37	34	21	430
2002	32	37	42	40	38	35	47	37	40	36	33	35	452
2003	37	38	36	40	38	37	45	45	47	44	36	30	473
2004	45	39	38	42	48	46	40	41	53	46	34	28	500
2005	45	39	38	42	48	46	40	41	53	46	34	28	500
2006	36	41	40	42	45	40	42	44	46	38	35	31	480
2007	36	41	40	42	45	40	42	44	46	38	35	31	480
2008	36	42	37	36	40	35	45	48	36	40	44	36	475
2009	36	42	37	36	40	35	45	48	36	40	44	36	475
2010	40	42	40	44	40	47	47	45	47	40	40	36	508
2011	40	42	40	44	40	47	47	45	47	40	40	36	508
2012	40	46	42	43	41	44	46	45	43	41	46	35	512
2013	40	46	42	43	41	44	46	45	43	41	46	35	512
Total	498	527	506	533	544	528	578	565	580	527	501	418	

Source: Authors' estimates.

Independent variables

We will use the following variables as explanatory risk factors for our leverage based risk pricing.

i. Market risk premium

The first explanatory factor is market risk premium of CAPM. This will be calculated as the difference between market return and risk free rate. It represents additional returns an investor can earn by investing in a fully diversified market portfolio instead of an individual security or a synthetic portfolio.

ii. Firm size premium – Small Minus Big (SMB)

The SMB factor takes into account the risk associated with size of a firm. This is computed as the difference between returns on stocks having low (small) and high (big) market capitalisation. The size factor is created on the basis of market capitalisation (calculated as average share price for the year times number of share outstanding). Small stocks will be those that will have market capitalisation less than the median market capitalisation for the whole sample while large stocks will be one with market capitalisation more than median size. SMB will be computed as different between average of stocks with small and big market capitalisation. For our 12 portfolios it will be:

$$\text{SMB} = \frac{(\text{SHHL} + \text{SHLL} + \text{SMHL} + \text{SMLL} + \text{SLHL} + \text{SLLL})}{6} - \frac{(\text{BHHL} + \text{BHLL} + \text{BMHL} + \text{BMLL} + \text{BLHL} + \text{BLLL})}{6} \quad (4)$$

iii. Book to market premium – High Minus Low (HML)

Book to market ratio is used to distinguish between value and growth firms. Firms with high book to market ratio are value stocks which have entered maturity phase or expected to do so very soon. Such firms have stable cash flows and are likely to offer modest returns to the shareholders. On the contrary, firms with low book to market value are termed as growth stocks with significantly more cash flows than value firms. Since, underlying fundamentals are likely to remain low for value firms, investors demand premium to invest in such firms. Similar to SMB, this factor is also constructed by ranking all firms on their book to market values. However, we classify them into three categories. Firms that are in the top 30% rank with respect to book to market are classified as High (H), those in the middle 40% will be termed as Medium (M) and lastly the bottom 30% will be referred as Low (L) book to market firms. The HML factor will be the difference between average high and low book to market firms. Mathematically this can be represented as:

$$\text{HML} = \frac{(\text{BHHL} + \text{BHLL} + \text{SHHL} + \text{SHLL})}{4} - \frac{(\text{BLHL} + \text{BLLL} + \text{SLHL} + \text{SLLL})}{4} \quad (5)$$

iv. Financial leverage premium – High Leverage Minus Low Leverage (HLMLL)

Following Mirza et al. (2013), we mimic the leverage factor as the variation between returns on high leverage firms, and those which possess low leverage. As financial debt warrants fixed obligations, it is a source of financial risk for a firm with high leverage, resulting in a loss of financial flexibility and discretionary rights on the free cash flows of the firms. Therefore, investors are likely to demand risk premium when investing in firms with high leverage. We define financial leverage as the proportion of long-term financial debt (including lease obligations), short-term financial obligations (credit lines, overdrafts, working capital financing etc.) to total assets and the current portion of long-term debt. Once, this measure is computed, the firms will be ranked and we classify firms above medium as High Leverage Firms and firms below medium as those having low leverage. The leverage factor (HLMLL) will be the difference between firms of high financial leverage (or financial distress as alternate definition) and low financial leverage. This is calculated as:

$$\text{HLMLL} = \frac{(\text{SHHL} + \text{BHHL} + \text{SMHL} + \text{BMHL} + \text{SLHL} + \text{BLHL})}{6} - \frac{(\text{SHLL} + \text{BHLL} + \text{SMLL} + \text{BMLL} + \text{SLLL} + \text{BLLL})}{6} \quad (6)$$

For robustness of leverage factor, we introduce another sort based on financial distress. This is based on probability of default under asset value model using option pricing framework. In case of Pakistan only Afzal and Mirza (2012) attempted to estimate an *ex ante* probability of distribution for Pakistan's commercial banks in reference of interest rate spreads. However, our sample comprises non-financial firms only therefore we modify their methodology to suit our sample.

In an option pricing setting, equity of a firm acts as an option (call) on the assets having a strike price equivalent to amount of debt repayments and maturity equal to that of financial debt. Any firm will be distant from distress (solvent) as long as there are sufficient resources to repay (total assets exceeding total liabilities). The only caveat to this approach is that from a solvency perspective, market value of assets is relevant, which is not always observable. To estimate the *ex ante* market value of assets we follow an iterative process. If market values are stochastic in nature, the assets will follow a geometric Brownian motion of the following form:

$$dV_A = \mu V_A dt + \sigma_A V_A dw \quad (7)$$

In this equation, V_A represents market value of assets; μ is likely variation in that value having a standard deviation of σ_A . Being stochastic in nature, W is a standard Weiner process. Assuming that equity of the firm is V_E along with financial commitments of X that will mature in time T , an economic riskless of r with a density function N , we can model value of equity as:

$$V_E = V_A N(d_1) - X e^{-rT} N(d_2) \quad (8)$$

$$\text{with } d_1 = \frac{\ln(V_A/X) + (r + 1/2\sigma_A^2)T}{\sigma_A \sqrt{T}}, \text{ and } d_2 = d_1 - \sigma_A \sqrt{T} \quad (9)$$

However, comparing equations for value of assets and equity, we encounter problem of two unknowns (If value of assets is not known, it is not possible to compute standard deviation). To solve this, we adapt an iterative process. As the sample firms are listed with active trading, we calculate standard deviation of equity for trailing 12 months. This is used as proxy for standard deviation in assets and we calculate daily market value of assets. Once we get the market value of assets, we recalculate the standard deviation of assets. The process will be repeated till standard deviation of equity from first pass and standard deviation of assets in the second pass converge within 0.0001. The converged standard deviation is treated as volatility in assets and is used as final input for estimating true market value of assets. Using these estimates, probability of default can be calculated as:

$$PD = 1 - N \left[\frac{\ln \left(V_{Ai}/X_i \right) + \left(r + 1/2\sigma_{Ai}^2 \right) T}{\sigma_{Ai} \sqrt{T}} \right] \quad (10)$$

Once PD is estimated for all sample firms the sorting is done using median for the sample with firms having greater PD than median as ones with greater financial distress and vice versa.

4. Empirical results and discussion

The descriptive statistics of sorting variables are presented in Table 5, 6, 7 and 8. The average firm size based on market capitalisation has been increasing from PKR 382Mln in 2001 to over 1Bln in 2013. It must be noted that average number of listed firms in these years has not increased substantially with few seasoned offerings and hence the increase in market capitalisation is mainly due to increase in market prices. This should be also evident from the level of representative index KSE 100 that increased by 16x during our sample period. KSE 100 was at 1500 on January 1, 2001 and closed at above 25,000 on December 31, 2013. It must be noted that this price appreciation went through some turbulent years mainly between 2007 and 2009 when average market capitalisation witnessed a significant decline from the previous periods. In these years marked to market positions of investors took a significant hit, eroding all unrealised gains. The later years witnessed a recovery that is apparent from our descriptive statistics on market capitalisation.

The average book to market ratio for our sample stocks remained range bound between 0.43 and 0.62. The range is not surprising for an emerging market with high volatility where deviation from fundamental values is frequent. The average low book to market ratio depicts concentration of growth stocks which further establishes the case of value premium. The growth stocks offer an upside potential for the investors owing to firms' expected cash flows while value stocks are likely to offer lower future benefits. Therefore, with more growth stocks available, investors are likely to invest in value firms by requiring a risk *premia* warranting its systematic pricing in asset returns.

The descriptive statistics on financial distress factors are interesting with average net debt to total assets ranging between 41.63% and 48.54% for the sample period of 14 years. It represents a low variation in use of debt financing by the listed firms in Pakistan. This is not surprising for at least two reasons. Firstly, in some of the sectors, financial debt is

Table 5. Descriptive statistics: firm size based on market capitalisation (PKR in millions).

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Median	69.38	86.06	87.76	98.86	115.80	132.64	107.76	125.52	178.22	151.40	148.72	161.69	182.77
Average	382.15	379.95	434.07	429.54	548.81	848.87	685.61	550.39	681.93	782.26	894.78	850.20	1059.53
Std Dev	237.21	266.68	284.18	283.07	383.60	601.39	681.60	751.61	629.13	819.86	672.23	527.01	619.95

Source: Authors' estimates.

Table 6. Descriptive statistics: book to market ratio.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Median	0.42	0.38	0.43	0.45	0.52	0.42	0.51	0.47	0.43	0.33	0.39	0.34	0.42
Average	0.55	0.47	0.55	0.57	0.62	0.47	0.59	0.57	0.54	0.43	0.50	0.46	0.53
Std Dev	1.01	0.62	0.46	0.39	0.42	0.28	0.41	0.52	0.45	0.45	0.47	0.46	0.47

Source: Authors' estimates.

Table 7. Descriptive statistics: net debt to total assets (%).

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Median	42.75	44.57	46.00	48.01	46.26	44.12	42.87	41.90	40.86	41.60	40.55	38.55	41.38
Average	44.10	45.72	47.01	48.54	47.89	46.04	45.23	45.97	45.54	47.60	44.01	41.63	43.78
Std Dev	25.66	25.04	25.72	26.75	27.62	26.84	26.09	27.64	32.47	31.78	29.65	28.40	31.31

Source: Authors' estimates.

Table 8. Descriptive statistics: probability of default (%).

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Median	1.52	2.03	1.51	1.97	1.77	1.56	2.13	1.77	1.58	1.87	1.53	2.26	1.95
Average	2.02	1.86	1.98	2.70	2.12	2.38	3.27	3.46	3.71	2.80	2.39	2.16	2.65
Std Dev	0.05	0.59	0.63	0.81	0.24	0.85	0.97	0.45	0.95	0.09	0.44	0.19	0.59

Source: Authors' estimates.

non-existent and given their strong cash flows, growth can be sustained through internal sources. Secondly, the economic cycle in Pakistan is not very volatile and no extra ordinary opportunities emanate, that may warrant a substantial increase in gearing. However, with firms in the sample having net debt to total assets of over 70% (one standard deviation from the average), we expect pricing of leverage in portfolio returns that are sorted for financial leverage.

The estimated average probability of default has also remained stagnant in proximity of 2% with the exception of 2007 to 2009, when it was substantially over 3%. This period, marked by a global depression owing to subprime crisis and Pakistan's economy, albeit minimal, experiences some spill over shocks. Further, stock prices also experienced a sharp decline in these years, which consequently increased the calculated probability of default. The average statistics on likelihood of default are more volatile than the book based debt to total assets ratio indicating that financial distress can increase or reduce, despite the level of financial leverage. For example, average gearing in 2006 was 46% with an estimated probability of default of 2.38% and despite a slight reduction in net debt to total assets to 45.2% in 2007, the probability of default mounted to 3.27%. Similarly, from 2009 to 2010 gearing increased from 45% to 47% but probability of default reduced from 3.71% to 2.8%. Therefore, factor constructed on likelihood of default is likely to better capture distress premium compared to net debt to total assets.

The empirical results for four factors model are presented in Table 9 and 10 for the 12 portfolios that were created at the intersection of size, book to market and financial distress. Table 9 represents regression results for portfolios that were sorted using net debt to total assets, as a proxy for gearing premium, while Table 10 reports results for portfolios where leverage risk was based on *ex ante* probability of default. The loadings on market risk premium were insignificant for all portfolios. This depicts that the notion of market risk proposed by Sharpe (1964), was not priced in the stock returns for our sample period and firms. These findings on market risk are consistent with Mirza and Shahid (2008) and Rehman and Mirza (2013) who reported insignificant coefficients for market risk suggesting that such a premium is not priced in time series of stock returns in Pakistan. The coefficients on SMB are significant with negative loadings for portfolios with big firms and positive coefficients for small firms' portfolios. This indicates evidence of size premium in the KSE with investors requiring higher returns for small firms. All these coefficients are significant at 99% except for SMHL and SLLL portfolios which are significant at 95%. These findings on size premium were robust for both our definitions of financial leverage. The signs remained consistent on SMB factor for all portfolios that were sorted on probability of default for financial distress. The significance of coefficients on SMHL and SLLL also increased to 99%.

Our findings further support evidence of value premium for our sample portfolios. We report positive coefficients for HML factor for all four portfolios that had stocks with high book to market ratio, and negative for all portfolios with low book to market ratio. These signs are consistent with rationale of value premium as investors would require higher returns to invest in value stocks compared to growth firms. All coefficients were significant at 99% and with robust results for the regression using probability of default sorting. Our findings on size and value premium are principally in line with those reported by Mirza and Shahid (2008) who suggested pricing of size and value effect in the KSE. However, our evidence is stronger than what was reported earlier depicting that the magnitude of pricing of size and value premium has increased over time. It must be noted that our sample

Table 9. Four factor regression on portfolios sorted for size, book to market and leverage (net debt to total assets).

	α	β_1	β_2	β_3	β_4	$t(\alpha)$	$t(\beta_1)$	$t(\beta_2)$	$t(\beta_3)$	$t(\beta_4)$	R^2	D-W Stats
BHLL	-0.175	-0.852	-0.602	0.732	-0.811	-0.441	-1.627	-4.811	7.916	-4.040	0.424	2.083
BHHL	-0.166	-0.374	-0.751	0.810	0.858	-0.470	-0.637	-5.348	7.802	3.808	0.598	2.097
BMLL	0.111	-0.514	-0.625	-0.058	-0.265	0.298	-0.920	-4.679	-5.858	-2.538	0.302	1.992
BMHL	-0.011	-0.244	-0.676	-0.166	0.661	-0.029	-0.426	-4.939	-5.109	3.771	0.383	2.042
BLLL	0.312	-0.126	-0.631	-0.943	-0.831	0.818	-0.231	-4.840	-9.790	-3.975	0.478	2.089
BLHL	-0.037	-0.276	-0.751	-0.684	0.549	-0.103	-0.483	-5.483	-6.757	4.401	0.517	2.049
SHLL	-0.042	-0.146	0.092	0.910	-0.710	-0.118	-0.251	6.639	8.854	-3.184	0.596	2.031
SHHL	0.336	-0.428	0.143	0.860	0.674	0.917	-0.754	2.498	8.580	3.099	0.402	2.037
SMLL	0.065	0.020	0.030	-0.066	-0.857	0.186	0.034	2.125	-6.229	-3.743	0.350	2.000
SMHL	-0.003	-0.435	0.026	-0.024	0.822	-0.009	-0.788	1.944	-2.444	3.883	0.372	2.035
SLLL	-0.237	-0.769	0.025	-0.884	-0.780	-0.690	-1.271	1.737	-8.276	-3.363	0.284	2.088
SLHL	-0.085	-0.628	0.238	-0.658	0.922	-0.234	-1.094	3.635	-6.488	4.186	0.280	1.997

$\beta_1, \beta_2, \beta_3$ and β_4 refer to factor loadings on market risk, size, value and leverage premium respectively Level of Significance refer to 99% for $|t| > 2.33$ and 95% for $|t| > 1.96$. Source: Authors' estimates.

Table 10. Four factor regression on portfolios sorted for size, book to market and financial distress.

	A	β_1	β_2	β_3	β_4	$t(\alpha)$	$t(\beta_1)$	$t(\beta_2)$	$t(\beta_3)$	$t(\beta_4)$	R^2	D-W Stats
BHLL	0.246	-0.234	-0.924	0.691	-0.562	0.727	-1.329	-23.331	12.920	-14.387	0.551	2.053
BHHL	0.265	-0.092	-0.901	0.616	0.677	0.982	-0.539	-23.604	11.958	17.999	0.652	2.048
BMLL	-0.109	-0.064	-0.967	-0.585	-0.209	-0.400	-0.449	-30.377	-13.607	-6.664	0.549	1.994
BMHL	0.415	0.025	-1.014	-0.694	0.326	1.581	0.181	-32.969	-16.718	10.759	0.610	2.048
BLLL	-0.423	0.115	-0.968	-0.208	-0.194	-1.509	0.789	-29.465	-4.690	-5.981	0.497	2.092
BLHL	0.334	0.183	-0.912	-0.335	0.338	1.163	1.223	-27.121	-7.381	10.188	0.572	2.058
SHLL	0.069	0.237	0.031	0.478	-0.415	0.253	1.665	9.645	11.071	-13.148	0.597	2.017
SHHL	-0.435	-0.121	0.238	0.706	0.650	-1.230	-0.656	5.738	18.997	15.918	0.419	1.985
SMLL	0.215	-0.225	0.346	-0.736	-0.726	0.740	-1.151	7.878	-18.682	-16.785	0.456	2.039
SMHL	-0.341	0.054	0.078	-0.803	0.960	-0.991	0.302	2.638	-22.231	24.194	0.536	1.987
SLLL	0.766	0.104	0.096	-0.216	-0.518	0.660	0.692	2.843	-4.741	-15.564	0.465	2.088
SLHL	0.489	0.116	0.125	-0.439	0.425	1.573	-0.713	3.424	-2.793	11.832	0.361	1.995

$\beta_1, \beta_2, \beta_3$ and β_4 refer to factor loadings on market risk, size, value and financial distress premium respectively Level of Significance refer to 99% for $|t| > 2.33$ and 95% for $|t| > 1.96$. Source: Authors' estimates.

size and time span is sufficiently larger than Mirza and Shahid (2008), that to date was the only study exploring SMB and HML factors in Pakistan. One of the notable findings from our research is little relevance of market risk premium. These results are comparable with other findings on emerging and developed economies. Aleati, Gottardo, and Murgia (2000) reported presence of weak market risk premium for Italian stocks while recognising significant loading on size and value factors. Connor and Sanjay (2001) also pointed out that for Indian firms, beta is a weak proxy of risk. Mirza and Afzal (2011) also highlighted the inability of market risk premium to explain stock returns in fifteen European countries. The evidence of weaker (or no) existence of market risk premium indicates that global investors are more concerned about firm level sensitivities and believe them to be systematic in nature.

The results on leverage and financial distress factors are interesting to note. We find significant coefficients for the HLMLL factor with positive factor loadings for portfolios with firms that had high leverage, and negative for firms with relatively lower financial leverage. All coefficients were statistically significant at 99%. Similar findings are reported when we used an alternate definition of financial distress. The portfolios sorted on probability of default not only demonstrate existence of distress premium but also display increased significance. Further, as can be seen from Table 10, adjusted R^2 for all regressions also increased for probability of default portfolios representing that portfolios sorted on financial distress better explain the pricing of portfolio returns. Lastly, Durbin Watson statistics for all regressions indicate no evidence of serial correlation between the time series variables.

These findings have interesting implications vis-à-vis asset pricing foundations. Firstly, we confer with the general findings of Mirza et al. (2013), Campbell et al. (2008) and Vassalou and Xing (2004) who contended that financial leverage is systematic in nature and priced in stock returns. Secondly, our results also support their notion that if SMB and HML factors implicitly accounts for gearing or financial distress then either the proxy of leverage or distress premium should be insignificant or by inclusion of a new factor, size and value factors should lose their significance, which is clearly not the case. Lastly, our findings are more robust than Mirza et al. (2013) because in addition to a book based measure of financial leverage, we attempted to proxy financial distress through an *ex ante* probability of default that improved the significance of our findings.

5. Conclusion

Asset pricing models are aimed at explaining the factors that contribute towards expected returns on investments. Although a consensus exists that only systematic factors will be priced, the controversy pertaining to which factors are relevant continues to exist. The empirical evidence on various asset pricing propositions is largely mixed with varying results across sample economies and time frames. This makes it difficult to specify few definite factors that will always contribute towards pricing of risk.

In this research we used an augmented Fama and French factor model, to examine the relevance of financial leverage and default likelihood for asset pricing in an emerging economy. As a result, we can highlight three important findings. Firstly, our results failed to deduce any support in favour of CAPM based risk premium. As highlighted, this is in line with recent findings in other economies. Secondly, we find strong significance of size, value and firm specific financial risk premium in stock returns. Lastly, we confer that size and value premium are specific risk factors that do not implicitly or explicitly proxy firm

specific credit risk. These factors should be assessed by examining gearing, or more appropriately an *ex ante* probability of default.

On conceptual grounds, these findings should not be surprising because a firm's size and its business cycle may represent some level of financial risk but that is not always the case. A firm with large market capitalisation may be technically solvent but it may face cash flow insolvency if there are insufficient free cash flows for fixed coverage. Similarly, a growth stock may not always face credit pressures especially if it has ample financial flexibility. Therefore, a proxy that is directly linked with financial leverage or likelihood of distress is expected to capture the relevant risk which is evident from our findings.

While this study essentially focused on Pakistan's capital market, the results are of relevance to other developing markets. This is because most of these economies have at least two homogeneous characteristics. They are subject to cyclical cash flows which pose pressure on debt servicing inflating the financial risk of a firm. Similarly, the lower recovery rates on account of weak litigation systems also contribute towards increased risk emanating from gearing. The asymmetries dominating financial markets will push investor to demand a risk premium for investing in a firm with higher default risk. As we hypothesise these results to be generally valid for most developing economies, a possible extension of this research is to test our proposition in various markets on an individual level as well as by forming a global portfolio as proposed by Mirza and Afzal (2011). One final contribution of our study is to integrate credit risk with market risk by adapting probability of default for our estimations that have been previously used only in context of credit risk management.

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No potential conflict of interest was reported by the authors.

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