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SELECTIVE DIVERSIFICATION: DOES THE CAPITAL ASSET PRICING MODEL CAPTURE EFFECTS?

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ABSTRACT

The modern finance theory has indisputably strong pillars due to the years of diverse and adapting research that has taken place and still continues till date. But the basic structure of this theory, that has been taken and improved time and again, is owed to the very first contributors i.e., Harry Markowitz in 1952 and William F. Sharpe in 1964. Though been subjected to ample criticism, the original Capital Asset Pricing model, that is the simplest of its form today, still holds relevance for numerous investors and researchers. Sharpe's theory had multiple assumptions that are considered unrealistic when the real process of investing is considered, and having a very well-diversified portfolio spanning over industries is one of them. Selective diversification has fast become the norm of investing and in unprecedented times, when only a handful of industries perform favourably, it has also become an essential practice. This paper attempts to use the original Capital Asset Pricing Model to compare three portfolios compiled from India's NIFTY 500, with varying levels of diversification. Covid-19 and its impact on the share market and all businesses has been undeniably strong like the 2007-09 recession but has in an unlikely way, resulted in facilitating growth in very specific industries like pharmaceuticals and healthcare, a typical K-type growth scenario. This paper investigates whether CAPM is able to capture such a change in growth across portfolios.

KEYWORDS: *Capital Asset Pricing Model, Diversification, Pharmaceutical Industry, Anomalies*

JEL Codes*: C58, G12, G11*

Selective Diversification: *Does The Capital Asset Pricing Model Capture Effects?*

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INTRODUCTION

The theories surrounding capital asset pricing have adapted with new research but the importance of diversification has long remained a constant. As explained by Markowitz (1952), an old rule is that an investor should possibly divide all his investment amongst the securities that give maximum expected return and map it with his utility (essentially derived out of consumption) curves of wealth to reach an optimal stage, maximising expected utility of his terminal wealth arising out of undertaking risky investment decisions. With the number of securities invested in being large, it will generally ensure that the actual return from the portfolio in the end is extremely close to its estimate. However, Markowitz states that assuming that the law of large numbers will work on a portfolio is unacceptable. Instead, the E-V maxim or the maximisation of

expected return and minimisation of variance rule implies "the right kind of diversification for the right reason". Naïve diversification should be sacrificed for smart diversification. Since firms from the same industry are more prone to performing good / poorly together, a diversified portfolio will hold superiority but this superiority is not ultimate and as stated by him, can be competed with an exception of a single security that has the maximum expected return and minimum variance. Such a security however, is rare to find. But using the opposite of the above stated logic, it would not be completely wrong to expect that then, when securities from particular industry are likely to be performing favourably together, a non-diversified portfolio might perform better than a diversified one. This hypothesis is studied using empirical results in the further sections of this paper.

As a natural offshoot of the normative portfolio theory of Markowitz, the creators of original positive Capital Asset Pricing Model (CAPM), Sharpe (1964), Lintner (1965) and Mossin (1966) and Black (1972) propagated the same idea of maximising expected return and minimising variance to plot an investment opportunity curve or efficiency frontier – a set of investment options from which the investor must choose the one which maximises his utility. They essentially figured out that cocktail of human economic and financial decisions comprising of consumption, investments and lending-borrowing, (Sehgal and Sehgal, 2021) at risk free rate alters the shape of a concave efficiency frontier into a straight line and is tangent to the original efficiency frontier at a point comprising of a well-diversified risky market portfolio. The new straight line is the new efficiency frontier which is superior to the original concave efficiency frontier at all stages. To quote Fama French (2004), "*We can then see that all efficient portfolios are combinations of the risk-free asset (either risk-free borrowing or lending) and a single risky tangency portfolio,. This key result is Tobin's (1958) "separation theorem."*" They further argued the presence of a simple linear relationship between expected return and the *relative* measure of co-variance of a security with the market wide single risky tangent portfolio, termed beta, when the market is in equilibrium. In equilibrium, it states that

$$E(r_i) = R_f + (R_m - R_f)\,\beta_i$$

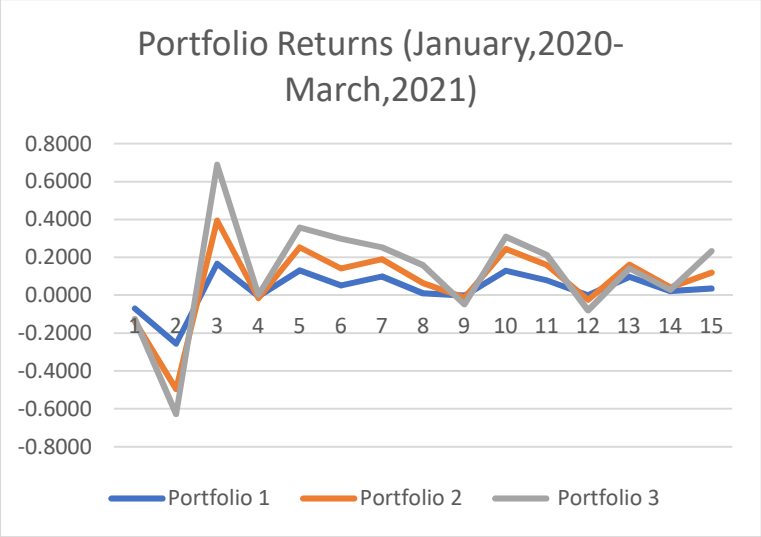
In other words, a fair compensation for risky investment is compensation for time (risk free rate) and risk premium based on variability of a security in relation to a well-diversified market portfolio.

This model however, since, started losing its relevance in the wake of new found anomalies (Fama-French, 1993) and newer factors cropped up as explanations to the expected returns. Risk was also attributed to size of the business and its value apart from the market factor of the original Sharpe-Linter-Mossin-Black CAPM. It has been subjected to lot of research worldwide including in India (Sehgal & Balakrishnan, 2013)

This quantitative relationship between expected return of an investment and its risk however, still is widely used in simplified comparisons and by investors looking to make faster decisions. This paper studies 3 different portfolios with varying levels of diversification and uses the Capital Asset Pricing Model (CAPM) as the benchmark to see whether there is a marked difference in expected returns. Using a long study period, up till recently (2007-2021), it will also examine the growth of stocks of the Pharmaceutical and healthcare industry. Part 2 independently traces the growth of the industry that can be attributed to the pandemic and that led us to build our expectations about non-diversification. Part 3 builds the CAPM for the three said portfolios using monthly data and part 4 concludes the paper.

TRACING THE RISE OF PHARMACEUTICALS AND HEALTHCARE

The Covid-19 pandemic has brought about unprecedented changes in lifestyle as well as consumption patterns. While essentials have climbed up in their demand, so have pharmaceutical drugs, healthcare companies and chemical industries. As the second wave hit India in March, 2021, worse than the previous year, there was a rush for drugs like Remdesivir and a steeply rising demand for vaccinations, oxygen plants and medicines prescribed by doctors for treatment at home. Nifty Pharma Index is a measure of the performance of pharmaceutical sector and takes into account 10 stocks listed on the National Stock Exchange. In April 2021, it climbed by 4% and has beaten the Nifty index for two consecutive months as reported by Sultana (2021). For the purpose of this study, 3 portfolios were built from the NIFTY 500 stocks. Portfolio 1 and 2 have varying levels of diversification with portfolio 2 being less diversified (see table 1 and table 2 for composition). Portfolio 3 comprised solely of Pharmaceutical stocks. Returns from the 3 portfolios are plotted for the period of January, 2020- March,2021 as a line graph in figure 1.



Note: Returns accessed from Yahoo Finance, portfolio returns calculated using simple average and graph plotted using MS Professional Plus 2019.

Figure 1: Trend of Portfolio Returns.

As can be seen, the returns from Portfolio 3 has been above the returns from the other two for a long period, except a total of 4 months. Similarly, Portfolio 2 has also relatively performed better than Portfolio 1 except a similar period of 4 months across this time at different points. At the end of February, the returns from Portfolio 3 has steadily risen from a downfall, commensurate with the beginning of the second Covid wave in India. A similar peak was witnessed in March,2020 when the impact of the pandemic was newly felt in India. This showed how during the period of this pandemic and vaccination drives, a portfolio comprising mainly of pharmaceutical stocks is likely to perform better than others. This led us to form an a priori expectation, that during such an unprecedented time, lesser diversification and increased focus on pharma and health care stocks should possibly give higher expected returns.

CAPTURING EFFECTS OF DIVERSIFICATION

This section explores the modelling of expected returns using the common excess return version of the market model for 3 different portfolios (Sehgal & Balakrishnan, 2013). Herein, excess returns of the portfolio over the risk free investment is regressed on the excess returns of the market over this investment. The CAPM being used is as follows:

$$R_{pt} - R_{ft} = \alpha + \beta\,(R_{mt} - R_{ft})$$

Here, R_{pt} is the returns on a said portfolio, R_{ft} is the returns on a risk-free investment and R_{mt} is returns of the market. α Represents abnormal returns over a set market benchmark or average and β is the sensitivity coefficient that is representative of the systematic risk that this portfolio has.

DATA AND METHODOLOGY

This study spans the period of October, 2007 March, 2021. Monthly data for all required variables of the study is collected i.e., containing a time series of 162 months. The NIFTY 500 companies were taken into consideration and data on their adjusted closing price was collected for this period from Yahoo Finance. These represent the top 500 companies listed on the National Stock Exchange of India, on the basis of full market capitalisation. To build Portfolio 1, a random sample of 100 companies was built from the list of these 500. However, complete data for this entire period was only available for 70 companies. Portfolio 2 was built using the procedure of stratified sampling where we reduced the number of industries included and increased the weight of pharmaceutical and health care related stocks but the total number remained at 70. Portfolio 3 comprised of solely pharmaceutical stocks that had complete price information for these 162 months, out of the NIFTY 500 companies, and ended up constituting only 38 stocks. (See Appendix A and Appendix B for the summary of the industry composition of portfolio 1 and portfolio 2 respectively.)

All stocks were expected to carry the same weight in each month and hence, portfolio returns were calculated for these 162 months by taking the simple average of their returns. 91-day government treasury bill was considered the risk free investment and its annualised yields for every month was accessed from the database of the Reserve Bank of India. These annualised yields were converted to monthly returns by dividing by 12. The market returns were also accessed from Yahoo Finance by using the NIFTY adjusted closing price as a market benchmark. As a last step, the excess returns of the portfolios and excess returns of the market over the risk-free investment are calculated and then, an Ordinary Least Squares Regression was conducted to estimate the CAPM mentioned in the beginning.

RESULTS

The OLS regression was run for the three different portfolios formed and produced the results as recorded in Table 3, Table 4 and Table 5.

Table 3: CAPM Results for Portfolio 1

	Coefficient	Standard Error	t-statistic
α	0.03070322	0.00968831	3.16910082
β	1.03371646	0.01666223	62.0394996
$R^2 = 0.9600888$			

Table 4: CAPM Results for Portfolio 2

	Coefficient	Standard Error	t-statistic
α	0.02359647	0.010108913	2.3342247
β	1.01929402	0.0173856	58.6286365
$R^2 = 0.95552241$			

Table 5: CAPM Results for Portfolio 3

	Coefficient	Standard Error	t-statistic
α	0.01924607	0.03078632	0.62515023
β	1.01598376	0.06413439	15.841481
$R^2 = 0.87150659$			

All the values of αfor the three portfolios are positive and greater than zero, indicating that these 3 investments are outperforming the market index by a small margin and are also statistically significant at a confidence level of 95%. What is noticeable however, is that as diversification decreases, the value of αalso successively falls by a minute amount indicating that considering only the market factor, CAPM does not encourage diversification of any form. The values of βare constantly greater than 1 for the three portfolios, also indicating that these investments are comparatively riskier than the market. But this value and its statistical significance is also representative of greater expected returns. While all 3 values remain above 1, it can also be noted as diversification falls, the level of volatility i.e., beta's value also falls minutely and so does the t-statistic. This indicates, that though of a small amount, CAPM does indicate here that more random diversification is riskier than less diversification. The value of R^2, though extremely high, is also seen to be falling as diversification decreases, indicating that the explanatory power of CAPM falls as diversification is lessened.

CONCLUSIONS

Diversification has always been encouraged by most researchers for the sake of security and better expectation of returns. In times that can be considered as outliers however, the validity of this belief can be sufficiently questioned. The covid-19 pandemic, with the same unprecedentedness facilitated growth of the pharmaceutical industry and in such a time, diversifying less and solely focussing on investing in related industries makes good business sense. To study the same, this paper used CAPM and studied the expected returns from 3 different portfolios. We find that while all 3 perform better than the market and give positive returns, lesser diversification does not prove to increase the returns. However, considering the multiple criticisms that CAPM has faced due to the validity of its application, further research can use the same methodology and study these portfolios using the Fama-French 3-factor or 5-factor pricing models which incorporate the effect of more factors on the expected returns. That might help capture the effects and usefulness of less diversification in a clearer sense.

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Appendix A Industry Composition of Portfolio 1

Serial No.	Industry	No. of Stocks	Percentage of total
1	Automobile	3	0.04
2	Cement& products	2	0.03
3	Chemicals	2	0.03
4	Consumer Goods	18	0.26
5	Fertilisers & Pesticides	3	0.04
6	Financial Services	7	0.10
7	Industrial Manufacturing	6	0.09
8	IT	8	0.11
9	Media Entertainment & Publication	1	0.01
10	Metals	1	0.01
11	Oil & Gas	3	0.04
12	Pharma	8	0.11
13	Power	1	0.01
14	Services	3	0.04
15	Telecom	3	0.04
16	Textiles	1	0.01

Appendix B Industry Composition of Portfolio 2

Serial No.	Industry	No. of Stocks	Percentage of Total
1	Automobile	5	0.07
2	Chemicals	10	0.14
3	Consumer goods	10	0.14
4	Consumer Services	3	0.04
5	Financial Services	2	0.03
6	Healthcare Services	2	0.03
7	Industrial manufacturing	1	0.01
8	IT	10	0.14
9	Metals	1	0.01
10	Pharma	21	0.30
11	Power	3	0.04
12	Telecom	2	0.03