

Mathematical data analytic model for investment patterns assessment in stocks of selected sectors

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Abstract

The investment patterns adopted by various Companies include either internal or external sources of funds, to invest in diverse options within the capital market and money market instruments. This paper is to propose a mathematical analytic model that explores corporate investment patterns and their subsequent impact on profitability, borrowings, and other parameters of corporate health. Specifically, the paper intends to examine the immediate effect of investments on the company's Profit After Tax (PAT), excluding investments in Fixed Assets. Furthermore, the study seeks to provide a mathematical comparative analysis using collected data on Retained Earnings, a critical component of profitability, and investments. By suggesting a mathematical data analytic model, this research paper also addresses the reasons why many businesses continue to rely on outdated methods and conventional choices, apart from Fixed Assets.

Subject Classification: 91-10, 91G15, 91G70.

Keywords: Analysis of profitability, Mathematical modeling, Data analysis.

1. Introduction

An investment refers to a monetary transaction where an asset or goods are purchased with the expectation of generating future income. The investment patterns of companies vary based on their specific requirements, expectations, fund availability, risk tolerance, and

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objectives, as revealed through mathematical analysis of corporate data. Internal sources of funds play a significant role in investment patterns, including increased liabilities, decreased assets, net income after tax, revaluation of fixed assets, and decreased net working capital, among others. Mathematically analyzed data indicates that commonly utilized investment avenues include equities, debentures, bonds, and mutual funds. The proposed mathematical model of analyzed investment patterns suggests that a well-balanced and well-managed investment policy, taking into account risk, return, and liquidity, will enable corporations to navigate various financial situations successfully

2. Review of Existing Research

Various studies in past have reflected on Investment patterns and decisions of companies such as:

- Griliches & Wallace, 1965, analyzed investment behavior and profitability impact of 11 US companies from 1935 to 1954. Their model suggests higher returns application.
- Gordon, 1992, examined neo-classical and post-Keynesian theories of investment. In the neo-classical theory, investment's rate of return equals the interest rate.
- Rajakumar, 2005, studied corporate financing and investment in India from 1957 to 1999, analyzing 6623 companies. Findings indicate a positive correlation between debt equity ratio and company investment.
- Alabass, 2019, analyzed the impact of corporate investment on corporate performance. The study focused on 500 listed companies from Pakistan during the period of 2010 to 2015.

The accurate assessment of investment's impact on profit, borrowing, retained earnings, and reserves necessitate an extended duration, as investment requires ample time to flourish. This study encompasses a longitudinal or cross-sectional approach, enabling a meticulous analysis and temporal assessment of investment impacts.

3. Objectives and Methodology

The objectives for collecting such data are as follows:

1. To investigate the effect of investments (excluding Fixed Assets) on the company's profitability.

- 2. To analyze the impact of investments (excluding Fixed Assets) on the borrowings and reserves of the studied company.
- 3. To examine the impact of changes in investment (excluding Fixed Assets) on the net fixed assets of the company.

4. Scope of the study

- 1. The researcher employed the purposive sampling method to select 208 listed Indian companies from various sectors for the study.
- 2. The study encompasses sectors such as Automobile, Information Technology, Steel, Cement, Sugar, and Financial Services.
- 3. The primary objective of the research is to analyze and examine the impact of investments on the company’s profitability and other financial parameters, including Profit after Tax, Reserves, Retained Earnings, and Assets, among others.
- 4. The research spans a period of 15 years, specifically from 2003-2004 to 2017-2018, focusing on the selected listed Indian companies.

5. Data Analytics

- 1. The study’s findings reveal that the mean values for the Investment to Borrowings (INVBORROW) and Investment to Liabilities & Assets (INVLIABASSETS) ratios are relatively higher at 863.97 and 3631.49, respectively. On the other hand, the Investment to Reserves (INVRESERVES) ratio exhibits the lowest mean value of -3478.47. Figure 1 below, illustrates the Numerical Analysis of relation between borrowing, liabilities and investments.

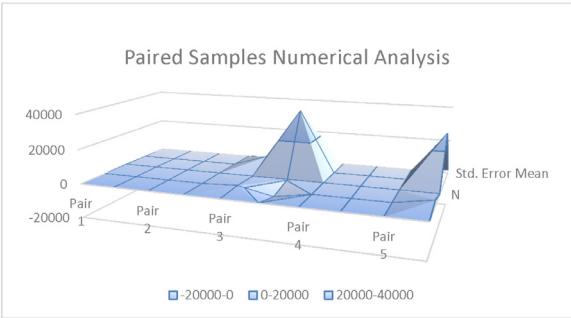


Figure 1
Paired Samples Numerical Analysis

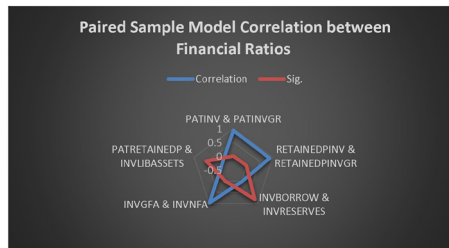


Figure 2

Paired Sample Model Correlation between Financial Ratios

These results indicate significant variations in the ratios among the companies included in the study based on the collected data. Figure 2 above draws a correlation between the various financial ratios, namely borrowings, liabilities and investments

- Descriptive analysis of the collected data indicates a high level of skewness in the ratios considered for the study. This suggests a substantial variation in the values of the ratios due to the diverse sectors and sizes of the companies included in the analysis.

$$*\sigma_s = \sqrt{1/n - 1} \sum_{i=1}^n (x_i - \bar{x})^2 \quad *SE = \sigma / \sqrt{n} \quad (1)$$

$$*r = (n \sum xy - (\sum x)(\sum y)) / (\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}) \quad (2)$$

“The Paired Samples Correlations Analysis reveals the bivariate Pearson correlation coefficient for each pair of variables examined, along with a two-tailed test of significance. The results indicate that Pair 1, Pair 2, and Pair 4 exhibit significant correlations. Additionally, the Paired Samples Test provides the Assumption Model test results.”

Here we do the detailed interpretation of the model, based on Figure 3 and Table 1 and 2 mentioned below.

- PATINV and PATINVGR are significantly correlated, as correlation coefficient is 0.926. Any change in Profit After Tax to Investments (PATINV) will positively change Profit After Tax to Investment in Group companies (PATINVGR) by more than 92%.
- Pair 2, RETAINEDPINV and RETAINEDPINVGR are positively correlated with each other as correlation coefficient is 0.883. Any change in the ratio Retained Profit to Investment (RETAINEDPINV) will positively change Retained Profit to Investment in Group

Companies (RETAINEDPINVGR) by approximately 88% and vice versa.

3. Pair 4, INVGFA and INVNFA are also positively correlated. Any change in Investment to Gross Fixed Assets ratio (INVGFA) will impact positive change in Investment to Net Fixed Assets ratio (INVNFA) by 97% and vice versa.

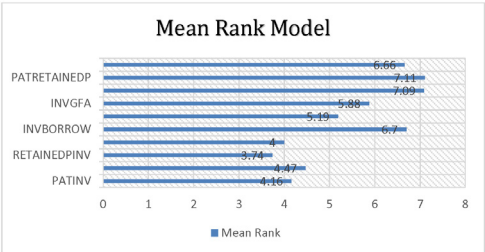


Figure 3
Mean Rank Model

Table 1
Model Analysis

ANOVA Model						
		Sum of Squares	df	Mean Square	F	Sig.
PATINV	Between Groups	44534.909	142	313.626	.018	1.0000
	Within Groups	1136705.70	65	17487.78		
	Total	1181240.62	207			
RETAINEDPINV	Between Groups	19690.031	142	138.662	.018	1.000
	Within Groups	514520.445	65	7915.699		
	Total	534210.477	207			
INVBORROW	Between Groups	9784370257.86	142	68904015.9	1252.39	.000
	Within Groups	3576146.31	65	55017.64		
	Total	9787946404.175	207			
INVRESERVES	Between Groups	278822469041.8	142	1963538514	165351.	.000
	Within Groups	771870.487	65	11874.93		
	Total	278823240912.2	207			
INVGFA	Between Groups	603791.959	142	4252.056	994.63	.000
	Within Groups	277.875	65	4.275		
	Total	604069.834	207			

Table 2
**One Sample Kolmogorov-Smirnov Test [Assumption Model One-Sample
 Kolmogorov-Smirnov Test Summary]**

Null Assumption Model problem under study		Sig.	Null Assumption
1	The distribution of PATINV is normal with mean 5.69 and standard deviation 75.541.	.0001	Reject
2	The distribution of PATINVGR is normal with mean 7.29 and standard deviation 100.207.	.0001	Reject
3	The distribution of RETAINEDPINV is normal with mean 3.69 and standard deviation 50.801.	.0001	Reject
4	The distribution of RETAINEDPINVGR is normal with mean 4.78 and standard deviation 76.822.	.0001	Reject
5	The distribution of NVBORROW is normal with mean 863.98 and standard deviation 6,816.392.	.0001	Reject
6	The distribution of NVRESERVES is normal with mean -3478.28 and standard deviation 36,701.120.	.0001	Reject
7	The distribution of INVGFA is normal with mean 7.12 and standard deviation 34.020.	.0001	Reject
8	The distribution of INVNFA is normal with mean 18.35 and standard deviation 156.385.	.0001	Reject
9	The distribution of PATRETAINEDP is normal with mean 1.20 and standard deviation 2.099.	.0001	Reject
10	The distribution of NVLIBASSETS is normal with mean 3631.50 and standard deviation 28,879.408.	.0001	Reject

$$*ANOVA Model(F) = MST / MSE,$$

$$MST = SST / p - 1, MSE = SSE / N - p, SSE = \sum(n - 1)$$

Interpretation of Model: - There is a statistically significant difference between the means of two variables only in case of Investment to Borrowing ratio, Investment to Reserves ratio and Investment to Gross Fixed Assets ratio.

6. Findings

- The statistical tests conducted on the data do not establish a direct association between changes in Investments in Group Companies and changes in Retained Earnings of the company.
- Investments do not exhibit a direct significant impact on the Total Assets of the company. Changes in Investments (excluding Fixed

Assets) and Investments in group companies do not result in substantial variations in the company's total assets.

- Based on the results of the statistical analysis, we can conclude that Investments made by the company are not directly correlated with the company's Reserves.
- Many companies continue to rely on traditional techniques and conventional investment options when choosing the right avenues for investments (excluding Fixed Assets). Popular choices among companies include investing in Mutual funds, equity of group companies, and bonds.

7. Conclusion

The model suggests that when a business decides against investing, the use of cash for future sales and earnings is symbolized by any subsequent change in gross fixed assets. If not, the company's cash reserves may grow, which might make them less profitable while endangering the safety of its customers. Researchers analyzed that only 7% to 8% of the total asset share for the companies under examination is made up of these investments (other than Fixed Assets). Other than fixed assets, changes in investment do not considerably affect the company's profitability, either positively or negatively.

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