

GSCI COLLATERALIZED FUTURES AS A HEDGING AND DIVERSIFICATION TOOL FOR INSTITUTIONAL PORTFOLIOS: AN UPDATE

PAUL D. KAPLAN

*Vice President and Chief Economist
Ibbotson Associates*

SCOTT L. LUMMER

*Chief Investment Officer
The 401(k) Forum*

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PREFACE

Lummer and Siegel [1993] explored GSCI[®] collateralized futures as an asset that could be held along with stocks, bonds, and cash in a diversified portfolio. They found that a collateralized position in GSCI futures is both a good diversifier for stocks and bonds, and an effective hedge against inflation.

What follows is an update of the Lummer and Siegel study. In this updated version, we extend the data period to the end of February 1997 and use the official time series of the GSCI Total Return Index as computed by Goldman Sachs.¹ We find that the main conclusions of the original study continue to hold. However, the reversal in the signs of five-year monthly correlations between the returns on GSCI collateralized futures and the returns on stocks, bonds, and inflation shows that while GSCI collateralized futures provide diversification for stocks and bonds over the long-run and also hedge inflation, they do not always do so over short periods of time.

INTRODUCTION

Both bonds and stocks are contingent claims on the wealth of firms. Bonds, the senior claims, are promises to make payments denominated in money, and perform very poorly when the real (purchasing-power) value of money declines in an inflationary environment. Stocks, as claims to the real economic assets of firms once bondholders have been satisfied, provide a greater measure of purchasing power protection than bonds over the long run, although their short-run performance during periods of inflation has been poor. (A review of the literature on equity returns and inflation is in Ibbotson and Brinson [1993].)

By holding real economic assets directly in the portfolio, investors can hedge against inflation much more effectively than with stocks. Real assets also tend to diversify away some of the risk

of equities, with which they have surprisingly low correlations. Real assets include real estate, precious metals, commodities, and a variety of other items that have value independent of the monetary units in which they are denominated. All of these can be used to achieve the goals of diversification and inflation protection (see Ankrim and Hensel [1993]).

WHAT IS A GSCI COLLATERALIZED FUTURES POSITION?

This article focuses on one particular real asset, a collateralized position in the Goldman Sachs Commodity Index (GSCI) futures contract. The GSCI itself is diversified among commodities, and represents a cross section of the principal raw and semi-finished goods used by producers and consumers.²

A collateralized position in the GSCI futures contract consists of the full dollar value of an unleveraged long GSCI position held over a period of time, using U.S. Treasury bills for 100% collateral. The dollar value of the GSCI futures position is based upon the futures contract's \$250 multiplier (e.g., if the Index is at 200.00, the dollar value of the futures contract would be \$50,000).

The analysis reported here is based on a simulation of historical returns to a fully collateralized long position in the GSCI futures contract as represented by the GSCI Total Return Index.

The GSCI futures contract trades at the Chicago Mercantile Exchange with a contract for every month of the calendar year. The simulation assumes that when a futures contract matures the position is liquidated, and the funds are fully reinvested in a long position in the next lead month contract. This "roll" would take place twelve times per year.

Returns are then derived from three sources: 1) change in the market value of the GSCI futures contract (related to changes in the component commodity prices), 2) interest from the Treasury bills held as collateral, and 3) any systematic bias between the prices of different contract months.

PERFORMANCE OF THE GSCI TOTAL RETURN INDEX COMPARED WITH OTHER INVESTMENTS

Exhibit 1 shows the growth of a \$100 investment made on December 31, 1969, in various asset classes including the GSCI Total Return Index.³ The GSCI Total Return Index has the best performance over the ensuing twenty-seven years and two months, growing almost thirty-three-fold for a compound annual total return of 13.7%.

The two stock market indexes shown, the MSCI EAFE and the S&P 500, also have high returns. Bonds and bills do not perform as well, despite record-high bill yields and a vigorous bull market in bonds in the second half of the period.

All the asset classes beat inflation. Exhibit 2 shows the compound annual returns on each of the asset classes graphed in Exhibit 1.

As Exhibit 3 shows, the higher-returning asset classes generally have higher risk. The GSCI Total Return Index is roughly as risky as stocks, with a standard deviation of 20.1%.⁴ The S&P 500 and EAFE stock market indexes have standard deviations of 16.2% and 19.2%, respectively. Bonds exhibit moderate risk over the period taken as a whole, although they fluctuate wildly during the late 1970s and early 1980s. Treasury bills, which have no default risk and negligible price risk, show variability due to the drift in their yields over time, which indicates their reinvestment risk.

DIVERSIFICATION BENEFITS: CORRELATION OF THE GSCI TOTAL RETURN INDEX WITH OTHER ASSETS

The GSCI Total Return Index has significant negative correlations with stocks and bonds.

Exhibit 4 shows the correlations of annual returns over 1970-1996. The large negative correlation of the GSCI Total Return Index with bonds is expected, because theory suggests that the prices of real asset claims and money claims (bonds) will move in opposite directions.

The GSCI Total Return Index is also negatively correlated with stocks. These findings are noteworthy given the acceptance of stocks as a long-run inflation hedge. Not only is the GSCI Total Return Index negatively correlated with bonds, but it appears to hedge the risks of stocks as well.

Correlations of *monthly* returns on the GSCI Total Return Index with other assets are close to zero when computed over the whole period. Over the latest five years studied, March 1992 to February 1997, the GSCI Total Return Index has a monthly correlation of 0.12 with bonds, 0.28 with S&P 500 stocks, 0.39 with EAFE stocks, 0.25 with Treasury bills, and -0.06 with inflation. Every one of these correlations is opposite in sign to the long-term annual correlations. These results are in sharp contrast with those in Lummer and Siegel [1993] who found that over the five-year period of their study (May 1987 to April 1992) with the exception of Treasury bills, the monthly correlations were similar to the long-run annual correlations.

The recent change in monthly correlations is at least partly attributable to the composition of the GSCI. While the recent increases in commodity prices have been reflected in the GSCI and the Producer Price Index, they have not yet had an impact on consumer prices and the Consumer

Price Index. While producer and consumer prices must be tied together in the long-run, over the short-run they can move differently.

To see the effectiveness of GSCI collateralized futures as a portfolio diversifier, consider a portfolio consisting of 60% in U.S. stocks, 30% in bonds, and 10% in bills, and a portfolio that is 57% in U.S. stocks, 28.5% in bonds, 9.5% in bills, and 5% in the GSCI Total Return Index. Both portfolios are rebalanced monthly. The portfolio without the GSCI Total Return Index returns 11.1% annually with a standard deviation of 11.8% over 1970-1996. Over the same period, the portfolio with the GSCI Total Return Index returns 11.4% annually with a standard deviation of 11.0%, exhibiting a higher return with less risk.

Over the long run, the GSCI Total Return Index is also an inflation hedge, as shown by the positive (0.26) correlation of the annual GSCI with inflation. Consumer prices, producer prices, and commodity futures prices moved upward together, at first rapidly, over the period of generally accelerating inflation from 1970 to mid-1981, then less quickly during the disinflation that followed.

PERFORMANCE OF THE GSCI TOTAL RETURN INDEX BY SUBPERIOD

Inflation rates, and yields on both long- and short-term bonds, tended to rise during the entire decade of the 1970s, except for the brief 1975-1976 period -- and reached their peak in mid-1981. In order to divide the study period into inflationary and disinflationary parts, the date September 30, 1981 is used. This is the month-end with the highest long-term U.S. Treasury bond yield ever recorded (14.82%).

Exhibit 5 shows the growth of \$100 invested over the period from December 31, 1969 to September 30, 1981 in various assets. This figure replicates, in magnified form, the left half of Exhibit 1.

The GSCI Total Return Index is the winner by a large margin, growing to \$649 (representing a 17.26% compound annual return). Foreign stocks outperform U.S. stocks, with \$100 growing to \$288 and \$208, respectively. The long-suffering bond market, which grew to only \$146, was at the bottom, far below the inflation rate.

This environment, which included two oil price shocks as well as a large secular increase in the inflation rate, was ideal for the commodity investor. The GSCI Total Return Index rose by 75% in 1973 (the year of the first oil price shock) and nearly 40% in 1974, mitigating the sharp declines of the stock market in those two years. In fact, the GSCI Total Return Index was practically a mirror image of the S&P 500 during the crash-and-recovery cycle of 1973-1976, illustrating the gain from diversification.

It is noteworthy that oil futures were not in the GSCI during this period because no heavily traded oil futures existed at the time; the rise in the price of oil was hedged by increases in the prices of other kinds of commodities that were represented in the GSCI.

In 1979, the year of the second oil price shock, the GSCI Total Return Index rose by almost 34%. While the U.S. and foreign stock markets both rose in 1979, bonds declined, their high income returns more than overshadowed by the capital losses due to rising yields over the year. Once again, the diversification benefits of a position in GSCI collateralized futures are illustrated.

An abrupt shift in the course of the U.S. economy took place in the fall of 1981, as bond yields and inflation rates tumbled, in what proved to be the greatest bond market rally in history. (The stock market reacted later, in mid-1982, with a huge rally, and real GNP finally began to rise in late 1982 after declines in twelve of the previous fifteen quarters.)

Exhibit 6 shows the growth of \$100 invested in various assets on September 30, 1981, and held to February 28, 1997. Stocks are the big winner over this period, with the S&P 500 and EAFE growing to \$1176 and \$901 respectively.

A \$100 investment in bonds grew to \$744. During this period, the GSCI Total Return Index grew to \$503, easily outdistancing Treasury bills and inflation.

In summary, the GSCI Total Return Index performed well in periods of both accelerating and decelerating inflation. One can expect, however, a GSCI collateralized futures position to perform significantly better when the inflation rate is rising. It is precisely during these periods that assets traditionally held in portfolios experience low or negative returns.

YEAR-BY-YEAR PERFORMANCE OF THE GSCI TOTAL RETURN INDEX

An examination of the performance of the GSCI Total Return Index relative to other assets on a year-to-year basis shows the diversification potential of the GSCI. Exhibit 7 compares the yearly total returns on the GSCI Total Return Index, U.S. stocks (the S&P 500), and foreign stocks (the EAFE index).

Note that of the twenty-seven full years shown, only one (1981) had negative returns on both the GSCI Total Return Index and either of the stock market indexes. Stock market declines tended to be canceled out by rises in the GSCI Total Return Index for an investor holding both types of assets.

Exhibit 8 shows a similar analysis for bonds. None of the twenty-seven years had negative returns for both the GSCI Total Return Index and long-term U.S. Treasury bonds. This record should be considered in light of the miserable bond performance over 1973-1980, when total returns were negative in five of the eight years. The results displayed in Exhibits 7 and 8 suggest that GSCI collateralized futures are an even better diversifier for bonds than for stocks.

THE GSCI TOTAL RETURN INDEX IN A HIGH-INFLATION ENVIRONMENT

Exhibit 9 compares the GSCI Total Return Index with inflation as measured by the Consumer Price Index (CPI). The high-inflation years are those with inflation rates above 8%.

Note that in the four years with the largest increases in inflation, 1973-1974 and 1978-1979, the GSCI Total Return Index rose by over 30%. In contrast, in 1980, which had one of the highest inflation rates on record but not an increase from the previous year, the GSCI Total Return Index rose by less than the rate of inflation.

The only high-inflation year in which the GSCI Total Return Index declined was 1981, but that year showed a sharp inflation *decline* from the previous year. Thus, returns on collateralized long positions in GSCI futures tend to be high in periods of high inflation, but they are even more closely related to *changes* in the inflation rate.

WHY HOLD GSCI COLLATERALIZED FUTURES?

Although the GSCI Total Return Index has done spectacularly well over the period studied, from January 1970 to February 1997, the expected return does not necessarily mirror this segment of recent history. More likely, its long-run expected return is closer to that of Treasury bills. Why, then, should investors hold GSCI collateralized futures?

GSCI collateralized futures are essentially a diversification asset. They do well when other assets do poorly. Most investors do not expect or hope for a return to the high inflation rates of the 1970s, when stocks and bonds did poorly, and the GSCI Total Return Index performed well. There is some possibility, however, that such an environment will reoccur. GSCI collateralized futures should provide protection against declining stock and bond values in a future period of rising inflation or rising commodity prices.

If inflation rates are stable or decline further, GSCI collateralized futures may have flat or negative returns, even though they did well in the disinflation that began in 1981. Such an outcome would be acceptable to most investors, who would be likely to experience further gains in their primary wealth-generating assets--stocks and bonds.

GSCI collateralized futures present investors with the opportunity to hold positions that move with the prices of real assets in the economy. Real estate is sometimes held for this purpose, but GSCI collateralized futures and real estate are quite different asset classes. Differences in their characteristics, such as liquidity, can give a place to both in a diversified portfolio.

GSCI collateralized futures provide exposure to the prices of real assets in roughly the proportions in which they are used for production. The real estate market, in contrast, consists of wealth-generating businesses that provide exposure to an important real asset (buildings), but it does not track a broad cross section of real asset prices.

CONCLUSION

GSCI collateralized futures can be held by risk-averse investors who seek diversification and protection against poor returns in other asset classes. These instruments are especially valuable to investors who attach a high probability to rising inflation and interest rates and who want to hedge their stock and bond positions against such changes.

Such investors, however, are not the only ones who should consider GSCI collateralized futures as an investment. If an investor believes there is any realistic possibility of another inflationary or commodity spasm over the investment horizon, a position in GSCI collateralized futures would serve as a diversifier. Investors who want to hold a more complete cross section of the assets in the economy should consider GSCI collateralized futures for their exposure to real assets.

APPENDIX A
Year-By-Year Total Returns on GSCI Collateralized Futures and
Other Principal Asset Classes (%)

Year	GSCI			Long-Term		
	Collateralized Futures	S&P 500 Stocks	EAFE Stocks	Treasury Bonds	Treasury Bills	Inflation
1970	15.10	4.01	-10.51	12.11	6.52	5.49
1971	21.08	14.31	31.21	13.23	4.39	3.36
1972	42.43	18.98	37.60	5.69	3.84	3.41
1973	74.96	-14.66	-14.17	-1.11	6.93	8.80
1974	39.51	-26.47	-22.15	4.35	8.00	12.20
1975	-17.22	37.20	37.10	9.20	5.80	7.01
1976	-11.92	23.84	3.74	16.75	5.08	4.81
1977	10.37	-7.18	19.42	-0.69	5.12	6.77
1978	31.61	6.56	34.30	-1.18	7.18	9.03
1979	33.81	18.44	6.18	-1.23	10.38	13.31
1980	11.08	32.42	24.43	-3.95	11.24	12.40
1981	-23.01	-4.91	-1.03	1.86	14.71	8.94
1982	11.56	21.41	-0.86	40.36	10.54	3.87
1983	16.26	22.51	24.61	0.65	8.80	3.80
1984	1.05	6.27	7.86	15.48	9.85	3.95
1985	10.01	32.16	56.72	30.97	7.72	3.77
1986	2.04	18.47	69.94	24.53	6.16	1.13
1987	23.77	5.23	24.93	-2.71	5.47	4.41
1988	27.93	16.81	28.59	9.67	6.35	4.42
1989	38.28	31.49	10.80	18.11	8.37	4.65
1990	29.08	-3.17	-23.19	6.18	7.81	6.11
1991	-6.13	30.55	12.49	19.30	5.60	3.06
1992	4.42	7.67	-11.85	8.05	3.51	2.90
1993	-12.33	9.99	32.94	18.24	2.90	2.75
1994	5.29	1.31	8.06	-7.77	3.90	2.67
1995	20.33	37.43	11.55	31.67	5.60	2.54
1996	33.92	23.07	6.36	-0.93	5.21	3.32
Jan - Feb 1997	-8.26	7.07	-1.87	-0.74	0.84	0.47

APPENDIX B**Decade-By-Decade and Whole Period (January 1970 to February 1997) Summary Statistics of Monthly Return on GSCI Collateralized Futures and Other Principal Assets Classes**

		Compound Annual Return (%)	Annualized Arithmetic Mean of Monthly Return (%)	Annualized Standard Deviation of Monthly Return (%)
1970-1979	GSCI	21.25	23.87	26.19
	S&P 500	5.86	7.18	17.07
	EAFE	10.09	11.42	17.43
	Treasury Bonds	5.52	5.87	8.25
	Treasury Bills	6.31	6.31	0.58
	Inflation	7.37	7.38	1.19
1980-1989	GSCI	10.67	11.71	15.30
	S&P 500	17.55	19.13	19.39
	EAFE	22.77	24.61	21.57
	Treasury Bonds	12.62	13.71	16.04
	Treasury Bills	8.89	8.89	0.89
	Inflation	5.09	5.10	1.26
1989-1997 (Feb)	GSCI	7.92	9.22	17.45
	S&P 500	15.14	15.91	13.44
	EAFE	3.44	4.99	18.35
	Treasury Bonds	9.63	10.00	9.05
	Treasury Bills	4.92	4.93	0.46
	Inflation	3.32	3.32	0.72
1970-1997 (Feb)	GSCI	13.69	15.36	20.05
	S&P 500	12.49	13.77	17.13
	EAFE	12.73	14.32	19.24
	Treasury Bonds	9.17	9.80	11.84
	Treasury Bills	6.88	6.88	0.83
	Inflation	5.45	5.46	1.21

ENDNOTES

Scott Lummer was a managing director of Ibbotson Associates when this article was written.

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1. Lummer and Siegel [1993] used a preliminary version of the GSCI Total Return Index.
2. The GSCI is described in *The GSCI Manual: A Guide to the Goldman Sachs Commodity Index* [1997]. The GSCI futures contract, traded on the Chicago Mercantile Exchange, is described in the *GSCI Futures and Options 1997 Information Guide* [1997].
3. For all figures and appendixes in this article, results for the GSCI Total Return Index (abbreviated "GSCI" where space necessitates) are constructed by Goldman, Sachs & Co.

The Standard & Poor's 500 Stock Composite Index (S&P 500) is used to represent the U.S. stock market. Returns shown for the S&P 500 are total returns as calculated by Ibbotson Associates.

Morgan Stanley Capital International (MSCI)'s Europe, Australia, Far East (EAFETM) index is a capitalization-weighted, total return index of the principal developed-country stock markets outside North America. EAFE returns are in U.S. dollars with gross dividends reinvested.

Bonds are represented by Ibbotson Associates' index of U.S. Treasury bond total returns, constructed by holding a one-bond portfolio with a maturity as close to twenty years as the data permit. Treasury bills are represented by Ibbotson Associates' Treasury bill index, which reports the total return from rolling over each month a one-bill portfolio containing, at the beginning of each month, the shortest bill with not less than one month to maturity.

The Consumer Price Index, constructed by the Bureau of Labor Statistics (BLS), represents inflation over 1970-1978; thereafter, we use the BLS' Consumer Price Index for All Urban Consumers (CPI-U). The inflation indexes are not seasonally adjusted.

4. Monthly standard deviations were annualized by treating an annual return as a compound return of twelve independent monthly returns. See the *Stock, Bonds, Bills, and Inflation 1997 Yearbook* [1997], p. 106 for details.

All derived statistical data, such as standard deviations and correlations, are calculated by Ibbotson Associates from the data described in note 3.

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Exhibit 1

Growth of \$100: 12/31/69-2/28/97

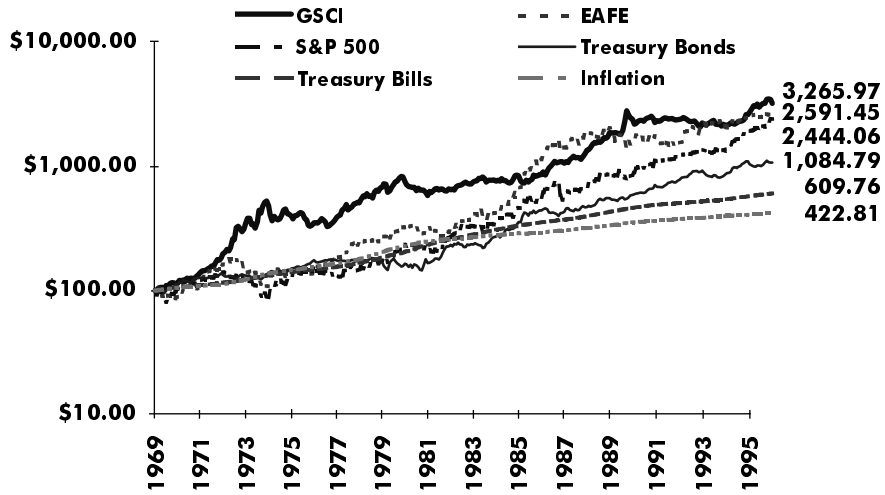


Exhibit 2

Compound Annual Returns: 12/31/69-2/28/97

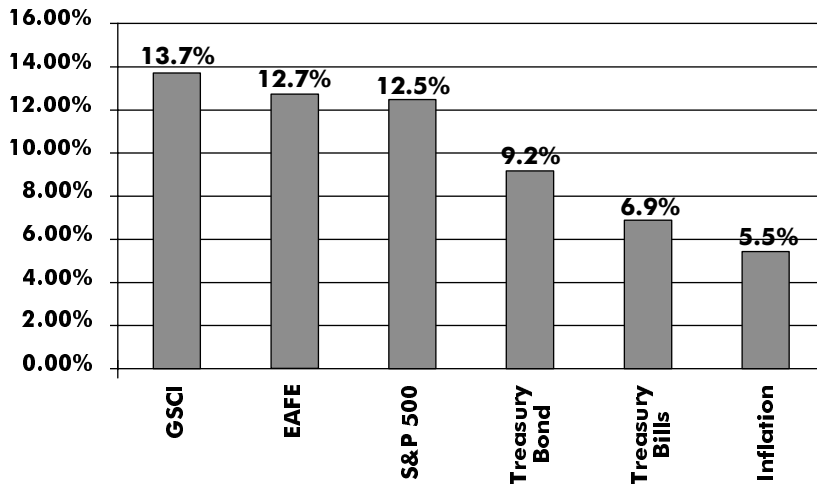


Exhibit 3

Annualized Monthly Standard Deviations: 12/31/69-2/28/97

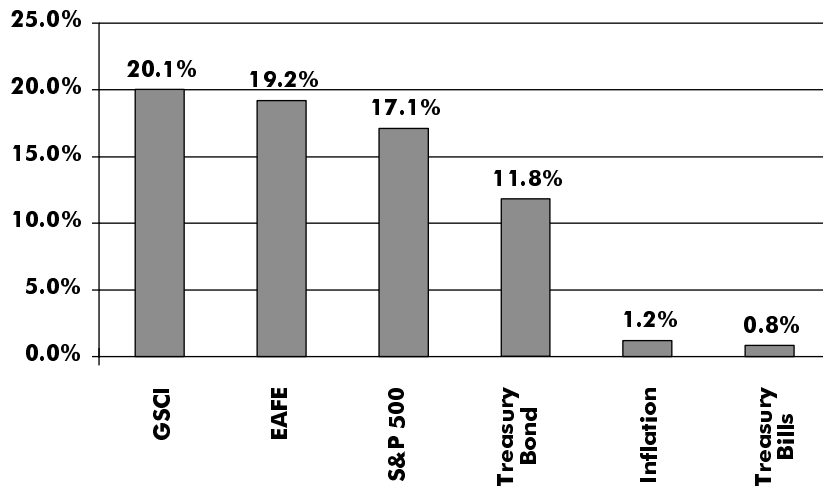


Exhibit 4

Annual Correlations of GSCI With Other Assets: 1970 - 1996

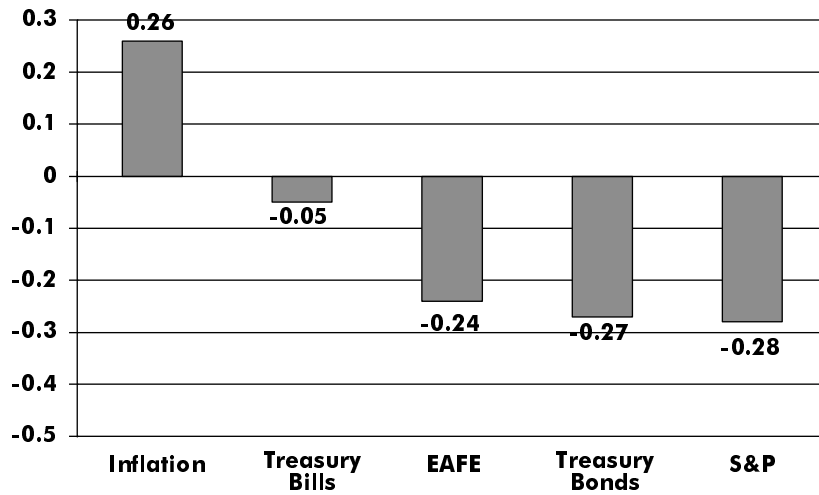


Exhibit 5 Growth of \$100 from 12/31/69 - 9/30/81

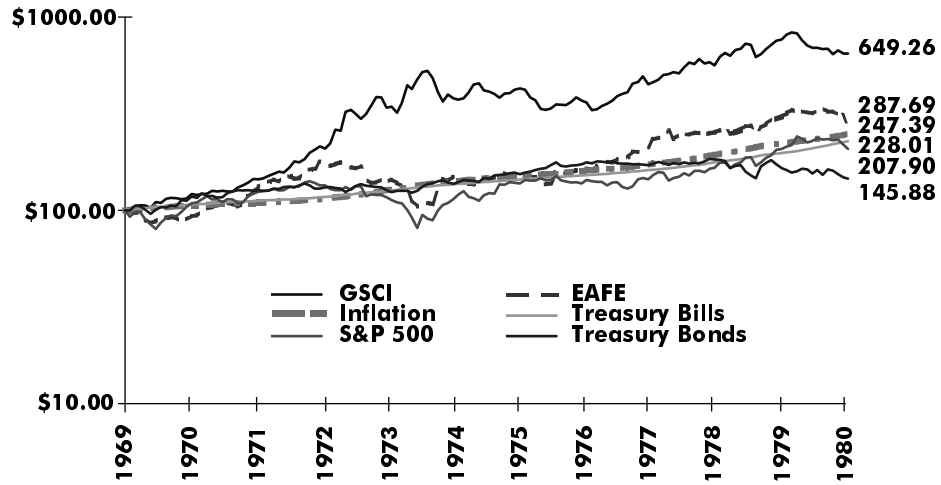


Exhibit 6

Growth of \$100 from 9/30/81 - 2/28/97

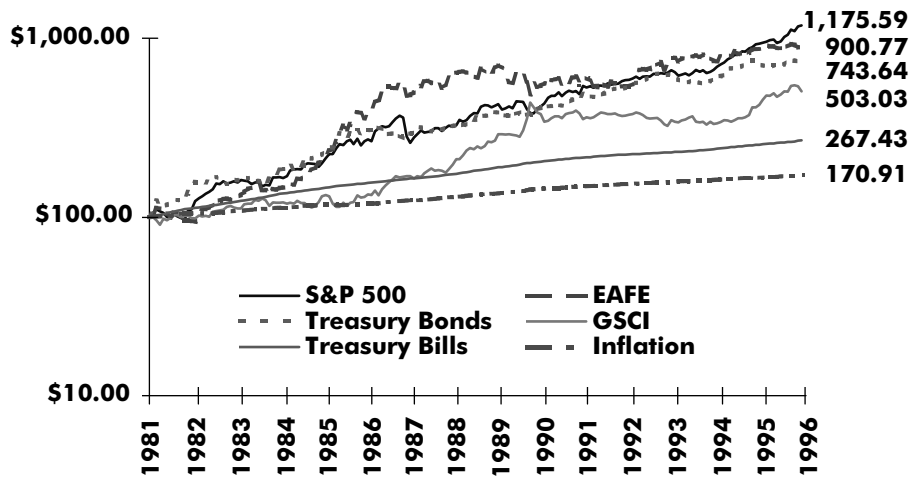


Exhibit 7

Year-By-Year Total Returns on GSCI Collateralized Futures, S&P 500 Stocks & EAFE

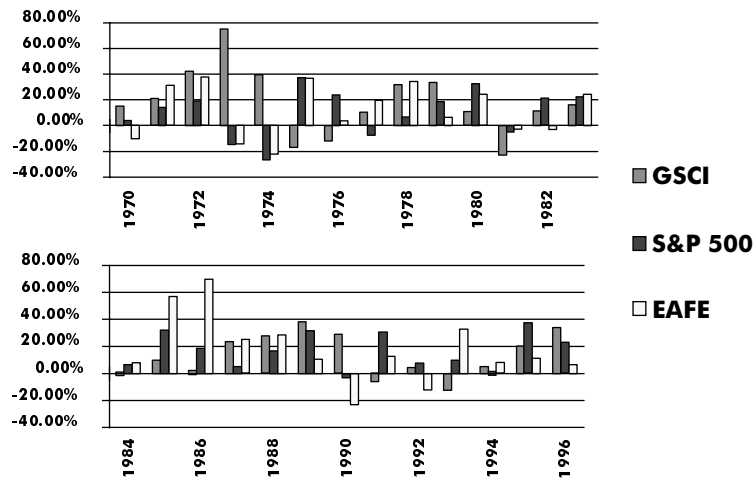


Exhibit 8

Year-By-Year Total Returns on GSCI Collateralized Futures & Long-Term Treasury Bonds

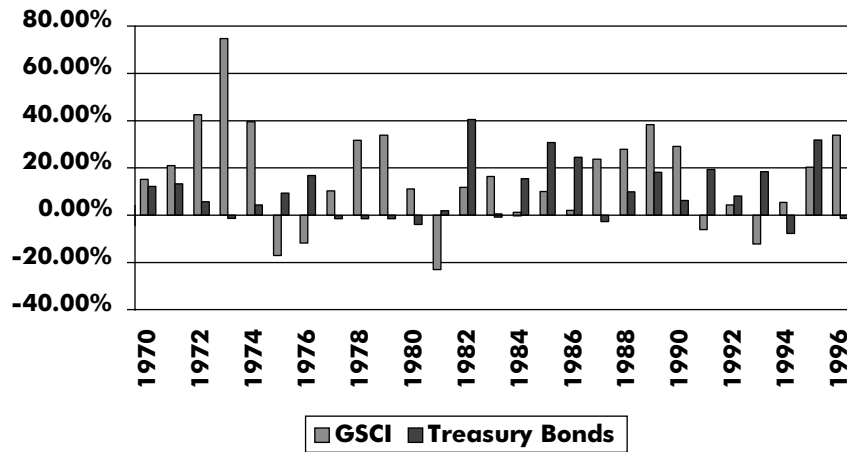


Exhibit 9

Year-By-Year Total Returns on GSCI Collateralized Futures & Inflation

