An Empirical Analysis of the Performance of the Ghana Stock Exchange and Treasury Bills

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Abstract

The study compared risk and returns characteristics of stock exchange traded shares and treasury bills in Ghana to find out which of the two instruments gives better rewards to investors. We made use of annualized returns of these instruments and applied statistical measures of average annual returns, standard deviations and co-efficient of variations for the analysis. Comparing investor 'A' (Treasury Bills Investment) and investor 'B' (GSE All-Share Investment) as sample study for the period of 1990 to 2010, it was revealed that GSE All-Shares Index has higher risk and higher return. This result confirms the general expectation of the relationship between rate of returns and the risk associated with investment – the higher the risk, the higher the return. The Study further revealed that the market performance of both treasury bills and GSE All-Share Index outperformed the rate at which prices were rising (average inflation rate) for the period 1990 – 2010.

Key Words: Ghana Stock Exchange, Stocks, Treasury bills, returns, risk

1.0 Introduction

The influence of market imperfections on security pricing has long been recognized. Market performance, in particular, has attracted a lot of attention from traders, regulators, exchange officials as well as academics. Recent financial crises, however, suggest that, at times, market conditions can be severe and improvements can decline or even disappear, such shocks are a potential channel through which asset prices are influenced by macroeconomic variables. Jacoby, et al (2000) provides theoretical arguments to show how treasury bills impacts stock market prices. Jones (2001) show that stock prices predict expected returns in the time-series. Pastor and Stambaugh (2003) in their findings concluded that expected stock returns are cross-sectionally related to risk. As more data has become available, recent work has shifted focus on studying time-series properties of risk in equity markets as well as in Treasury bills. Hasbrouck et al, 2001, document commonality in trading activity and risk in the equity markets. Huang, et al (2001) relates risk to return volatility, while Brandt (2002) study the relationship between liquidity, order flow and the yield curve.

So far, the literature on stock and Treasury bill risk has developed in separate strands. There is good reason; however, to believe that risk in the stock and money markets covaries. Although the unconditional correlation between stock and Treasury bill returns is low (Campbell, 1993), there are strong volatility linkages between the two markets (Fleming, 1998), which can affect risk in both markets by altering the inventory risk borne by market making agents (O'Hara et al, 1986). Second, stock and money market risk may interact via trading activity. A negative information shock in stocks often causes a "flight to quality" as investors substitute safe assets for risky assets.

The resulting outflow from stocks into Treasury bills may cause price pressures and also impact stock and Treasury bill returns. In other situations, stock and Treasury bills order flows may be complementary. Further, systematic wealth or informational shocks could induce positively correlated trading while the extant literature has examined the dynamic interaction of treasury bills and returns in stock markets (Hasbrouck, 1991). Earlier work has analyzed the effects of monetary policy and fund flows on financial markets. Fleming et al (1997) document that monetary shocks are associated with large changes in treasury bills and stock prices. For fund flows, Edelen et al (2001) show a positive association between aggregate flow and concurrent market returns, while Goetzmann et al (2002) document that fund flows affect price formation in equity markets. These findings indicate that fund flows and monetary factors can affect returns and volatility.

Oudet et al (1973) propose that stocks would be a perfect hedge against inflation given that they are held up to a suitable investment horizon. They argue that factors such as the expected stock prices, nominal earnings forecast and the interest rate adjustment mechanism determine the length of the appropriate investment horizon. In a related study, Oudet (1973) revisits the notion of stocks being a good hedge against inflation. In the theoretical part of his study, he elaborates the factors that may render stocks as a good hedge against inflation. He explains that a rise in inflation may result in growth in the real earnings due to the lead-lag proposition, i.e. the cost of the production do not increase as fast as the price of the final products, resulting in higher profits. However, the empirical results of his study did not find any evidence of positive inflation hedging capacity of stocks.

Modigliani and Cohn (1979) attribute the perverse hedging capacity of stocks to the mispricing of stock markets due to inflation illusion. They argue that the mispricing of stock markets result in undervaluation of stocks during periods of high (positive) inflation. They elaborate that this mispricing is the outcome of two inflation induced errors committed in the valuation of stocks. Firstly, the accounting profits ignore the gains resulting from the decrease in the real value of nominal debt. Secondly, the equity earnings should be capitalized using real rather than nominal rates. The discounting of the earnings at the nominal interest rate results in undervaluation of stocks. Fama (1981) documents an alternative hypothesis, known as the proxy hypothesis, and elaborates on the underlying role of real activity in the relation between stock returns and inflation. The proxy hypothesis postulates that the negative relation between stock returns and inflation is spurious and owes to the fact that inflation is negatively related to real activity while stock returns have a positive relation with real activity. Geske et al (1983) supplement and extend Fama's proxy hypothesis by adding another piece to the puzzle by elaborating on the role of the fiscal sector in explaining the spurious relation between stock returns and inflation. Boudoukh et al. (1994) test the Fisher hypothesis for US stocks at the industry level.

They group the entire market of stocks into 22 industries and analyze the relation between inflation and stock returns. They document that the hedging capacity of stocks depends upon the cyclical tendency of a particular industry and conclude that non-cyclical industries, in general, have better hedging capacity. Campbell (2004) analyzes the relation between stock prices and inflation by employing the dividend-price ratio model of Campbell et al (1988). They test three alternative explanations of the effect of inflation on the stock's yield or the dividend-price ratio. Firstly, if stocks were claims on real assets, an increase in expected inflation would result in an increase in future earnings of the stocks, thereby rendering no effect on the dividend price ratio, implying positive relation between inflation and stocks. Secondly, the long run growth rate of dividends may be affected by inflation resulting in an increase in the nominal dividend-price ratio. The risk of inflation in turn, could induce investors to increase the equity risk premium and the real discount rate. As per this explanation, inflation is positively related to stock prices. Lastly, they test the Modiglani and Cohn (1979) hypothesis of mispricing driven by inflation illusion. Their findings validate only the Modigliani-Cohn hypothesis that the negative relation between stock prices and inflation is due to mispricing driven by inflation illusion. They document that the mispricing effect tends to diminish with an increase in the investment horizon.

Empirical studies of Barro (1991) have shown that low-income countries have greater policy uncertainty than high-income countries and that policy uncertainty is an important factor for the lower long-run investment and output in these countries. Recent theoretical and empirical works have also demonstrated a clear negative link between macro-economic and political uncertainty and levels of private investment across countries. For example, Serven et al (1993) reported a negative impact of inflation and real exchange rate volatility on private investment in a sample of developing countries.

Aizenman et al (1995) found a negative correlation between indicators of macro-economic volatility (terms of trade, inflation, real exchange rate) and private investment. Green et al (1991) found that higher inflation rate had negative effect on private investment of 23 developing countries in their pooled time series cross-sectional study. Another strand of literature has examined the effects of political uncertainty on investment. These studies have focused on the role of government instability, rapid government turnover, unstable incentive frameworks, social unrest and fundamental uncertainties about property rights. In the light of the above theories, it is clear that private investment decisions may be subject to multiplicity of influences and evidences, different behaviour under different circumstances and time period.

Every investment entails some degree of risk, according to Francis (1991); it requires a present sacrifice for a future uncertain benefit. Every investor has his or her own attitude about risk and how much he or she can tolerate, (Cheney and Moses 1999). They pointed out that since investment alternatives have different types of risks associated with them, the investor must determine which combination of alternatives matches his/her particular risk tolerance. They also pointed out that intelligent investing involves combining investment alternatives in a portfolio that offers a fair return for the risk one is willing to assume.

Mckinnon and Shaw (1973) argued that developing countries suffer from financial repression and that if these countries were liberated from repressive conditions, this would induce savings, investment and growth. This conclusion however, applies only when the capital market is in disequilibrium with the demand for funds exceeding supply.

Aboagye et al (2008) in studying the performance of stocks in Ghana, using an investment of the same amount in treasury bills and shares over a period of 1991 and 2001, found out that investors in stock exchange traded shares earned on average 54% per annum, whereas treasury bill investors Earned 36.3%. Thus stock exchange traded shares returned a positive risk premium of about 18 percentage point on average per annum. Risk is therefore rewarded. He further pointed out that investors in treasury bills as well as investors in shares all realised average annual returns that exceeded the average rate at which prices were increasing. He noticed with concern the establishment of an organised stock exchange where limited liability companies now have a chance to raise capital. But Ghanaians are so impressed with the observable high rate of returns on treasury bills that many believe treasury bills offer the chance to earn higher returns than can be earned on other financial securities. In general, this study aims at comparing and analyzing the annual returns on treasury bills and equity securities for the period 1990-2010. To determine whether investors are given premiums for taking risk and to find out whether investors are adequately compensated in real terms, that is after considering inflation.

2.0 Methods

2.1 Study area

The Ghana Stock Exchange (GSE), Ghana's only stock exchange, was incorporated in July 1989 as a company limited by guarantee under the Companies Code, 1963 (Act 179). Approval to operate as a stock exchange was obtained under the now repealed Stock Exchange Act 1971 (Act 384). Trading on the GSE commenced in 1990. It currently has 35 listed companies whose shares and bonds are traded on the floor of the exchange. These listed companies commit to disclosure standards and compliance with regulations. GSE All-Share Index is the only index that is compiled and published by GSE. GSE-All Share Index is a market capitalization index of all share listed on GSE. All listed companies are included in the index at total market for a period from 12 November 1990 to 30 December 1993 calculated by averaging the market capitalization for all trading sessions during this period. Base index value is 100. To maintain the continuity of the index, the base year total market value is adjusted for all events affecting the capitalization of the companies included in the index that are not caused by price changes. These invents include new share issues, new listings, de-listings, and right issues.

2.2 Source of Data

Data was collected from Bank of Ghana Library, others from the FACTS BOOK issued by the Ghana Stock Exchange as well as Statistical Services of Ghana. The study population was made up of the results of the Ghana Stock Exchange all-share index since the year of establishment in 1990 to 2010, and treasury bills rates as published by the Bank of Ghana for the same period.

The study therefore used documentary data on annual returns of the two investment instruments- T-bills and GSE-All Share Index-and compared these results with the inflation rates for the period 1990 – 2010. This research work relied on information from documentary source or secondary data. Historical data on annual returns were collected and processed to determine the average annual returns of the listed stocks and Treasury bills in Ghana for a period. Data collected covered the period 1990-2010.

2.3 Model Specification, estimation and test

The investment variables used in the comparative study are the 91 – Day Treasury Bill and the Capital Market Instruments, represented by the GSE - All Share Index. The choice of the 91 – Day Treasury Bill was based on its popularity among investors in Ghana. The GSE index is chosen because it tracks performance of the capital market as a whole and is therefore quiet representative of the market. We considered two investors, investor 'A' and investor 'B'. Investor 'A' started the year 1990 by investing an amount of money in a 91-day treasury bill. Investor 'B' started the same year by purchasing one share each of the listed companies on the GSE with the same amount of money. By buying a share each of the companies listed on the GSE, the investor had created an investment portfolio. After 91 days, investor 'A' reinvested all proceeds from his Treasury bill investment in yet another 91-day Treasury bill investment again. He did this till the year ended. His returns were then rolled over. This means that his returns are calculated as the compound return earned for the year. This roll over was done after every 91 days for every year till to the end of 2010.

For investor 'B' at the end of 2010, his portfolio had a value equivalent to the dividends he received on each company share in addition to the market value of each share in the portfolio. Most often, dividends paid by a company were used to buy more shares of the same company. The gains or return realized for the year is equivalent to the end-of-year value of the portfolio minus the value of the portfolio at the start of the year. The rate of return equaled the gain divided by the value of the portfolio at the start of the year. This process is repeated yearly in computing the annual rates of return on the portfolio of shares. If within the course of any particular year, any company listed on the GSE issued additional shares to shareholders probably in lieu of cash dividends, stock dividends and /or stock splits, the increased number of shares is used in computing the value of the portfolio thereafter. Some companies also undertook ―rights issue‖. These were additional shares sold exclusively to existing shareholders in proportion to their share quantity or the number of shares they hold. If a company in investor 'B's portfolio sold him a rights of issue, in computing the rate of return, consideration is given to the additional investment that was made by 'B'. Comparing the annual returns on the treasury bills and equities, the following are calculated for the two instruments;

- The average annual rate of return (nominal and real)
- The standard deviations and
- Co-efficient of variations

The average annual rates of returns are obtained by using the Arithmetic Mean formula and the Geometric Average formula.
Arithmetic Mean (AM) = Σ ARR/ n, where
Σ ARR is the total of annual rates of returns and n is the number of years.
The Geometric Average = {(HPR1+1.0) (HPR2 + 1.0) (HPR3 + 1.0) .....} 1/n – 1.0
Where, HPRi is a holding period for exactly one year.
The ―real‖ average annual rates of return have been computed using the formula

$$\frac{(1 + Norminal\ Interest)}{(1 + Inflation\ Rate)} - 1$$

The standard deviations are computed using the formula.

$$\theta = \frac{\sqrt{Ri - R^2}}{n}$$

$$\text{Where: } \frac{\Sigma}{n}(Ri - R^2) = \delta^2(variance)$$

Ri = Annual Rate of Return during period (i)
R^2 = the expected value of the holding period yields i.e. the Geometric mean or the Arithmetic mean of the series.
And n = the number of observations

The co-efficient of variation have been calculated by dividing the standard deviation of the returns by the expected rate of the returns i.e. the geometric or arithmetic average of the series.
Two hypotheses have been generated for the study;

(1) H_o = investments in equities have higher returns in the long run than investments in treasury bills
H_i = investments in equities do not have higher returns in the long run than investments in treasury bills

(2) H_o = average annual returns on both treasury bills and listed equities are normally over and above the average rate of inflation

H_i = average annual returns on both treasury bills and listed equities are not over and over the average rate of inflation

4.0 Empirical Results and Discussion

4.1 Analysis of the 91- day Treasury bill

The annualized historical returns obtained by investors in Treasury bill in Ghana for the period 1990– 2010, in the form of interest are analyzed by comparing them with the average rate of return for the period. The historical annual rates of return are also compared with corresponding annual inflation rate to see how the instrument fared against the inflation. In terms of the riskiness of the instrument during the period, the standard deviation and the co – efficient of variation of the security are also computed for use in the overall analysis.

Table 1: Nominal Interest Rate, Rate of Inflation and Real Rate of Returns of Treasury Bills for the Period 1990 to 2010

Year	91-Day Treasury Bill Return (%)	Rate of Inflation (%)	Real Rate of Returns (%)
1990	29.53	35.9	-6.37
1991	21.05	10.3	10.75
1992	27.13	13.3	13.83
1993	34.78	27.7	7.08
1994	34.78	34.2	0.58
1995	45.06	70.8	-25.74
1996	47.88	32.7	15.18
1997	47.53	20.5	27.03
1998	28.67	15.7	12.97
1999	34.18	13.8	20.38
2000	41.99	40.5	1.49
2001	28.94	21.3	7.64
2002	26.6	17	9.6
2003	19.6	31.3	-11.7
2004	17.1	16.4	0.7
2005	11.4	13.9	-2.5
2006	9.6	10.9	-1.3
2007	10.6	12.7	-2.1
2008	24.7	18.1	6.6
2009	22.5	16	6.5
2010	12.25	8.58	3.67

Table 1 shows that the nominal return an investor gets from investing in treasury bills increased from 29.53% in 1990 to as high as 41.99% in 2000.This means that an investor (A) who invested GH¢1,000 in 1990 would have his money increased to the value of GH¢28,902 by the end of 2000(Ref. Appendix A).That is realizing a monetary return of GH¢27,092 over the 11-year period, based on our assumption that the investor rolls over both principals and interest earned. Table 1 further shows that, there has been a persistent drop in the rate of return from the year 2000 to 2006 then it fluctuates by a smaller magnitude in 2007.The rate dropped to as low as 9.6% as at the end of year 2006. The investor (A) would have a monetary value of GH¢78,415 at the end of 2006 (Ref Appendix A).The data further means that on the average the investor in treasury bills obtains a 27.42% rate of return per annum on this risk free investment.

The returns on the Treasury bills earned have not factored the time value of money. This means that, we need to factor the concept that the GH¢1,000 invested in 1990, is not the same as GH¢1,000 obtained in 2010.This is mainly because of inflation. Thus to be able to obtain the true return the investor earned over the period we need to factor in the respective annual inflation rates. In order words we need to calculate the real rate of return. The inflation rates for the respective years and calculations of the real rate of return are depicted on Table 1 above.
From Table 1 above, it will be seen that the real rate of returns were negative in certain years. For examples, it was a negative 25.74% in 1995 and negative 2.5% in 2005. This means that for those years it was not worth investing in treasury bills, as the returns earned from such investments in those years fell short of increases in general price levels.

The negative returns recorded further means investible funds, committed to treasury bills for those years lost value. For Investor A, given the real rate of return above, it means that the investor's real value of his money at the end of 2000 was GH¢1,906 (Ref. Appendix B). This further means that in real terms the investor had made a monetary return of GH¢906.

The Table1 also indicates a persistent drop in the real rate of returns from 1999 onwards; with the rate dropping from 20.38% in 1999 to 3% by the end of 2010. This means that the return from T-bills has performed poorly compared to inflation in those years. Investor A's real monetary value at the end of 2010 was thus GH¢2217 (Ref. Appendix A). Indicating a growth of GH¢1217 in real money terms from the investment made in 1990. This means an average annual growth of 4.49% over the period. This average real rate of return for the period means that investment in Treasury bill over the period especially when rolled over with interest resulted in a real gain. The real gain over the period seems to be quite low, this confirms the finance theory that the lower the risk, the lower the return'. However to further confirm this maxim; we need to ascertain the level of risk associated with treasury bills over the period. To measure the risk therefore, the standard deviation of this investment is computed in Table 2.

Table 2: Treasury Bill Rate and Standard Deviation

Year	91-Day Treasury Bill Rate (%)	Deviation from the Average Return	Squared Deviation
1990	29.53	2.107619048	4.44205805
1991	21.05	-6.372380952	40.607239
1992	27.13	-0.292380952	0.085486621
1993	34.78	7.357619048	54.13455805
1994	34.78	7.357619048	54.13455805
1995	45.06	17.63761905	311.0856057
1996	47.88	20.45761905	418.5141771
1997	47.53	20.10761905	404.3163438
1998	28.67	1.247619048	1.556553288
1999	34.18	6.757619048	45.66541519
2000	41.99	14.56761905	212.2155247
2001	28.94	1.517619048	2.303167574
2002	26.6	-0.822380952	0.676310431
2003	19.6	-7.822380952	61.18964376
2004	17.1	-10.32238095	106.5515485
2005	11.4	-16.02238095	256.7166914
2006	9.6	-17.82238095	317.6372628
2007	10.6	-16.82238095	282.9925009
2008	24.7	-2.722380952	7.41135805
2009	22.5	-4.922380952	24.22983424
2010	12.25	-15.17238095	230.2011438

Table 2 above also shows that Standard Deviation for Treasury bills for the period is 11.62%, implying that the yearly returns (actual returns) deviated from the average returns that are Expected Returns by 11.62% representing a relatively low risk. This confirms with the finance theory mentioned above.

The relationship between the nominal rate of returns and inflation rates over the period is depicted on the figure below. It can therefore be argued that, to gain a higher return on one's investments therefore one ought to take a higher risk in terms of investments. Shares as said earlier in this research, is of a higher risk than treasury bills. Therefore it is essential to analyze shares or equity investments over the same period to ascertain the level of truthfulness of this theory.

4.2 Analysis of capital market instruments (GSE all share index)

The historical annual return obtainable on the capital market as represented by the GSE All- Share Index, are analyzed by comparing them with the average rate of return for the period. The annual rates of return are also compared with their corresponding annual rates of inflation to see how the capital market fared against inflation. The Standard Deviation and Co – efficient of variation are also calculated for use in the overall analysis. Table 3 shows the nominal rates of return on the stock market as represented by the GSE index for the period 1990 to 2010. From which the average rate of returns for each year, Standard Deviation have been calculated.

Table 3: Nominal Returns, Real Rate of Returns, Rates of Inflation and Standard Deviation for GSE shares in Ghana for the Period 1990 – 2010.

Year	Nominal Rate Of Return (%)	Rate of Inflation (%)	Real Rate of Return %	Deviation from Average Return	Squared Deviation
1990	-29.75	35.9	-65.65	-62.29571429	3880.756018
1991	-8.18	10.3	-18.48	-40.72571429	1658.583804
1992	-3.62	13.3	-16.92	-36.16571429	1307.95889
1993	113.73	27.7	86.03	81.18428571	6590.888247
1994	124.35	34.2	90.15	91.80428571	8428.026876
1995	6.33	70.8	-64.47	-26.21571429	687.2636755
1996	13.82	32.7	-18.88	-18.72571429	350.6523755
1997	41.85	20.5	21.35	9.304285714	86.56973265
1998	69.69	15.7	53.99	37.14428571	1379.697961
1999	-15.22	13.8	-29.02	-47.76571429	2281.563461
2000	16.55	40.5	-23.95	-15.99571429	255.8628755
2001	11.42	21.3	-9.88	-21.12571429	446.2958041
2002	45.96	17	28.96	13.41428571	179.9430612
2003	154.67	31.3	123.37	122.1242857	14914.34116
2004	91.33	16.4	74.93	58.78428571	3455.592247
2005	-29.72	13.9	-43.62	-62.26571429	3877.019176
2006	5.21	10.9	-5.69	-27.33571429	747.2412755
2007	31.21	12.7	18.51	-1.335714286	1.784132653
2008	58.16	18.1	40.06	25.61428571	656.0916327
2009	-46.58	16	-62.58	-79.12571429	6260.878661
2010	32.25	8.58	23.67	-0.295714286	0.087446939

Table 3 shows that nominal annual returns on the stock market for the period 1990 to 2010 ranged between -46.58% and 154.67 % with an average annual return of 32.55%. In 1993, 1994, 1997, 1998, 2002, 2003, 2004 and 2008 the market made above average returns. Returns on the market for 2003 in particular were splendid. The position of Investor B, who invested the same amount of money as Investor A above (that is GH¢1,000) in 1990 is analyzed as follows: the return rates achieved means that, the nominal value of his portfolio will be GH¢47787 at the end of 2005, the real value of the investment at the end of the period, that is after considering inflation trends over the period will however be GH¢612 (Ref .Appendix B).

The Table further shows average real returns of 9.61%, this shows that the average investor is being rewarded above the general increases in prices over the period. This is consistent with finance theory. In terms of the risk of shares, the table shows that the Standard Deviation of returns on the market was 52.30% which means that actual returns deviated from the average return (expected return) by as much as 52.30% an indication of high risk. This again is consistent with finance theory.

Table 4: Summary of results for the period 1990 to 2010

	Average annual nominal returns (%)	Average annual real returns (%)	Standard Deviation (%)	Co-efficient of Variation
91-Day Treasury bill	27.42	4.49	11.62	0.423778264
GSE All share Index	32.55	9.61	52.3	1.606758833

From the Table above, it is clear that reward was being gained for bearing risk. However in the case of Investor A and B analyzed above, A turned to have a higher amount of money in real terms at the end of the period. This finding would on the surface seem to be inconsistent with economic theory. However, it must be pointed out that these investments are exposed to both systematic risk (economy wide risk) and unsystematic risk (company specific factors).Again economic/finance theory is stated in the context of long –run returns. This study has considered twenty-one (21) annual observations only. These may not be enough points from which to draw observations that may be said to be holding in the long run.

4.3 Risk return analysis

Finally, this research seeks to find out whether risk was being compensated over the period. This can be measured by the level of risk premium obtained over the period.

The market risk premium can be estimated by using the average annual returns on Treasury Bill Instruments and the Average Annual Returns on GSE All-Share index. This is shown on the table 5 below. The returns from treasury bills are used as risk free to complete the risk premium of the shares investments.

Table 5: The Market Risk Premium

Year	GSE-All- Share (%)	91-Day Treasury Bill Rate (%)	Risk Premium
1990	-29.75	29.53	-59.28
1991	-8.18	21.05	-29.23
1992	-3.62	27.13	-30.75
1993	113.73	34.78	78.95
1994	124.35	34.78	89.57
1995	6.33	45.06	-38.73
1996	13.82	47.88	-34.06
1997	41.85	47.53	-5.68
1998	69.69	28.67	41.02
1999	-15.22	34.18	-49.4
2000	16.55	41.99	-25.44
2001	11.42	28.94	-17.52
2002	45.96	26.6	19.36
2003	154.67	19.6	135.07
2004	91.33	17.1	74.23
2005	-29.72	11.4	-41.12
2006	5.21	9.6	-4.39
2007	31.21	10.6	20.61
2008	58.16	24.7	33.46
2009	-46.58	22.5	-69.08
2010	32.25	12.25	20

Table 5 indicates an average risk premium of 5.12% over the 21 years. That is on average, investors who own share would demand a premium of 5.12% over the Treasury Bills rate to induce them to hold the share. The Table further gives an interesting revelation that 12 out of the 21 years studied, indicated negative risk premium, meaning that investors were rather lost out, as result of taking risk and investing in shares. The results can be further analyzed using the comparative approach.

4.3.1 Return Analysis

Column 1 and 2 (Ref. Table 4) show estimates of arithmetic mean annual rates of returns (nominal and real) for treasury bills and stocks (equities) represented by GSE index for the period 1990 to 2010. The results shows that in nominal terms both treasury bills and GSE index posted positive returns over the period. However, GSE index posted a higher average rate of return of 32.55% per annum over the period. The return analysis also indicates that in real terms the GSE index performed better than Treasury bills as shown by the average real return estimates for both instruments. The GSE index and Treasury bills recorded positive average real returns of 9.61% and 4.49% per annum respectively. The average real rate of return recorded by GSE index during the period 1990 to 2010 was relatively better hedged against inflation than the treasury bills.

4.3.2 Risk Analysis

a. Standard Deviation (a measure of risk)

Table 4 shows standard deviation of treasury bills and GSE index .The GSE Index turned to be by far riskier instruments than treasury bills. The risk involved is indicated by the standard deviation of 52.30%. Thus in terms of risk, the 91 Day – Treasury bills had lower risk as measured by the standard deviation of the instrument and in terms of returns; the treasury bills recorded the lower returns in both nominal and real terms over the period of 1990 to 2010.

b. Co-efficient of Variation

The assertion is further confirmed by the Co – efficient of Variation, which measures the relative risk. In terms of co – efficient of variation, the 91 – Day Treasury bill recorded the lower co – efficient of 0.42, emphasizing the fact that Treasury bills is less risky than GSE index. The GSE index had a very high co – efficient of variation of 1.61 because of its large standard deviation.

5.0 Conclusion

The study based on the above summary has proved the hypothesis that average annual returns on both treasury bills and listed equities are normally over and above the average rate of inflation. It also confirms the hypothesis that investments in equities have higher returns in the long run than investments in treasury bills. A disclaimer however, needs to be made that future performance may differ from past performance. Investments in shares, thus appears to be a better instrument than treasury bills. Additionally investors have been adequately rewarded for bearing risk as stock exchange traded shares for the period under study returned a positive average annual risk (market risk) premium of 5.12% over treasury bills. It is recommended that the government should pursue sound macroeconomic policies that will ensure inflation and other factors are fairly stable, to encourage greater savings and investment.

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Appendix

A.

Calculation of Nominal Growth in Investment in Treasury Bill (Investor A)

Year	Amount Invested	Rate	Interest	Closing Value
1990	1000	29.53	295.3	1295.3
1991	1295.3	21.05	272.66065	1567.96065
1992	1567.96065	27.13	425.38772	1993.348374
1993	1993.348374	34.78	693.28656	2686.634939
1994	2686.634939	34.78	934.41163	3621.046571
1995	3621.046571	45.06	1631.6436	5252.690155
1996	5252.690155	47.88	2514.988	7767.678202
1997	7767.678202	47.53	3691.9774	11459.65565
1998	11459.65565	28.67	3285.4833	14745.13893
1999	14745.13893	34.18	5039.8885	19785.02741
2000	19785.02741	41.99	8307.733	28092.76042
2001	28092.76042	28.94	8130.0449	36222.80529
2002	36222.80529	26.6	9635.2662	45858.07149
2003	45858.07149	19.6	8988.182	54846.25351
2004	54846.25351	17.1	9378.7093	64224.96286
2005	64224.96286	11.4	7321.6458	71546.60862
2006	71546.60862	9.6	6868.4744	78415.08305
2007	78415.08305	10.6	8311.9988	86727.08185
2008	86727.08185	24.7	21421.589	108148.6711
2009	108148.6711	22.5	24333.451	132482.1221
2010	132482.1221	12.25	16229.06	148711.182

Calculation of Real Growth in Investment in Treasury Bill (Investor A)

Year	Amount Invested	Rate	Interest	Closing value
1990	1000	-6.37	-63.7	936.3
1991	936.3	10.75	100.65225	1036.95225
1992	1036.95225	13.83	143.4104962	1180.362746
1993	1180.362746	7.08	83.56968243	1263.932429
1994	1263.932429	0.58	7.330808086	1271.263237
1995	1271.263237	-25.74	-327.2231571	944.0400796
1996	944.0400796	15.18	143.3052841	1087.345364
1997	1087.345364	27.03	293.9094518	1381.254815
1998	1381.254815	12.97	179.1487496	1560.403565
1999	1560.403565	20.38	318.0102465	1878.413812
2000	1878.413812	1.49	27.98836579	1906.402177
2001	1906.402177	7.64	145.6491263	2052.051304
2002	2052.051304	9.6	196.9969252	2249.048229
2003	2249.048229	-11.7	-263.1386428	1985.909586
2004	1985.909586	0.7	13.9013671	1999.810953
2005	1999.810953	-2.5	-49.99527383	1949.815679
2006	1949.815679	-1.3	-25.34760383	1924.468076
2007	1924.468076	-2.1	-40.41382959	1884.054246
2008	1884.054246	6.6	124.3475802	2008.401826
2009	2008.401826	6.5	130.5461187	2138.947945
2010	2138.947945	3.67	78.49938958	2217.447334

B. Calculation of Nominal Growth in Investment in GSE Shares (Investor B)

Year	Amount Invested	Rate	Interest	Closing value
1990	1000	-29.75	-297.5	702.5
1991	702.5	-8.18	-57.4645	645.0355
1992	645.0355	-3.62	-23.3503	621.6852149
1993	621.6852149	113.73	707.0426	1328.72781
1994	1328.72781	124.35	1652.273	2981.000841
1995	2981.000841	6.33	188.6974	3169.698195
1996	3169.698195	13.82	438.0523	3607.750485
1997	3607.750485	41.85	1509.844	5117.594063
1998	5117.594063	69.69	3566.451	8684.045366
1999	8684.045366	-15.22	-1321.71	7362.333661
2000	7362.333661	16.55	1218.466	8580.799882
2001	8580.799882	11.42	979.9273	9560.727228
2002	9560.727228	45.96	4394.11	13954.83746
2003	13954.83746	154.67	21583.95	35538.78457
2004	35538.78457	91.33	32457.57	67996.35651
2005	67996.35651	-29.72	-20208.5	47787.83935
2006	47787.83935	5.21	2489.746	50277.58579
2007	50277.58579	31.21	15691.63	65969.22031
2008	65969.22031	58.16	38367.7	104336.9188
2009	104336.9188	-46.58	-48600.1	55736.78204
2010	55736.78204	32.25	17975.11	73711.89425

Calculation of Real Growth in Investment in GSE Shares (Investor B)

Year	Amount Invested	Rate	Interest	Closing value
1990	1000	-65.65	-656.5	343.5
1991	343.5	-18.48	-63.4788	280.0212
1992	280.0212	-16.92	-47.37959	232.641613
1993	232.641613	86.03	200.14158	432.7831926
1994	432.7831926	90.15	390.15405	822.9372407
1995	822.9372407	-64.47	-530.5476	292.3896016
1996	292.3896016	-18.88	-55.20316	237.1864448
1997	237.1864448	21.35	50.639306	287.8257508
1998	287.8257508	53.99	155.39712	443.2228737
1999	443.2228737	-29.02	-128.6233	314.5995957
2000	314.5995957	-23.95	-75.3466	239.2529926
2001	239.2529926	-9.88	-23.6382	215.6147969
2002	215.6147969	28.96	62.442045	278.0568421
2003	278.0568421	123.37	343.03873	621.0955681
2004	621.0955681	74.93	465.38691	1086.482477
2005	1086.482477	-43.62	-473.9237	612.5588207
2006	612.5588207	-5.69	-34.8546	577.7042238
2007	577.7042238	18.51	106.93305	684.6372756
2008	684.6372756	40.06	274.26569	958.9029683
2009	958.9029683	-62.58	-600.0815	358.8214907
2010	358.8214907	23.67	84.933047	443.7545376