Pharmaceutical Industry and Idiosyncratic Risk

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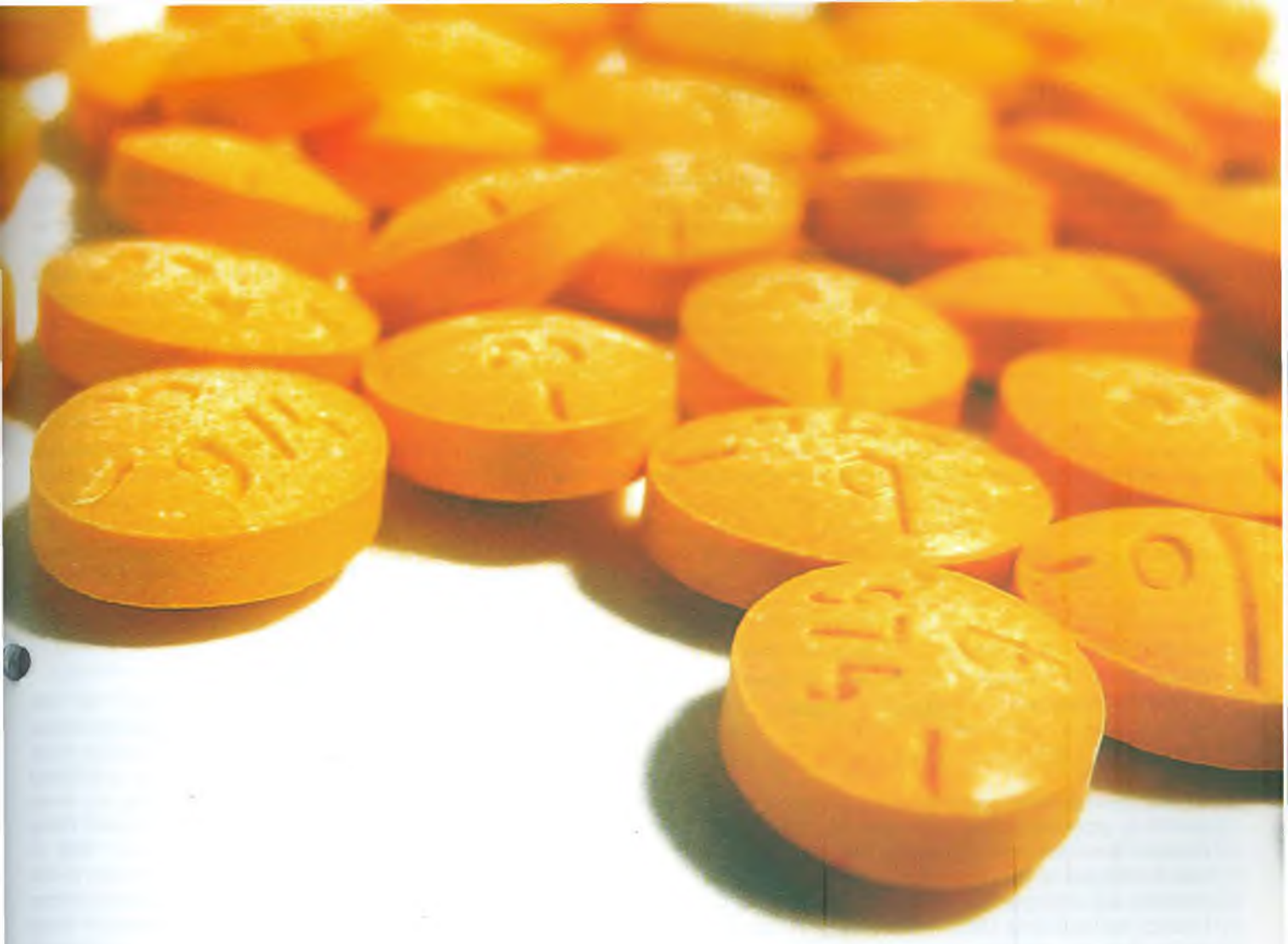
ABSTRACT

The study tries to develop a model that contains variables that can be used to determine both the market risk and the idiosyncratic risk unique to the pharmaceutical industry, which is characterized as a capital intensive industry and mainly deals with producing products that are considered long-term investment. The results suggest that significant determinants for the market risk are size, leverage, and efficiency when capital is excluded and size, capital, and efficiency when leverage is excluded. The significance and the signs of the regression coefficients imply that market investors consider that the larger the size of the pharmaceutical company the lower is the market risk and have higher the leverage or debt ratio the larger is the market risk and finally higher is the efficiency of the company the lower is the market risk. Further the results indicate that the significant determinants of idiosyncratic risk are size and earnings variability whether leverage or capital is included in the determinants set. These two significant determinants provide increased guidance to investors seeking diversification to minimize specific risk.



INTRODUCTION

Several studies have examined stock return volatility over different time periods. Given the fact that there are some unique characteristics in the pharmaceutical industry, an examination of the role of idiosyncratic risk in this market is of interest.

Recently Pfizer, the largest drug company in the world, sent shareholders a packet of information, including a 2003 Annual Review, a 2003 Financial Report, and a Notice of Annual Meeting and Proxy Statement. In the annual review one finds the trademarked names and brief descriptions of 21 important prescription medicines owned by Pfizer. The financial report contains forward looking statements and notes to the consolidated financial statements: both of which address "Legal Proceedings and Contingencies" using the same initial language. Pfizer reports that: "We and certain of our subsidiaries are involved in various patent, product liability, consumer, commercial, environmental, and tax litigations and claims; government investigations; and other legal proceedings that arise from time to time in the ordinary course of our business. We do not believe any

of them will have a material adverse effect on our financial position. Litigation is inherently unpredictable, and excessive verdicts do occur. Although we believe we have valid defenses in these matters, we could in the future incur judgments or enter into settlements of claims that could have a material adverse effect on our results of operations in any particular period. Patent claims include challenges to the coverage and/or validity of our patents on various products or processes. Although we believe that we have valid defenses to these ch with respect to all of our material patents, there can be no assurance as to the outcome of these matters, and a loss in any of these cases could result in a loss of patent protection for the drug at issue, which could lead to a significant loss of sales of that drug and could materially affect future results of operations." Note 20. to Pfizer's consolidated financial statements then in more detail addresses some pending legal issues, including "patent matters ... the majority of which involve claims by generic drug manufacturers that patents covering our products are invalid and/or do not cover the product of the generic manufacturer". This same note then goes on to briefly discuss legal issues which somehow involve nine of Pfizer's above mentioned 21 important prescription medicines.

In the United States Constitution, Congress has express power to promote science and under this authority has enacted laws concerning patents, the basic framework for which is found in Title 35 of the United States Code. These statutes are interpreted by courts, administered by the United States Patent Office, and often overlap with other state, federal, and/or international laws. Profits of pharmaceuticals are directly related to the monopolies granted to the pioneer/innovator companies and then later to the generic manufacturers once the patents have expired. Approximately150 brand name pharmaceutical drugs, or one-third of all prescription medicines in the United States worth more than thirty billion dollars in annual sales, will lose their patent protection by year 2005 (Piatt 2003).

To better understand idiosyncratic risk of pharmaceuticals, a working knowledge of patent law is essential. Patent law grants to the patentee/ innovator the right to exclude others from making, using, offering for sale, or selling the patented drug in the United States, or importing the patented drug into the United States during the term of the patent. Once the patented invention enters the public domain, a patentee must file for a patent within one year to obtain patent protection. Due to this rule, pioneer drug manufacturers must apply for patents within a short time of beginning the Food and Drug Administration (FDA) regulatory process (Soehnge 2003).

To obtain a patent, the inventor must file an application with the United States Patent Office (PTO) along with the appropriate fees, see www.uspto.gov. The application is ex-parte and must claim that the invention is novel, useful, and non-obvious. Applicants have the duty to disclose all material information including prior art of which they have knowledge. PTO examiners have the responsibility for reviewing applications and researching the prior art to decide whether or not to reject the claims in the patent application. This review is not as extensive as one might guess: an average being less than 20 hours over the course of the two to three year prosecution of each application. Once granted, the United States patentee receives a patent for twenty years from the date of filing the application with the PTO (Paine 2003).

Drug innovators must also comply with FDA regulations that require pharmaceutical manufacturers complete extensive safety and efficacy testing prior to submission to the FDA for review and approval. Upon completion of a formal three phase process of testing and data generation, a New Drug Application (NDA) is filed with the FDA, which then begins its process of review and approval. The approval time after submission to the FDA takes longer than two years (Urevig 2003).

Prior to 1984, a generic drug manufacturer was not permitted to rely on the testing performed by an innovator and thus would be required to repeat the clinical trials involved in the process described above. These tests could not begin until the innovator's patents covering the drug expired. Proceeding otherwise, the generic risked being sued by the innovator for patent infringement. Due to spiraling drug costs to consumers and the tensions in the pharmaceutical industry, the stage was set for amendments to patent and drug laws which would stimulate more competition and expedite generic drug approvals (Gongo 2003).

The Drug Price Competition and Patent Term Restoration Act of 1984, commonly know as the Hatch Waxman Act provides added patent protection to innovators at the same time giving generic drug companies some relief. Specifically, the Hatch-Waxman Act includes a patent restoration provision which allows a drug innovator to gain an extended patent term due to some of the time lost to the FDA approval procedure. The total patent life may not exceed five years beyond the date of expiration of the original patent term or extend beyond fourteen years from the FDA's approval. The Hatch-Waxman Act allows generic drug companies to rely on the safety and efficacy data generated by the innovator companies during their FDA approval process. The Act also allows generic companies to begin their FDA approval process before the patents on the brand-name drugs expire.

Finally, the Act requires innovators that file NDA's to provide the FDA with information about the patents covering their brand-name products. The FDA lists these patents in a publication entitled "Approved Drug Products with Therapeutic Equivalence Evaluations" known as the "Orange Book" because of its cover's color (Robinson 2003

A generic company within Hatch-Waxman's safe harb

becomes able to make and use pharmaceuticals in violation of a pioneer's patent on a drug as long as that use is reasonably related to obtaining federal approval to market its drug. What types of activities may be construed to be reasonably related to obtaining FDA approval has been heavily litigated and includes using the drug to raise capital, obtaining foreign patents, selling the drugs to international distributors, demonstrating the drug publicly, advertising the product or its clinical trials, and more. Once a generic manufacturer is ready to seek FDA approval, an "abbreviated new drug application" (ANDA) is filed which contains information showing the generic to be essentially equivalent to the brand name. Assuming statutory requirements are met, there is no limit to the number of ANDA's the FDA may approve. Furthermore, the first ANDA applicant gets a 180-day period of market exclusivity in which no additional ANDA's may receive FDA approval and this generic monopoly does not begin until actual commercial marketing. This pro-generic ANDA-approval procedure is compromised in some situations by the pioneer drug company's ability to initiate a thirty month stay on ANDA approval triggered by filing a patent infringement suit. Interestingly there can be no thirty month stay on FDA approval of generic antibiotics (Piatt 2003).

In the last twenty years pharmaceu tical competition has evolved with scores of court decisions interpreting the details of the Hatch-Waxman Act. That evolution is presently surroun ded by controversy manifested by recent studies conducted by the Federal Trade Commission and by proposed amending legislation. That controversy includes: antitrust concerns arising from agreements between innovator and generics governing market entry; "Orange Book" listing abuses by innovators; frivolous infringement claims; compulsory licensing of drugs to combat diseases and terrorism. In the past, Congress has and should wisely avoid broad sweeping legislative change based upon contemporary public sentiment. Congressional action with respect to any changes to the unique incentive-backed expectations of the pharmaceutical industry needs to be watched closely.

The purpose of this study is to investigate the determinants of the unique idiosyncratic risk in the pharmaceutical industry filling the gap created by the absence in previous studies. The findings will contribute to the knowledge needed by investors in pharmaceutical companies where market and idiosyncratic risks are both relevant to their decision. Pharmaceuticals whose average beta is 0.9 i.e. less than 1, attract the growth- oriented investors, who like to diversify in more defensive stocks especially during times of high uncertainty (Ryan 2002). However, Campbell et al (2000) point out that some investors are unable to diversify, because first, they are the managers of the firm especially those who have stock options; second some other investors may own small number of stocks that may not have high correlation with the aggregate market; third, there may be some arbitrageurs who may try to exploit the mispricing of pharmaceutical stock prices; fourth, the effects of some informa- tion, which may be specific to the pharmaceutical industry, could be examined through this risk measure and finally if the options were written on the pharmaceutical stocks, the pricing of these options would require study of both market and the idiosyncratic risk. These reasons make the decomposition of risk into market and idiosyncratic risk more relevant for such investors in their evaluation and selection of investment instru-ments.

After isolation of idiosyncratic risk, the second part of the analysis would involve estimation of whether some of the characteristics of the pharmaceutical industry are related to idiosyncratic risk measure. These characteristics include various accounting based variables such as: size, financial leverage, efficiency of management, liquidity, capital, and variability of earnings. Rest of the paper is organized as follows. Section two outlines the theoretical model of the idiosyncratic risk based on the Capital Asset Pricing Model (CAPM). The data and methodology employed is discussed in section three while results are analyzed in section four and conclusions are offered in the last section five.

MODEL FOR IDIO SYNCRATIC RISK

Typical return of pharmaceutical stocks can be decomposed into two components. A market aggregate and a firm-specific residual. On this basis we can derive a time-series measure of volatility. We incorporate weights in such a manner that this methodology would be applicable for any arbitrary weighting scheme of these stocks. Let us say that subscript j refers to individual pharmaceutical stock whereas, subscript m refers to the market aggregate for pharmaceuti-cals. Hence, the excess return on individual stocks would be expressed as $r_{it} = r_{jt} - r_{ft}$, where r_{ft} is the risk-free rate and excess market return is $r_{mt} = \sum_i w_{it} r_{it}$.

In the next step, we decompose these two components of return volatility. We first, decompose the measure based on CAPM, and then we modify this model for empirical implementation. The CAPM model can be written as:

$$r_{jt} - r_{ft} = \alpha_j + \beta_{jm} r_{mt} + \varepsilon_{jt} \quad (1)$$

As stated above, r_{mt} is the market risk premium and equals $r_{mt} = r_{at} - r_{ft}$, where r_{at} is the aggregate market return. Since, we are taking excess returns, CAPM allows us to set intercept equal to zero in the following equations:

$$r_{it} = \beta_{im} r_{mt} + \delta_{it} \quad (2)$$

In (2)β_{im} refers to beta for the industry and δ_{it} is the industry specific-residual or idiosyncratic risk. Taking variance of both sides we get:

$$\sigma^2(r_{it}) = \beta_{im}^2 \sigma^2(r_{mt}) + \sigma^2(\delta_{it}) + 2\,Cov(r_{mt}, \delta_{it}) \quad (3)$$

Where, is the standard deviation of excess returns. We assume that the market return is orthogonal to idiosyncratic risk or the error term is independent and identically

distributed (iid). This permits us to derive a simple variance decomposition in which the covariance term is zero:

$$\sigma^2(r_{it}) = \beta_{im}^2 \sigma^2(r_{mt}) + \sigma^2(\delta_{it}) \quad (4)$$

We will employ $\sigma^2(\delta_{it})$ as a volatility measure for the idiosyncratic risk, which will be regressed against various pharmaceutical industry's characteristics as the independent variables.

DATA AND THE EMPIRICAL MODEL

In the second part of our analysis, we isolate the specific factors that make pharmaceutical industry unique and contribute to the idiosyncratic risk. In particular, we try to find out as to how the size, financial leverage, efficiency of management, liquidity, capital, and earnings contribute to the overall sensitivity of firm-specific risk factors for these firms. These factors and why they are important are discussed below

1. Size

The larger size the pharmaceutical firm, measured by the logarithm of their assets, could lead to a higher or lower idiosyncratic risk. This is based on two conflicting arguments. On one hand, the larger size the pharmaceutical firm the higher its idiosy-ncratic risk. This is due to the assumption that the firm is more likely to be an innovator, investing more in research and development of new drugs causing its idiosyncratic risk to increase due to the high cost of developing drugs, the long approval time, the high rate of failure and the competition from generic drugs. On the other hand, it can be argued that the larger size the pharmaceutical firm the lower is its idiosyncratic risk. This argument is based on the assumption that the larger the size of the pharmaceutical firm the more it is diversified geographically. It trades in a wider market line and is expected to enjoy larger economies of scale and scope. "... research programs located within larger firms are significantly more productive than rival programs located within smaller firms". (Henderson and Cockburn, 1996. P.55). As a result, the larger firm would be more insulated from fluctuations in the market prices of their products than the smaller firm who is unable to achieve such a level of diversification or economies of scale and scope.

Based on these two arguments it can be hypothesized that size can take a coefficient with a negative or positive sign as determinant.

2. Financial Leverage Risk

Like the industrial firms, a lower level of capital or higher proportion of borrowings is likely to magnify the earnings for pharmaceuticals while increasing their financial risk. In addition, it is also likely to exacerbate the agency problems between the managers and the bondholders thus increasing the idiosyncratic risk.

Based on this argument it can be hypothesized that the lower the financial leverage, measured by the ratio of total debt to equity, the lower the idiosyncratic risk and that the higher the financial leverage the higher the idiosyncratic risk.

3. Management Efficiency

This measure would involve management's ability to control operating expenses of the company. Conceptually, it may include the amount pharmaceuticals pay for every dollar of income generated by them. Depending on the level of interest rates, it may also involve the appropriateness of choice of assets and liabilities, which may enable pharmaceuticals to maximize its income and minimize its costs for profit maximization. Additionally, improved efficiency could be achieved by effectively utilizing the benefits from the economies of scale by pooling R&D, and the economies of scope by widening the product line.

Management efficiency will be measured by the ratio of operating expenses to total expenses. Based on the above arguments it can be hypothesized that the higher the ratio the less efficient the pharmaceutical firm in managing its operations leading to higher idiosyncratic risk and vice versa.

4. Liquidity Risk

Liquidity risk may impact the current or future earnings if the pharmaceuticals are unable to meet their payment obligations. Funding risk may arise, if the pharmaceutical firms are unable to liquidate illiquid assets without loss of value and within a reasonable time period. Market liquidity risk arises if investors or management are unable to sell pharmaceuticals stocks because of lack of market depth arising from the fact that less analyst tend to follow these securities. Most pharma ceuticals would hold some assets that can be liquidated easily to meet their liquidity needs. This risk measure would also include the ability of a pharmaceutical firm to obtain funds from the capital markets. Larger pharmaceuticals are expected to have less liquidity needs than the smaller ones. We will test this hypothesis by sub-dividing pharmaceuticals based on their size. We will employ quick ratio calculated as cash and marketable securities divided by total assets as a measure of liquidity risk for pharmaceuticals. . Based on the above argument, it can be hypothesized that the higher the quick ratio, the lower the perceived company's liquidity risk the lower its idiosyncratic risk.

5. Capital Risk

Capital is a measure of solvency of a pharmaceutical firm. Hence, the greater is the equity of a pharma-ceutical firm as

a percentage of its assets, the more amounts would be available to cushion the losses, if any, and less risky is the capital structure of such an organization. Larger and more diversified pharmaceuticals would tend to carry lower proportion of equity as a percentage of their assets, whereas, smaller pharma-ceuticals would tend to have larger equity as a percentage of assets in view of the fact that they are less diversified and have less ability to raise funds from the capital markets. Capital risk is measured by the ratio of equity capital to total assets.

Based on the above argument it can be hypothesized that, the higher this ratio the lower the idiosyncratic risk of the pharmaceutical firm.

6. Earnings Risk

Firms that have stable earnings, lower would be the impact on idiosyncratic risk. More diversified and larger pharmaceuticals are expected to generate more reliable or stable earnings over a time period. Nevertheless, the earnings generated by the pharmaceuticals are dependent on the patent expiration, introduction of generic drugs and pricing restrictions. The Pharma-ceutical Company can enjoy an additional profit from owning a monopoly on the drug because of the patent protection that could lasts for 20 years. However, price regulations and the introduction of the generic drugs could lead to the loss of additional profits (Harris, NY Times, 6/12/2003). Earning risk or volatility is measured by the standard deviation of the earnings ratio calculated by dividing net income by total assets known as return on assets (ROA).

Based on these arguments it can be hypothesized that the lower return on assets, the higher is the idiosyncratic risk of the pharmaceutical industry.
Using these measures and hypotheses we estimate the following models with the two measures of idiosyncratic risk:

$$\sigma^2(\delta_{it}) = \psi_0 + \psi_1 Size + \psi_2 Leverage + \psi_3 Efficiency + \psi_4 Liquidity + \psi_5 Capital + \psi_6 Earnings + \lambda_t \quad (8)$$

$$\sigma^2(\eta_{it}) = \psi_0 + \psi_1 Size + \psi_2 Leverage + \psi_3 Efficiency + \psi_4 Liquidity + \psi_5 Capital + \psi_6 Earnings + \lambda_t \quad (9)$$

In these equations, the independent variables are *Size*, which is computed as logarithm of assets [*log (assets)*], *Leverage*, which is defined as the degree of financial leverage and it is measured by [*Debt / (Debt + Equity)*], *Efficiency*, which measures how effectively the management controls its operating costs and is measured by [*(Net Sales EBITDA) / Net Sales*], *Liquidity*, which is defined by how quickly assets can be converted into cash without loss of value to meet pharmaceuticals liquidity needs and is measured by (*cash and marketable securities / total assets*), *Capital*, is the amount of capital a pharmaceutical firm has to cushion its losses and is measured by (*equity/total assets*), and finally *Earnings*, which measures earnings as related to the assets. Because of the diversification and the assets and liability structure some firms are expected to have more stable earnings to cushion possible losses. This is measured by return on assets (ROA). The data used in this analysis was obtained from *Compustat* for a five-year time period (from 1995 to 2000). Monthly returns for the pharmaceuticals were also obtained from *Compustat* for the corresponding period. These pharmaceutical firms either trade on the New York Stock Exchange (NYSE) or over the counter (NASDAQ). We also obtained the data on the market index Standard and Poor (S&P) 500. The time period covered for the market index and the pharma-ceutical indices is from January 1995 to December 2000. Since, some of the pharmaceuticals did not have complete accounting information we had to drop these from our database. In the first stage of our analysis, we computed the measures for both idiosyncratic risk and the market risk. We also computed these values for the individual pharmaceuticals using the models defined and discussed above. In the second stage of our analysis, we computed average values for the accounting based measures over the five-year interval. We used the measures of idiosyncratic and market risk as the dependent variable and accounting based measures as the independent variables in the cross-sectional regression models given above.

DISCUSSION OF RESULTS

The descriptive statistics in table 1 show that the average size of the pharmaceutical companies is $2.90 billion and that they do not differ substantially in terms of size as indicated by the relatively low standard deviation. They show that the pharmaceutical companies are not highly leveraged with an average of 29% leverage ratio, contrary to the common contention since they need large amounts of funds to finance their R&D. They appear to depend on their equity funds more in financing their activities including their R&D. This is confirmed by the relatively high capital ratio with an average of 61% and a low standard deviation of 0.23. In addition, the figures in table 1 indicate that efficiency ratio is very high indicating that the operating expenses of the pharmaceutical companies are very high as compared to their total expenses which could be attributed to the large and increasing spending on the R&D. Further, table one indicates that the liquidity of the pharmaceuticals, with an average quick ratio of 0.39 which is much less than one, is very low implying that most pharmaceutical companies could be classified as illiquid. They keep low cash position and low accounts receivable as compared to their current liabilities or short term sources of funds. Finally, table one shows that pharmaceuticals achieve a reasonable earnings level with an average earning ratio of 13.3%. However it shows that these earnings are highly volatile, showing a large fluctuation as indicated by the relatively high standard deviation of 10.89%.
The regression results are reported in table 2 which shows the regression coefficients under two alternative sets of independent variables. The first set includes the

independent variables of size, leverage, efficiency, liquidity, and earnings while the second set includes the same independent variables except that capital replaces leverage.

This is because when the multi-collinearity tests are run, it is found that the leverage and capital ratios have high multicollinearity. Under the two regressions the F-values of 4.77 and 5.12 are significant at the 1% level indicating that, cumulatively, these variables significantly impact the market risk. Also, the adjusted R-square, which indicates the proportion of variation in the dependent variable is explained by the independent variables has a value of 24.4% and 25.9% under the first and the second set respectively.

The figures in table 2 indicate that under the first set size, leverage and efficiency are statically significant with the right sign while liquidity and earnings are not statistically significant yet with the right sign. This means that the first three variables contribute the most to the determination of the firm's market risk as compared to the other two variables. It leads us to conclude that the smaller the size, the higher the leverage and the lower the efficiency of the pharmaceutical company the higher its market risk, and vice versa. Further, the figures of two variables indicate that the lower the liquidity and the lower the earnings the higher the company's market risk. All of these conclusions support our hypothesized relationship between the independent variables and the dependent variable i.e. the market risk.

Under the second set where capital replaces leverage the adjusted R-Square increases by 1.5% while the figures in table 2 indicate that size, efficiency and capital are statistically significant with the right sign and that liquidity and earnings are not statistically significant yet with the right sign. This means that the first three variables contribute the most to the determination of the market risk as compared to the other two variables. The market considers the that the larger the size of the pharmaceutical company the more efficient the company in running its operations benefiting from the economies of scale and scope and the greater the capacity to raise capital at a cheaper cost to fund its research and operations. Further the coefficients of the other two variables and their signs indicate that the market considers liquidity earnings less important in determining the company's market risk. This could be explained by the market's contention that pharmaceutical companies have easy access to the long- term capital market to finance their long term operations including research and development that takes a long time to develop, approve, produce and sell their drugs in the market. In other words it is conceived that the pharmaceutical companies are long term investors who need long term funds and not short-term liquidity. Their success in selling their drugs will generate increasingly high and earnings over a long period of time due to the monopoly and the patent protection that they can enjoy for an extended period of time.

Under the second set where capital replaces leverage, the regression results show that size, efficiency and capital are statistically significant and appear with the expected sign. They indicate as in the first set that the larger the size the lower the market risk, the lower the efficiency the higher the market risk and that the lower the capital the higher the market risk. Liquidity and earnings do not appear to be significant and are not important determinants of the market risk as perceived by the market. Again the explanations for these results could be found in the previous discussions of the first set. Market appears not concerned with liquidity and earnings due to the nature of the pharmaceutical companies which is characterized as long term investors that use long term funds and that they take a long time to produce results in terms of earnings. In other words, the market 's contention is that if the company is large, then its efficiency will improve due to economies of scale and scope and it will have an easy access to the capital market to raise the long-term needed funds. They expect the company to realize high and increasing earnings as they are protected by the monopoly given to them by the patent law.

As for the idiosyncratic risk, the results of the one factor regression model using the two sets of variables, the same as under the market risk, are reported in table 3. Under the two sets the F-Values are highly significant indicating that cumulatively the five variables in each set are good determinants of the company's idiosyncratic risk. This is supported by the high adjusted R-Square where its value is 66% under the first set and 65% under the second set.

As reported in table 3, under the first set where leverage is included and capital is excluded, and the second set where capital is included and leverage is excluded, the figures indicate that only size and earnings are statistically significant and that both appear with the expected sign. They imply that the larger the size of the company and the smaller the variability of its earnings the lower the company's idiosyncratic risk .The other three variables namely, leverage, efficiency and liquidity appear to be insignificant with only leverage appearing with the expected sign and efficiency and liquidity both appearing with the opposite signs. Again this could be explained by the fact that the larger the size of the company the greater the market power and its expertise to develop risk reduction strategies through more diversifications resulting into higher economies of scale and, or economies of scope that in their turn lead to higher earnings stability with lower volatility thus lowering its idiosy-ncratic risk. As for the other three insignificant factors, the operations of the pharmaceutical companies are oriented toward long term investment and financing with low consideration for liquidity, efficiency and leverage over the long run.

SUMMARY AND CONCLUSIONS

The study tried to develop a model that contains variables that can be used to determine both the market risk and the

idiosyncratic risk unique to the pharmaceutical industry which is characterized as a capital intensive industry that deals with producing products considered long investment. The process of production is very long and exposed to high risk due to the high level of failure rate.

The determinants were calculated from the accounting data of the pharmaceutical companies provided in the Compustat data base. These determinants include size measured by log (Assets); leverage measured by Debt / (Debt + Equity); efficiency measured by (Net Assets - EBITDA)/ Net Sales; liquidity measured by (Cash + Marketable Securities) / Total Assets; capital measured by Equity / Total Assets and finally the variability of earnings measured by the standard deviation of Net Income / Total Assets ratio. These determinants were regressed against first the market risk of measured by beta and then against the idiosyncratic risk measured by the standard deviation of the residual using the One Factor Regression Model with S&P 500 Index.

The results suggest that significant determinants for the market risk are size; leverage and efficiency when capital is excluded and size; capital and efficiency when leverage is excluded. The significance and the signs of the regression coefficients imply that market investors consider that the larger the size of the pharmaceutical company the lower its market risk; the higher the leverage or debt ratio the higher the market risk and finally the higher the efficiency of the company the lower its market risk. From these implications, it can be concluded that the market does not assume that the larger the size the more efficient the company and thus separate the two factors. In other words although the two factors are related they are distinguished by the market that evaluates their impact on market risk independently. Also, it can be concluded that the capital structure in the pharmaceutical companies is important and that could explain the tendency of the pharmaceutical companies to keep their leverage ratio low as compared to other industrial companies, apparently depending on fund generated internally. Finally, the results indicate that liquidity and earnings did appear to be significant determinants of the pharmaceutical company's market risk. It is possible that the market thinks that the pharmaceutical companies have easy access to the financial market and can raise funds as they need thus they do not need, so liquidity is not an issue and that in the long-run the pharmaceutical companies have stable earnings due to their monopoly on their developed drugs.

Further the results indicate that the significant determinants of idiosyncratic risk are size and earnings variability whether leverage or capital is included in the determinants set. These two significant determinants provide increased guidance to investors seeking diversification to minimize specific risk.

It is assumed that the larger the size of the pharmaceutical company the lower its idiosyncratic risk. This can be attributed to the contention that the larger size is associated with better management and more stable growth due to greater ability and capacity to develop drugs and afford failures than smaller size company. In addition it is assumed that the lower the variability of the earnings of the pharmaceutical company the lower its idiosyncratic risk. This can be attributed to the contention that in the long run pharmaceutical companies can achieve increasing more stable earnings as result of the patent protection and the operating in an imperfect and oligopolistic market.

Table 1
Descriptive Statistics of the Determinants of pharmaceuticals Riskiness

Variables	Number	Mean	Standard Deviation	Minimum	Maximum
Size	80	2.19	0.96	0.77	4.45
Leverage	80	0.29	0.55	0.00	4.69
Efficiency	80	0.91	1.40	0.00	5.48
Liquidity	80	0.39	0.30	0.6E-2	0.93
Capital	80	0.61	0.23	0.011	0.94
Earnings	80	13.13	10.89	1.40	49.89

The variables for the risk measure are computed as follows:
Size=log (assets); Leverage= debt/ (debt + equity);
Efficiency= (Net Sales – EBITDA)/Net Sales;
Liquidity= (cash + marketable securities)/total assets
Capital=equity/total assets; Earnings= (net income)/total assets

Table 2
Pharmaceuticals Market Risk – One Factor Regression Model with S&P 500

Variables	Coefficients/ Without Capital	Coefficients/ Without Leverage
Dependent Variable: Market Risk		
Size	-.114*** (-2.56)	- 0.140*** (-3.02)
Leverage	.151** (2.15)	----------
Efficiency	-3.55E-2*** (-2.30)	-3.40E-2*** (-2.89)
Liquidity	-0.155 (-0.97)	-3.32E-2 (-0.19)
Capital	--------	-0.465*** (-2.51)
Earnings	-3.27E-4 (-0.08)	7.96E -4 (-0.19)
F-Value	4.77***	5.12***
R^2	0.244	0.259

T-values are given in parentheses
, **, * indicate significance at 10%, 5%, and 1% levels respectively.*

Table 3
Pharmaceuticals Idiosyncratic Risk – One Factor Regression Model with S&P 500 Index

Variables	Coefficients/ Without Capital	Coefficients/ without Leverage
Dependent Variable: Idiosyncratic Risk		
Size	-4.38E-2** (-8.24)	-4.49E-2*** (-8.04)
Leverage	-4.47E-3 (-0.53)	
Efficiency	3.26E-4 (0.23)	-3.50E-4 (0.25)
Liquidity	1.15E-2 (0.60)	1.59E -2 (0.78)
Capital	-----	-9.82E-3 (-0.44)
Earnings	1.57E-3*** (3.07)	1.44E -3*** (2.81)
F-Value	28.55***	28.49***
R^2	0.66	0.65

T-values are given in parentheses
, **, * indicate significance at 10%, 5%, and 1% levels respectively.*

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