DO MACROECONOMIC FACTORS IMPACT CORPORATE DEBT? EVIDENCE FROM INDIA

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ABSTRACT

We study the impact of macroeconomic factors on corporate debt in India during April 2000 to March 2018 period using quantile regression. Our quantile regression outcomes reveal that the impact of consumer price index on corporate debt is significant and positive across the quantiles. However, the wholesale price index has a significant and negative impact on debt level. Interest rate and exchange rate do not show similar impact across the quantiles. In this paper, the results of quantile regression are also compared with ordinary least squares regression. The results of ordinary least squares regression indicate that all macroeconomic factors under study affect the corporate debt level.

Contribution/ Originality
This research is the first application of QR approach to study the effects of macroeconomic factors on corporate debt level in India. On the basis of results, this study gives some concrete suggestions to the corporate sector. First, companies should consider CPI and WPI while raising debt and second, companies should raise debt carefully using the IR and ER.

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1. INTRODUCTION

A financing choice plays a pivotal role in corporate governance and future development of a company. A key issue faced by managers is the financing decision. The question of capital structure relevance is first discoursed by Franco and Merton (1958). Several inside and outside elements can impingements the capital structure (mingle of equity and debt) of a company. A company can manage internal factors and their impact. In contrast, macroeconomic factors cannot be managed. Thus, capital structure choice is dictated by the macroeconomic factors as well. Moreover, a wide range of empirical research in this area done in developed countries confirms the impact of macroeconomic factors on capital structure choice (e.g. Korajczyk and Levy, 2003; Levy and Hennessy, 2007; Mokhova and Zinecker, 2014).

India is the fastest growing economy and thus borrowing decision of Indian companies is becoming one of the most central ingredients of capital structure. Indian corporate firms have more options in choosing their capital structure after the financial sector reforms in India. The cognition about the grade, way and power of internal and external constitutes gives supportive information for taking effective decision about capital structure. Therefore, it is crucial to work on the dependence construction between macroeconomic components and debt level of Indian companies.

This concern may lead to framing the following unanswered questions which can be addressed on: Do macroeconomic factors under consideration impact debt level of companies in India? Is there any symmetric or asymmetric dependence of the corporate debt for each one factor? To answer these questions we break down the impact of macroeconomic factors on the debt with regards to Indian companies using quantile regression (QR) methodology (Koenker and Bassett, 1978). We adopt a different approach in this paper than the one used in the empirical studies mentioned above. The QR allows ones to canvass the conditional dependence of stated quantiles of corporate debt in Indian companies with respect to the conditioning factors. To measure the impact on corporate debt (CD), we take the consumer price index (CPI), the wholesale price index (WPI), the exchange rate (ER) expressed in U.S. Dollars to Indian Rupees and the lending interest rates (IR) as the explanatory variables.

We show that the corporate debt of Indian companies is influenced by the OLS dependent variables, namely, WPI and ER. In contrast, there is an insignificant relationship between CPI, IR and corporate debt. The result of quantile regression varies across different quantiles.

Therefore, the main contribution of this study to the existing literature may be that this is the first act of using the QR method for the purpose of studying the effects of macroeconomic factors on debt of Indian companies, to the best of our knowledge.

The balance paper is framed as follows. Section two provides a literature review in connection with determinants of capital structure. Section three shows methodology employed in this paper. Section four presents data and variables. Section five illustrates analysis of results and discussion. Finally, section six makes concluding input on the paper.

2. LITERATURE REVIEW

Several studies are done worldwide at different point of time and under different circumstances on how the capital structure is explained by the company-specific factors. Friend and Lang (1988) reveal that the debt ratio is negatively associated with management's shareholding. Jahera and Lloyd (1996) find that the type of asset, firm's diversification and the alternative tax shields are the most influential factors affecting corporate debt level. Dalbor and Upneja (2002) show that higher long-term debt ratios and the probability of bankruptcy hold positive correlation with firm size. Firms with growth opportunities have less long-term debt. The effective tax rates have no significant

impact on the use of long-term debt. Lim (2012) finds a positive relationship between leverage and firm size with regards to the Chinese financial services publicly listed firms. They also pointed that the profitability, earnings volatility, non-debt tax shields, non-circulating shares goes down with an increase in leverage.

In Indian context, a number of previous studies also explain impact of company specific factors on capital structure. Sharma (2018) finds that profitability, age, size, tax shield and debt service capacity growth have a significant impact on real estate companies' financial leverage. Mokhova and Zinecker (2014) reveal that size, growth, cash flow, product and industry characteristics affect the optimal capital structure choice. Handoo and Sharma (2014) concludes that there is a significant impact of factors such as profitability, growth, asset tangibility, size, cost of debt, tax rate, and debt serving capacity on the leverage structure. Chakrabarti and Chakrabarti (2019) find the asset turnover ratio, age, size and liquidity are the significant causal factors of capital structure of Indian energy companies. In contrast, profitability, debt service capacity, tangibility ratio, non-debt tax shield and sales growth are insignificant determiner. Sinha and Ghosh (2010) study adjustments speed of macroeconomic variables in capital structure choice. They stretch the study of Drobetz and Wanzenried (2006) and use a Dynamic Partial Adjustment Model. Recapitalization policy of companies permits dynamic adjustments in leverage revision through the target leverage and the adjustment-speed. Jain and Karmakar (2018) show that 57 Indian non-financial service sector companies' capital structure decision is explained by the pecking order theory.

Few studies focus on macroeconomic variables and capital structure. Korajczyk and Levy (2003) demonstrated the influence of macroeconomic stipulations on capital structure choice. They also examine the factors affecting financial choices when firms make substantial changes in capital structure. Levy and Hennessy (2007) explains the heterogeneousness in funding practice over the business cycle. They also explain the reason for different behavior of firms. Mokhova and Zinecker (2014) study the influence of fiscal and monetary policies on capital structure in emerging and developed markets. They show the significant influence of macroeconomic factors on capital structure and financing sources. Dias et al. (2009), Bokpin (2009) and Camara (2012) also show the relationship between macroeconomic factors and capital structure. Sinha and Ghosh (2014) examine dynamics with interconnected fittings of corporate capital structure.

The QR methodology is adopted in the other field of finance. For example Allen et al. (2015) and Bassett and Chen (2001) for asset pricing model, Engle and Manganelli (2004) and Rubia and Sanchis-Marco (2013) for value at risk estimation and Gebka and Wohar (2013) and Mensi et al. (2014) for stock market return.

Nonetheless, we find no study that look into the impact of macroeconomic elements on corporate debt using QR methodology in Indian context. The survey of relevant literature suggests the dearth of studies that explore the relationship between macroeconomic factors and corporate debt. We fill these gaps in this research paper and extend the literature.

3. METHODOLOGY

Regression analysis is helpful to find the association between a dependent variable and explanatory variables. The Ordinary Least Square (OLS) regression is handy for the approximation of the conditional mean and conditional median. However, it provides a sketchy description of a conditional distribution (Mosteller and Tukey, 1977). We cannot employ OLS regression when our analysis attempts to extend towards the extremes of a dataset or beyond median because it is not efficacious for under such condition. The QR is proposed by Koenker and Bassett (1978). QR cannot keep sameness in the response of the dependent variable throughout its different quantiles (e.g. median); thus we can reach a finer account regarding the impact of macroeconomic factors on

the corporate debt. The figure may alter from 0 to 1 with each quantile. QR brings out the full distribution of the corporate debt conditional on the macroeconomic factors.

The QR model of Koenker and Bassett (1978)[1] can be written as

$$y_i = x'_i \beta_\theta + u_{\theta i} \text{ with } Q_\theta(y_t | x_t) = x'_t \beta_\theta \quad \text{................................. (1)}$$

Where x'_t indicates a vector of regressors, β_θ denotes the vector of parameters to be estimated, and $u_{\theta i}$ represents a vector of residuals. $Q_\theta(y_t | x_t)$ denotes the θth conditional quantile of y_i granted x'_i.

The approximation of β_θ is supported on the under mentioned optimization problem[2]:

$$\beta_\theta = \text{argmin}_\beta$$
$$\left\{ \sum_{t:yt>x'_t \beta} \theta |y_i - x'_i \beta| + \sum_{t:yt>x'_t \beta} (1-\theta) |y_i - x'_i \beta| \right\} \quad \text{................................. (2)}$$

A linear programming representation via the simplex algorithm or the generalized method of moments framework can be apply to solve the optimization problem (Brooks, 2014). The median regression is received by placing $\theta = 0.5$. Other quantiles of the conditional distribution can be found through variations of θ. The results for the 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 quantiles express gumption for the relationship of selected explanatory variables across the total conditional corporate debt distribution. In this paper, we go for the bootstrap method exemplified in Buchinsky (1995) to hold approximations of the standard errors for the coefficients in quantile regression. Further, it is useful for a comparatively minor sample size.

The under mentioned is the introductory model of this research:

$$CD = \alpha + \beta_1 CPI + \beta_2 WPI + \beta_3 IR + \beta_4 ER + \varepsilon$$

4. DATA AND VARIABLES

We empirically study how the macroeconomic factors affect the corporate debt using the quarterly data from April 2000 to March 2018. The variables include: (i) consumer price index; (ii) wholesale price index; (iii) lending interest rate[3] ; and (iv) exchange rate (expressed in U.S. Dollars to Indian Rupees). The corporate debt comprises the total debt (secured + unsecured borrowings) of twenty three companies listed in Bombay Stock Exchange SENSEX.[4] The total debt of seven banks is excluded from the dataset. Corporate debt data are collected from the quarterly results of respective company and the website of Moneycontrol[5]. The data of CPI, WPI and ER are captured from the FRED database. The 'Handbook of Statistics on the Indian Economy' published by Reserve Bank of India is used to collect the lending IR data.

We select these factors based on their applicability for the debt in Indian companies. Credit and reinvestment risks get influenced due to the expectation of changes in inflation rate. Some countries use WPI to measure inflation in the country and some countries like India use CPI. WPI is used to measure average varies in price in the sale of goods or services by the whole seller and CPI measures alter in the price of a sale of goods or services sells directly to consumers. It is difficult to obtain a loan during high interest rates. But consumer spending may be spurred during low interest rates and

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[1] For more information about QR, refer to Koenker and Bassett (1978).
[2] See Buchinsky (1995) for further details on QR.
[3] The lending rates data are of five major banks from public sector up to 2003-04. While for the later period, it is related to five major banks.
[4] BSE SENSEX is a free- float market weighted index of financial sound and well established thirty companies in the India.
[5] Visit www.moneycontrol.com

Table 1: Descriptive statistics, unit root test and stationarity

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	JB	ADF	PP	KPSS
									Unit root		
CD	398449	338343	1195818	76537.3	333064	1.06771	0.11319	0.0058***	2.050611	4.4449	1.06916
CPI	67.5126	60.0893	112.783	36.5662	26.2294	0.40961	-1.3716	0.0000***	0.9596	0.9981	1.15432
WPI	65.5	56.8728	106.815	34.5566	27.4933	0.33451	-1.5485	0.0000***	0.6972	0.9764	1.14176
IR	10.7724	10.625	14.125	7.875	1.9117	0.25338	-0.7608	0.0931**	0.7013	0.6933	0.61037
ER	51.8208	47.22	68.3734	41.1774	8.89234	0.74209	-1.0512	0.0005***	0.9733	0.9782	0.92263

**p < 0.05 and ***p < 0.01

Table 2: Empirical results for determinants of corporate debt

	OLS	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
α	140200.8	-696899.3***	-673062.3***	-695026.5***	-784095.3***	-717981.8***	-395508.5***	-444100.7*	-444100.7**	24742.57
	(0.093)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.064)	(0.018)	(0.905)
CPI	48203.35***	36628.65***	35833.82***	54288.49***	51763***	50350.32***	50542.53***	49258.76***	49258.76***	31400.08***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
WPI	-35942.02***	-25083.1***	-24843.61***	-40597.97***	-38326.3***	-38282.71***	-37717.86***	-37693.74***	-37693.74***	-18472.38***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
IR	-9166.199*	6487.903***	3678.487***	-1895.512***	1805.011	-3485.808	-15051.36***	-13370.13	-13370.13	-30721.07***
	(0.069)	(0.000)	(0.365)	(0.745)	(0.786)	(0.569)	(0.008)	(0.218)	(0.114)	(0.002)
ER	3296.243*	2693.832***	3604.589***	1560.489***	3059.078	4971.596**	407.3823	3002	3002	-2311.859
	(0.089)	(0.000)	(0.023)	(0.486)	(0.235)	(0.037)	(0.848)	(0.471)	(0.354)	(0.526)

* Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level

low interest rates can help business to expand and grow. The appreciation and depreciation in the exchange rate affect the company's import and export and consequently corporate debt. In this context, we expect the movements in macroeconomic variables have an important influence on the debt level of Indian companies.

5. EMPIRICAL RESULTS

5.1. Analysis of statistical properties
The mean value of all the variables is more than the median. Therefore, the variables appear to be skewed to the right. Kurtosis value for all the explanatory variables is less than 0. Thus it considers being a "light-tailed" dataset. Therefore, the result of the Jarque-Bera test indicates that all the variables do not follow normality. Finally, we use the conventional Augmented Dickey and Fuller (ADF) and Phillips and Perron (PP) statistics to test the null hypothesis of a unit root and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test for test the stationarity property under the null. All the variables are found to have a unit root. Hence, the stationarity is confirmed by including these variables in the first differences (Table 1).

We employ the Variance Inflation Factor (VIF) to check the state of multicollinearity. Since the VIF values for all the variables found to be less than 2, multicollinearity is not noticed.

5.2. Analysis of determiner of corporate debt
Table 2 illustrates the results of estimated coefficients for CPI, WPI, IR and ER at the 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 quantiles. The OLS results reveal that CPI has a positive and significant impact on corporate debt. This finding is similar to Dias *et al.* (2009). The CPI influence positively in emerging countries and Germany, while Greece and France are negatively influenced (Mokhova and Zinecker, 2014). On the other hand, the other inflation index that is WPI has a negative impact with high degree of significance. The IR indicates negative and the ER show positive impact on corporate debt. However, there is no powerful relationship between IR, ER and corporate debt.

The results of the quantile regression are more complicated and mixed. Further, the CPI is positive with a high degree of significance for all quantiles. The co-movement between the CPI and the corporate debt escalate from the lower to the upper quantiles. The quantile estimated coefficients for the CPI show positive sign. Thus, corporate debt increases with the increase in the CPI.

Further, the WPI has a significant and negative influence across the quantiles. It is remarkable to mention that the two inflation indices (CPI and WPI) indicate opposite results.

Moreover, the quantile regression outcomes reveal that values of the approximated coefficient on the ratio of IR over the corporate debt distribution are different. There is a significant impact of IR on the lower quantiles. The results of intermediate and upper quantiles reveal that the IR has a statistically significant influence on corporate debt at 0.6 and at the end of the quantile (0.9). The QR results unveil that the impact of IR on corporate debt is positively charged at 0.1, 0.2 and 0.4 quantiles. But the impact is considered to be negative in the rest of quantiles. This finding is consistent with Mokhova and Zinecker (2014) who found that interest rates influencing strongly and negatively the corporate debt.

Regarding the impact of ER on corporate debt, the ER has a significant impact on corporate debt in lower quantiles and median quantile. But the impact is absent at 0.4, 0.6 and upper quantiles. This implies the asymmetric dependence structure, having lower tail dependence and upper tail independence. The sign of coefficients is positive except 0.9 quantile meaning that the Indian companies increase debt, when the Indian rupee depreciates against the US dollar and vice versa.

In a nutshell, there is strong evidence that among the corporate debt determinants, the corporate debt of Indian companies is most sensitive to CPI and WPI. More precisely, if companies want to raise debt, they should consider CPI and WPI. In contrast, corporate debt is less sensitive to IR and ER. Therefore, it is directed that companies should raise debt carefully using the IR and ER factors because they do not significantly influence corporate debt across the quantiles.

6. CONCLUSION

This paper analyses the impact of macroeconomic variables on the debt level of Indian companies. It is essential to remark that the CPI does not impact corporate debt but WPI does. Moreover, interest rate moves inversely to corporate debt. Further, exchange rate significantly influences corporate debt.

Additionally, the QR gives different results in comparison with OLS. To the large extent the quantile regression results of CPI and WPI are opposite to each other. But variations are observed in the quantile estimated coefficients for interest rates. In case of exchange rate, the results of quantile estimates from median quantile to end quantiles do not found to be significant. We detect these findings using the QR, which helped to reveal the impingement of macroeconomic components on debt of Indian firms.

Finally, this paper is a first approach in analyzing the encroachment of macroeconomic elements on corporate debt using QR with regards to India. However, future research can be extended on other issues. The QR methodology can be used to study the same theme with any other country. Further, a specific sector or an individual company can also be analysed. The next possible extension of this study is to compare India with other emerging or developed economies.

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