SML-401 Project Report

Studying share price & company ratio correlation across various sectors in the Indian Market

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by

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Abstract

We have studied the share price correlations with the company ratios of companies belonging to various sectors in the Indian market.
This study helps to analyze how the market reacts to the fundamentals of operating performance specified as ratios. A high correlation between a ratio and the movement of share price indicates that the investors have focussed on this ratio and taken their decision to buy/sell the share. This approach can help to predict how stable the behaviour of the market is presently. A market that appears to have no apparent correlation with the ratios can be thought to be in a *temporary boom* phase. Correlation was used as a tool as it precisely predicts the linear component between two quantities. We can then extend this model to predict uncertain share prices from the more certain and predictable ratios released by the company.
We have implemented the code on MATLAB and done the study over 5 important sectors of the market.

Contents

Chapter 1

Introduction & Objectives

The stock price of a company is an important determinant for the state of affairs of the company. It is an important not just for the company itself, but for its share holders, investment banks, corporations & government and the industry at large. A good prediction methodology for how stock prices goes can hence be extremely beneficial.
Another important determinant of the company's progress over its lifetime are the Company Ratios that are to be released each year. A large number of ratios are release and studied and each explains a different economic dimension of the company.
Most ratios fall in the following 4 economic dimensions.

- Profitibility
- Financial Leverage
- Operating Leverage
- Corporate Growth

A fundamental market is that market where the share prices of all the companies is *at par*. Here, there current price of a share is what is stable and has reached after a long period. In such a situtation, the movement of the share price is an *exact* function of predetermined factors and there is no incentive for investors since there is homogenous knowledge all around.

However such a situation is far from being true in the practical world. Our objective is to quantify just how *true* this fact is in the case of Indian Market. We have chosen company ratios as the determining factor for the share prices and it should happen that the correlations should be predictable from theory.

For example, if the debt-equity (D/E) ratio of company X has been going up in the last 5 years, a sensible investor must understand that the company is getting involved in too much debt, and hence the priority of

this investor keeps going down at the time of yearly divident pay-out or liquidation. Hence, D/E ratio should be negatively correlated with share price. Higher the ratio, higher the dip in the share price over time.
Though such an observation is not strictly true for all sectors, Defence & Education being the notable exceptions, this should be the general trend. We have studied this ratio among others in detail and concluded.

1.1 Content

In this report, we begin by talking of our methodology of data collection, which is clearly the most critical step for our findings to make sense. We then describe, our methodology of finding correlations and a few assumptions in the input data. We then dive straight into a sectoral analysis by briefly talking of each company considered and finally do a Market analysis by taking the sector averages.

1.2 Motivation

- Company correlations to identify and study sectors/clusters in the market
- Time evolution of the correlations help this study to be dynamic and useful for the investor
- Risk reduction via diversification
- Predict share price using a fundamentally sound determinant like company ratio
- Ease of extension to all sectors in the Market

Chapter 2

Data & Methodology

We have used the following sources.

- capitaline.com for collecting debt, equity and ratio values for all companies considered.
- finance.yahoo.com for collecting share price values in the period 2002-2011 (or less where insufficient)
- google.com for other data collection like market share, volume, market capitalization, etc

The following sectors were chosen represented by the given companies.

- Oil/Energy : Indian Oil, Hindustan Petroleum, Suzlon Energy, GAIL, ONGC
- Banking : ICICI Bank, Axis Bank, HDFC Bank, SBI, PNB
- Automobilie : Tata, Hero Honda, Maruti Suzuki, Mahindra & Mahindra, Eicher Motors
- FMCG : ITC, HUL, Dabur, Nestlé India, Colgate

The following is the route we have taken to arrive at the correlation values of different companies between their ratios and share prices.

- For every sector, we have chosen 5-6 companies that represent about 80% of the market share in the sector. Also, we have ensured that sufficient data is available at the above mentioned sources.
- For each company, we downloaded 5-6 *important* company ratios based on the sector and our understanding of which ratio should be a strong determinant of the share price.
- For each company, we downloaded the last 8-10 years' daily share prices from Yahoo! Finance.

- There is an inherent discrepancy of frequency between share prices and company ratio. While a ratio is normally declared only at the end of the year, share prices evolve and change every second. To solve this problem, we considered 2 alternatives. For a series of daily share prices in financial year, we avaerage out the share price movement to arrive at a single figure. This approach can be justified as company ratio should predict the general trend of the share price movement throughout the year. A second approach was to take just the year closing value since we believe that the market ratio have an impact on the share price only when they are declared at the end of a financial year. Hence the correlation would be the highest then.

- Now that we have a matching set of ratios and share prices, we run the MATLAB in-built function *corrcoef* which returns the correlation between the ratio and the share price movement.

- We conclude each sector, by talking of the company and the sector itself.

- Finally we are in a position to remark about the whole Market itself in terms of how it reacts to changes in ratios.

Chapter 3

Sectoral Analysis

In this chapter, we dive straight into our findings & experiment results.

3.1 Oil/Energy sector

Ratio	Indian Oil	HPCL	Suzlon Energy	GAIL	ONGC
D/E	-0.6988	0.4859	-0.5224	-0.9408	0.2347
Current Ratio	0.1501	0.776	0.4131	0.7278	0.0399
Total Debt	-0.295	0.4265	-0.7508	-0.8626	0.5086
Debtors	-0.085	-0.1257	0.731	0.5930	0.1340
Total Equity	-0.011	0.1037	-0.8375	0.9339	0.4068
Fixed Assets	-0.325	-0.2211	0.3624	0.7371	0.7452
Inventory	0.552	0.1345	0.5520	0.9313	0.2354
ROCE	N/A	0.013	0.8203	0.2057	0.1616
ICR	0.5423	-0.1399	0.5123	0.9080	-0.067

Table 3.1: Correlation matrix for Oil/Energy sector

3.1.1 Interpretation

We find a somewhat hazy behaviour between ratios and share prices. The following dataset can be divided into public and private companies. For public companies, it seems that there is lesser correlation between ratios and prices.

Consider the ratio Return on Capital Employed. The correlation for Suzlon Energy, which is a private company is very high as compared to those of IOC and other public sector companies. This may be because in case of public companies the Capital Employed is largely of the government which must always invest in the company no matter the profitibility of the company for the industry is critical to the nation's development.

For Interest Coverage Ratio, Suzlon's share price is highly correlated with its ratio movement which should be the case. Since, the higher the ability to cover its interest, the greater the security of the investors. However, for public sector companies this ratio holds less meaning as the governement is believed to be able to cover any interest that the company may be liable to, and hence investors are less uncertain on that end.

For Suzlon & GAIL, the share prices are strongly correlated with the Total Shareholders' Funds. However, Suzlon being a private company shows a negative behaviour. This may be because a larger total equity is seen as a deterrent for new investors to come in and buy its shares. Since Suzlon already has a large number of shareholders to manage, new investors may not be able to get a good end of the bargain. However, GAIL being the largest supplier to natural gas in India is a very critical company. So, its move to increase the equity component is seen positively by investors.

In general we can conclude that this sector presents contrasting observations between public and private sector companies. A linear model of share price and ratio can easily be obtained for D/E ratio, ROCE & Total Equity.

Company Name	Market Share	Market Capitalization	Volume
IOC	44.5%	804.5B	33186
ONGC	81%		3937387
SUZLON	50%	25.38B	6726918
HPCL	17.5%	126.88B	50071
GAIL	70%	100.28B	22332

Table 3.2: Company market share in %

3.2 Banking

3.2.1 Banking Ratios

Credit-Deposit Ratio : Over the whole banking sector we observe that the Stock Price is most dependent upon the Credit-Deposit Ratio. The ratio is the proportion of loan-assets created by banks from the deposits received. Since the main operation of banks in India is to provide loans from the deposits they receive and earn interest on it, the Stock Price is highly correlated to this ratio.
Also as expected the correlation decreases as we move from Public Sector Banks to Private Sector Banks. Public Sector Banks main operation is to provide loans. Private Sector on the other hand try to maximise their profits by investing in other areas like Stock Markets, Mutual Funds, by trading in commodities such as Gold, Silver etc.

Key Ratio	Correlation with Adj. Stock Price				
	SBI	PNB	HDFC	ICICI	Axis
Credit-Deposit(%)	0.87	0.78862	0.74697	-0.68291	0.89738
Investment / Deposit (%)	-0.85203	-0.69405	-0.9251	-0.7484	-0.46347
Cash / Deposit (%)	0.74	-0.13057	0.48439	0.31473	-0.57918
Interest Expended / Interest Earned (%)	0.33174	0.35797	-0.08691	-0.5111	-0.64581
Other Income / Total Income (%)	-0.20405	-0.37055	0.098199	-0.52904	0.2869
Operating Expenses / Total Income (%)	-0.12311	-0.54284	0.38709	0.033234	0.56862
Interest Income / Total Funds (%)	-0.65206	-0.29558	0.5278	-0.28284	-0.06081
Interest Expended / Total Funds (%)	-0.18101	-0.00173	0.30841	-0.40645	-0.36668
Net Interest Income / Total Funds (%)	-0.6738	-0.68767	0.67807	0.64192	0.81353
Non Interest Income / Total Funds (%)	-0.5481	-0.46773	0.59306	-0.74376	0.16252
Operating Expenses / Total Funds (%)	-0.59066	-0.75923	0.63711	-0.13893	0.84411
Profit before Provisions / Total Funds (%)	-0.78217	-0.18415	0.77894	0.062389	0.38248
Net Profit / Total funds (%)	0.26718	0.62823	0.44022	-0.49059	0.63621
RONW (%)	-0.82435	0.13917	-0.71191	-0.73361	-0.60

Figure 3.1: Correlation Matrix for Banking Sector

3.2.2 Interesting Findings

Investment/Deposit (%): This is an interesting finding. We found that the Stock Prices of Banks have a high negative correlation with this ratio. This implies that the Stock Prices decreases as the investment/Deposit ration increases. This may be attributed to an investor psychology of banks investment in risky assets not being healthy for the banks but loans must be safer and better.

Net Interest Income / Total Funds (%): This is one more interesting finding. We see that the Stock Prices of Public Sector Banks are negatively correlated with this ratio while those of Private Banks like ICICI are positively correlated.

Return On Net Worth (RONW) : This is one more interesting finding contrary to some popular beliefs. What we find is that Stock Prices are negatively correlated with RONW. This is present across both Private and Public Sectors. Perhaps the share prices of these shares are being governed more by traders rather than the investors as the findings defy logic.

Other Income : Most of the banks except the ICICI Bank are uncorrelated with the Other Income segment. And the ICICI Bank is negatively correlated with the Other Income. The ICICI Bank must be generating some large other incomes which do not speak of the performance of the

company but present a distorted picture of the companys profitability. So the investors react negatively to the other incomes segment of ICICI Bank. **Operating Expenses/Total Funds:** Interestingly two banks Axis Bank and HDFC Bank are highly correlated positively with this ratio. This is strange as its a general notion that as any increase in Operating Expenses should show negatively on the Stock Price. But this is unique for these two banks only.

3.3 FMCG

Products which have a quick turnover, and relatively low cost are known as Fast Moving Consumer Goods (FMCG). FMCG products are those that get replaced within a year. Examples of FMCG generally include a wide range of frequently purchased consumer products such as toiletries, soap, cosmetics, tooth cleaning products, shaving products and detergents, as well as other non-durables such as glassware, bulbs, batteries, paper products, and plastic goods. FMCG may also include pharmaceuticals, consumer electronics, packaged food products, soft drinks, tissue paper, and chocolate bars.

S.No	Name	Industry	Weight
1	ITC	Cigarettes	44.83
2	HUL	Personal Care	19.01
3	Nestlé	Food Processing	11.25
4	Dabur India	Personal Care	5.47
5	Colgate	Personal Care	3.75

The weight column indicates the weights of these companies in the Bombay Stock Exchange (BSE) FMCG index. As can be seen from their weights, these companies hold more than 80% of the market share in FMCG goods.

3.3.1 Company Profile

The following is a brief description of the companies we studied in this sector. We feel this description is important to put these companies in the broader perspective since FMCG is a large sector and encompasses a lot of sub-industries.

- **ITC (Indian Tobacco Company)**
  ITC has a diversified presence in Cigarettes, Hotels, Paperboards & Specialty Papers, Packaging, Agri-Business, Packaged Foods & Confectionery, Information Technology, Branded Apparel, Personal Care, Stationery, Safety Matches and other FMCG products. While ITC is an outstanding market leader in its traditional businesses of Cigarettes,

Hotels, Paperboards, Packaging and Agri-Exports, it is rapidly gaining market share even in its nascent businesses of Packaged Foods & Confectionery, Branded Apparel, Personal Care and Stationery.

The main financial characteristics of the company are (in Rs. Crores):

1	Share Capital	381.82
2	Total Debt	107.71
3	Total Current Assets	8,142.36
4	Total Current Liabilities	8,063.52
5	Net Working Capital	78.84

- **Hindustan Unilever Limited**
  HUL is the market leader in Indian consumer products with presence in over 20 consumer categories such as soaps, tea, detergents and shampoos amongst others with over 700 million Indian consumers using its products. Its brands includeKwality Wall'sice cream, Knorrsoups & meal makers,Lifebuoy,Lux,Pears, Breeze,Liril,Rexona,Hamamand Moti soaps,Pureitwater purifier,Liptontea, Brooke Bond(3 Roses, Taj Mahal, Taaza, Red Label) tea,Brucoffee,Pepsodent
  andClose Uptoothpaste and brushes etc. The main financial characteristics of the company are (in Rs. Crores):

1	Share Capital	218.17
2	Total Debt	0
3	Total Current Assets	5,367.76
4	Total Current Liabilities	6,733.21
5	Net Working Capital	-1,365.45

- **Nestlé**
  Nestlé has 6,000 brands with a wide range of products across a number of markets including coffee, bottled water, other beverages (including Aero (chocolate) & Skinny Cow), chocolate, ice cream, infant foods, performance and healthcare nutrition, seasonings, frozen and refrigerated foods, confectionery and pet food. The main financial characteristics of the company are (in Rs. Crores):

1	Share Capital	96.42
2	Total Debt	0
3	Total Current Assets	1,045.97
4	Total Current Liabilities	1,669.61
5	Net Working Capital	-623.64

- **Dabur India**
  Dabur operates in key consumer products categories like Hair Care,

Oral Care, Health Care, Skin Care, Home Care & Foods. The main financial characteristics of the company are (in Rs. Crores): 86.90 109.97 917.95 872.16 45.79

1	Share Capital	86.9
2	Total Debt	109.97
3	Total Current Assets	917.95
4	Total Current Liabilities	872.16
5	Net Working Capital	45.79

- **Colgate-Palmolive Ltd.**
  Colgate is focused on the production, distribution and provision of household, health care and personal products, such as soaps, detergents, and oral hygiene products (including toothpaste and toothbrushes). The main financial characteristics of the company are (in Rs. Crores):

1	Share Capital	13.6
2	Total Debt	4.59
3	Total Current Assets	590.13
4	Total Current Liabilities	551.47
5	Net Working Capital	38.66

3.3.2 Interpretation

Key Ratio	Correlation with Adjusted Stock Price				
	ITC	HUL	Nestle	Dabur	Colgate
Debt-Equity Ratio	-0.7318	-0.5682	-0.6800	-0.5102	N/A
Long Term Debt-Equity Ratio	-0.6596	-0.6429	N/A	-0.7435	N/A
Current Ratio	0.4007	-0.3861	-0.6931	-0.8603	0.9717
Fixed Assets Turnover Ratio	-0.6169	0.6424	0.8761	0.6422	0.9830
Inventory Turnover Ratio	-0.9719	-0.1926	0.3657	0.5667	0.4645
Debtors Turnover Ratio	-0.8352	0.6599	0.3707	0.5419	0.9417
Interest Coverage Ratio	0.3091	0.7188	-0.1003	0.7487	0.9035
Return on Capital Employed(ROCE)(%)	-0.1166	0.8415	0.9165	0.5099	0.8502

Figure 3.2: Correlation Matrix for FMCG Sector

- There is no particular ratio that has a high correlation with the share prices for all the companies.

- The ratio **Return on Capital Employed (ROCE)** has a good correlation with stock prices for all the companies except for ITC. This is on expected lines as when this ratio increases, it indicates higher profitability and hence demand for its share goes up which finally leads to increase in share prices. Since ITC is the market leader in FMCG, decrease in ROCE did not bother investors too much and hence it did not have much effect on its share prices.

- **Interest Coverage Ratio** is also found to have high positive correlation. As it increases, investors feel safer about their money and that is the reason for having a positive correlation with stock prices. For Nestle, this ratio does not have much effect on its share prices may be because it has zero total debt in its capital structure.

- **Debt-Equity Ratio** has moderately negative correlation with stock prices. This is also according to expectations as decrease in debt percentage in capital structure reduces interest liabilities of the company and even in case of moderate profits ensures dividends for investors. Similar is the case with Long-Term Debt Equity.

- No specific pattern is observed with **Current Ratio.**

- **Inventory Turnover Ratio :** It was expected that this ratio will have a high correlation with stock prices as this is one of the most important ratios for FMCG companies. Since, these goods are replaced within an year, having a large inventory compared to sales can be detrimental to the efficiency of the company. But, no specific pattern is observed with it. In fact, we see a high negative correlation of this ratio with stock prices in case of ITC.

- **Fixed Assets Turnover Ratio** is found to have a high positive correlation to stock prices. Again, its contrary in case of ITC. So, we see that solvency and profitability ratios affect stock prices of these companies and using regression, we can obtain a relationship between them. Contrary to expectations, turnover ratios do not show any specific pattern. In case of ITC, reverse trend is observed compared to other companies for turnover ratios.

On the whole, we can say that FMCG market is not completely speculative. Investors do take into consideration these ratios before investing. Since ITC has the largest market share, its ratios dont seem to affect its stock prices much as investors have confidence that it will give them good returns.

3.4 Automobile

3.4.1 Company Profile

SNo	Ratio	Hero Honda	TATA	Eicher	Maruti Suzuki	M & M
1	Share Capital	39.94	570.6	26.94	144.5	282.95
2	Total Debt	66.03	16625.91	17.47	821.4	2880.15
3	Total CA	2882.58	11699.67	96.11	3772.4	6042.39
4	Total CL	4831.41	14609.16	158.53	3567	5200
5	NWC	-1948.8	-2909.5	-62.42	212.4	842.39

Table 3.3: Company Characteristics

Key Ratio	Correlation with Adj. Stock Price				
	Maruti Suzuki	Tata Motors	Eicher Motors	Hero Honda	Mahindra and Mahindra
Current ratio	-0.3003	-0.1126	0.0226	0.4445	-0.4035
Debt/Equity Ratio	-0.5875	.3470	-0.6868	-0.8688	-0.4521
Long Term Debt/Equity Ratio	0.8525	0.2527	0.5510	-0.8688	-0.4035
Fixed Assets	0.7462	0.1939	-0.3125	0.6820	0.6762
Inventory	0.5934	0.6054	0.4541	0.7489	0.6221
Interest Coverage Ratio	0.6585	0.0138	0.2690	0.5805	0.4693
Debtors Ratio	0.8525	0.2313	0.9065	0.8707	0.6435
ROCE	0.2233	-0.0844	-0.1672	0.1142	0.3777

Figure 3.3: Correlation Matrix for Automobile Sector

In the automobile industry as well, we find some similar patterns as to how the correlations between various ratios varied. For many companies, **Debtors Ratio** seems to be an important determinant of share price. A good car manufacture is indicative of how quickly manages its cash conversion cycle and converts the debtors into cash. This is representative of how well it manages its supply chain and hence as expected we find this ratio to be highly correlated.

Chapter 4

Literature Review & Future Scope

4.1 Paper Reviewed

As part of our project, we have consulted the paper [TM] extensively to understand the inherent nature of share prices and company ratios. We have also used the course material and information about company ratios to predict which ratios should be more correlated with the share prices and whether they should be directly correlated or not.

4.2 Model Assumptions

We have currently made a few assumptions which introduces a significant amount of error in our observations. These are:

- We take the average of the daily share prices in a year to arrive at an annual share price. This may or may not represent the progress of the share price of the company in a true sense. If there are erratic events during the year like natural calamities (like the one in Japan) or general recessions (like the one of 2008) the average may not represent how the company performed that year. In such a case the correlation would be low, or even contrary to expectations.

- We have only considered the closing prices of the share. This may not be a true indicator of what an investor looks for in a company. We may be better off taking the adjusted closing price or even the divident values.

- We have not considered any ratio-ratio intercorrelations. It may be possible to model 2 or more ratios in predicting or determining share price values and it is assumed that all other ratios are constant when

we are calculating the correlation between the share price and a given ratio.

4.3 Future Scope

- Predict future share prices by interpolating a relation between ratio and share prices that are highly correlated so that there is minimum error in this prediction
- Visualizing the correlations in different ways like taking a moving average of share prices over different periods of time to arrive at dynamic correlations
- Finding out better ways to arrive at annual share prices rather than simple averages
- Extending the study to various other sectors of the Market
- Come up with a measure to determine whether the Indian market is speculative or fundamental over a period of time. So we calculate how the various ratios are determining share prices in general over different periods of time and then in periods of high correlations, we can use this model to predict prices.

Chapter 5

Conclusion

We are now in a position to conclude a few things about the Indian market with regards to how the investors study the companies fundamentally before actually investing in them. A generally high correlation between these ratios and share prices is expected and would actually implicate two vital things.

- The market's movement is sound and stable. A high correlation would mean that external factors like war, natural calamities or even mild recessions would have lesser direct effect on the state of the market. This is because the investors as it is are only focussing on the company's inherent performance and temporary flucatuations would be less.
- This can be a practical way to predict share prices and help the investors understand the future trends.

We note that for all the sectors that we have studied we find high correlations between the companies and atleast one of the many ratios. This ratio is different for different sectors since different ratios are important for the better performance of the sectors. Also, within a sector some companies show high correlation with a ratio while others dont. We have noticed that public and private sector companies can explain this contrary trend. The correlations move very different for public and private sector companies.

We have give a horizontal study of 5 sectors (we were not able to compile the results of Telecom sector in time) which can help us give an insight into how the share prices move in the Indian market. Preliminary results have given us confidence that company ratios is a strong handle into determining and predicting share prices, and if we are given an opportunity to extend this project, we would like to look into various other sectors, other ratios and map the average correlation of the sector and market as an indicator. This study is an attempt to bridge the gap between **Ratios** which are fundamentally well defined and are taught very formally in management courses and **Share Prices** which are commonly believed to be very unpredicatable and almost a question of chance.

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