A Critical Study On Portfolio Optimization Of Physical Gold And Its Derivatives As An Ideal Investment Choice

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INTRODUCTION

Indian Market has always been attracted to the glitter of Gold .The fact is that though India's market share of the world Gold market is meager, but it stands number one in terms of demand .The demand is basically in the form of Jewelry, bar, coins, industrial demand for use in medicine and other purposes .Out of which, the demand for Jewelry is the highest as Indian investors look upon Physical gold as a '**stri-dhan**' for long term perspectives.

With more and more stock market gaining importance, regulators feel the importance to have some Gold Mining companies to get listed in stock exchanges. The result is that in the year 2001, one of the gold mining companies named as Deccan Gold Mines Limited was allowed to get listed in both the main stock exchanges of India.

Another option, also in the investing category, is investing in gold stocks, such as mining companies, either individually or through mutual funds. While these investments provide investors with exposure to the gold and are more liquid than physical gold, they don't offer the pure gold exposure many gold traders demand.

Another option is a gold-related exchange-traded fund (ETF). ETFs are pools of investments that trade on exchange like stocks. Typically, gold ETFs are intended to track a percentage of an ounce of gold, so in that sense, they are a way to trade physical gold.

One can also invest in a paper representation of gold, such as futures and options. Futures and options are contracts or options to buy or sell a specific security or commodity (such as gold) at a specific price at a specific time. Futures contracts are used to trade gold in the short-term; rarely does a gold trader take delivery of the gold. While trading gold with a futures contract does have "counterparty" risk-the possibility that the person on the other side of the contract won't deliver-the fact that gold contracts are traded on established exchanges minimize the possibility of losing money when trading gold.

Finally, one can trade so-called spot gold, which lets one to take a long or short position in gold while simultaneously taking the opposite position in the U.S. dollar-so trading spot gold is much like trading forex pairs.

Now let us discuss one by one on the following Gold Forms:

1. Deccan Gold Mines (the Sole Stock Available In Indian Stock Exchange):Deccan Gold Mines Limited is a company listed on the Mumbai Stock Exchange and is involved in gold exploration activities in the states of Karnataka, Andhra Pradesh, Rajasthan and Kerala. Rama Mines (Mauritius) Ltd. acquired a majority stake in the company from the promoters of Wimper Trading Limited and followed this acquisition by making an "open offer" to the public, as per the requirements of the Securities Exchange Board of India (SEBI) regulations in the year 2001. The name of the company was changed to Deccan Gold Mines Limited on 19 March, 2003. A rights issue to increase the paid up capital of the company to ₹ 5 crore was undertaken in the year 2004. DGML has entered into agreements with its associated company, Geomysore Services (India) Pvt. Ltd.,and its 100% owned subsidiary Indophil Resources Exploration Services Pvt. Ltd. for the transfer of Prospecting Licenses to DGML in the Dharwar-Shimoga, North and South Hutti, Ramgiri and Mangalur Prospecting blocks.

2. Indian Gold Future Market :Futures trading in gold was earlier carried out long before in Indian Market by the Bombay Bullion Association and continued till 1962, after which it was subsequently banned by the Gold Control Act that was imposed following the Chinese aggression in that year. With the development of Ahmedabad-based National Multi-Commodity Exchange of India Ltd (NMCE) in 2003, Futures trading in gold has been resumed after a gap of 41 years. After that, with three commodity exchanges coming into operation- viz the National Commodity and Derivative Exchange, the Multi Commodity Exchange of India Ltd. and the National Multi Commodity Exchange of India Ltd., gold futures trading further gained more importance.

But now, the question is when most of the investor's believe in investing in gold in its physical form, then why one should go for other forms? There are various ways as to how other forms of gold vary from physical gold, which is

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discussed afterwards.So in brief, we can get the following advantages for trading in gold futures as:

- For traders who don't want custody, it eliminates the hassles and costs of settlement and storage. This significantly reduces costs.
- Investors need much less money to participate.
- Traders can short sell. Provided they buy an equivalent contract back before the contract expires, they will have been able to profit from a falling price. This can only be done on spot markets with great difficulty, because it requires the seller to borrow gold, which is next to impossible for retail investors.
- All participants trade exactly the same notional rights - i.e. those defined on the standard contract, so the market grows deeper and more liquid in the standard futures contract than in spot bullion, where different qualities of bullion exist, each of which has different prices.
- Greater liquidity provides a reliable real-time price, something which is absolutely not available in the OTC bullion market.

3. Paper Gold /Gold ETF /Gold Funds: Gold ETFs are open-ended mutual fund schemes that will invest the money collected from investors in standard gold bullion (0.995 purity). The investor's holding will be denoted in units, which will be listed on a stock exchange.These are passively managed funds and are designed to provide returns that would closely track the returns from physical gold in the spot market.An investor can buy and redeem the units either directly from the mutual fund, subject to certain stipulations, or from the stock exchange.

WHY GOLD ETFs? - PHYSICAL GOLD VS GOLD ETF

There are enough reasons why gold should be included in any investor's portfolio -whether in physical form or paper form. Investing in gold ETFs will give the investor all the advantages of investing in gold while eliminating drawbacks of physical gold -- cost of storage, liquidity and purity, among others.

- Gold ETFs are transparent investment vehicles that will have to conform to rigid regulations on investment norms and valuations.
- Gold ETFs allow investment in gold in small denominations, which makes it easier for the retail investor to participate.
- Further, investing in paper gold gives an investor tax advantages over investing in physical gold. For less than three years, the gains are taxed at 30 per cent. Also, gold held in paper form is not liable for wealth tax.

TAXATION IMPLICATIONS OF GOLD ETFs

ETFs are taxed on the same lines as of debt mutual funds. Following is the taxation slab:

Table 1: Taxation Slab

Category	Short Term Capital Gain Tax	Long Term Capital Gain Tax	Dividend Distribution Tax	Security Transaction Tax
Individual	As per income tax slabs	10% or 20% with indexation	14.16%	0.125% at redemption
Corporate	30%	10% or 20% with indexation	22.66%	0.125% at redemption
NRI	As per income tax slabs	10% or 20% with indexation	14.16%	0.125% at redemption

Considering the Table 2, one can create an ideal portfolio consisting of Physical Gold -the most preferred form of investing in gold, Gold stocks, Gold Futures and Gold ETF -so that the benefits of each can be taken and the investor can earn good return .

RESEARCH METHODOLOGY

The research has been basically conducted to create an ideal portfolio that will consist of all the forms of gold and to see that how the portfolio varies with different economic conditions .The portfolio for short term & long term investors are judged and found out that whether for both it is same or varies and to which extent .The ultimate finding are based on the fact that which forms of gold can add further benefit to the portfolio.

SAMPLE TAKEN FOR THE STUDY

1. Deccan Gold mines Stock

Table 2: Availability Of Gold Through ETF Vs Other Sources

Parameters	ETF	jewelers	Banks	Gold Futures
Form Security	Demat form Taken care by fund	bar /coin Investors concern	Bar/Coin investor concern	Future contract Taken care by depository
Transparency	Very high	Very Low	High	High
Impurity Risk	Very low	High	very Low	Very low
Pricing (for retails investor)	Transparent -traded in exchange- Linked to international gold prices (incl. VAT)	Neither standard nor transparent.- May differ from jeweler to Jeweler (Incl. VAT)	Not standard. Huge Markup, 10-15% ideally- May differ from bank to bank (Incl. VAT)	Could be at premium or discount to spot price (Excl. VAT)
Selling Back	Real time - At transparent secondary market prices	Conditional and uneconomical	Restricted- may not be possible	Real time - At transparent secondary market prices
Bid -Ask Spread	Very Low	Very High	Can't Sell back	Very Low
Denomination	1 gram and in multiples of 1 gram	Available in Standard denomination	Available in Standard denomination	Available in Standard denomination
Making charges	Not involved	Involved	Involved	Not Involved
Storage requirement	Demat Account	Locker	Locker	Required once delivery taken
Wealth Tax	No	Yes	Yes	No
Benefit of long term capital gains tax	After 1 yr	After 3 yrs	After 3 yrs	Not available
Holding period	Investors choice	Investors choice	Investors choice	Has to be Compulsorily rolled over or squared off
Nomination facility	Yes	No	No	Yes

Source: Reliance Mutual fund AMC site & Benchmark Mutual fund AMC site .

Presently five Such Gold ETF along with the newly launched Gold ETF of SBI is available in market .Details are given below .

Fund	Pricing per unit	Expense ratio	Entry Load	Exit Load	Fund Manager	Inception date	AUM as on sep 09	Gold Bullion: Current asset (%)
Kotak Gold ETF	Approximately 1 gram of gold	1%	Nil	Nil	Abhishek Bhisen	27th July 2007	53.94 cr	99.61:0.31
Uti gold ETF	Approximately 1 gram of gold	1%	Nil	Nil	Swati Kulkarni	10th April 2007	208.44 cr	90:10
Benchmark Gold ETF	Approximately 1 gram of gold	1%	Nil	Nil	Vishal Jain	19th March 2007	285.81 cr	99:.09
Reliance Gold ETF	Approximately 1 gram of gold	2.50%	Nil	Nil	Hiren Chandaria	1st November 2007	184.38 cr	90:10
Reliance Gold ETF	Approximately 1 gram of gold	2.50%	Nil	Nil	Hiren Chandaria	1st November 2007	184.38 cr	90:10
Quantum Gold ETF	Approximately 1/2 gram of gold	1.25%	Nil	Nil	Chirag meheta	22nd feb 2008	12.18 cr	99.91 :.09
SBI Gold ETF	Approximately 1 gram of gold	2.50%	Nil	Nil	Not available	30th march 2009	Not available	90:10

Source :- http://www.onemint.com/2009/09/07/gold-etf-in-india/.

2. Physical Gold

3. Gold futures

4. Gold ETF (out of six, only Benchmark Gold ETF is taken into consideration). It is found that the returns from all five

ETF (except SBI) are statistically indifferent by means of ANOVA. So out of five, any one can be selected for the following research. As result, Benchmark Gold ETF is taken for portfolio construction (Reference - Annexure I).
The Period of Study is around 3 years- Dec 2006 - Nov 2009 (since the GOLD ETF have been into existence in Indian market for two years ,the 1st being Benchmark GOLD ETF launched in March 2007.

DATA COLLECTED

- **Deccan Gold Mines:** The stock values of this particular stock have been collected from the BSE site.
- **Gold Futures:** The Gold futures values are taken from MCX site with contracts expiring on dates from 5th Feb. 07 to 5th Oct 09.
- **Gold ETF:** NAV values of Benchmark Gold ETF are collected from the AMC site for the period taken for the study.
- **Physical Gold:** Gold Values, denominated in Rupee currency per 10 gram, are taken from MCX site for the period taken for study.

FINDINGS &ANALYSIS

A. Return & SD Analysis- For all the products selected ,Annualized Return & Annualized Standard Deviation for the period is calculated for three sub periods (06-07, 07-08,08-09) and also for the whole period 06-09 (**Reference - Annexure II).**

B. Variance-Covariance Matrix Construction : From the returns so calculated ,Annualized Variance & Covariance matrix is constructed for 06-07,07-08,08-09 and also for 06-09 **(Reference -Annexure III).**

C. Efficient Frontier and CML Construction- Efficient Frontier & CML is constructed combining A & B for three periods and for the whole period .Optimum Portfolio is identified from the above **(Reference Annexure - IV).**

D. Optimum Portfolio Identification : Optimum portfolio is identified from the point where the CML is tangent to the efficient portfolio frontier. From this, further conclusion is made (**Reference- Annexure IV).** From the discussion, the following findings are obtained:

Table 3 : Findings

Period	optimum portfolio	Portfolio return	portfolio risk	Weights of each form				Total weights
				Deccan gold	Gold futures	Gold ETF	physical gold	
06-07	A	30%	15%	0.3108493	0.336356	0	0.352794	1
07-08	B	10.5 &	8%	0.00722215	0.281657	0	0.711121	1
08-09	C	13	4.30%	0.05135314	0.528036	0	0.420611	1
06-09	D	10%	6%	0.05424867	0.382785	0	0.562966	1

Here we get four portfolio for four periods named as A (for 06-07) ,B (for 07-08),C (08-09) ,D (for 06-09).The following analysis is made from above .

1. During the period of 06-07, when the stock market was performing well and was at its peak at the end of the period, the optimum portfolio gives the highest return of 30 % and risk of 15 % .The portfolio so formed need to give more or less equal importance to all the forms except ETF, with the highest weightage given to Physical gold followed by Gold Futures and Gold Stock.

2. For the period 07-08, the stock market started with the highest price and crashed with the biggest points .The optimum portfolio B gave return of 10.5 % and risk of 7.7 % with highest weightage given to Physical gold and the lowest to Gold Stock .It was during this period that Gold prices were at its peak, since gold price behavior is more or less inverse to that of the stock market.

3. For 08-09 ,when market have seen the crush and revival , portfolio gives a return of 13 % with risk of 4.3 % on account of higher emphasis given to Gold Futures followed by Physical gold and Gold stock .

4. For the whole period ,portfolio have been able to give moderate return of 10 % and risk of 6 % with physical gold still leading the race followed by gold futures and gold stock .

5. Gold ETF have shown no importance in forming an ideal portfolio.

CONCLUSION

From the above study, the following conclusions can be made:

- For short term investment of period of one year, the portfolio is fluctuating with more emphasis given to Physical Gold or Gold futures or sometimes, Gold Stock. But that is changing depending on the stock market conditions.
- More or less, same weightage can be given to the three forms of Gold during period of boom or stable economic condition .Gold ETF is in its nascent phase during this period (06-07) .So including it in portfolio may not be a wise decision.
- During period of Falling market, Physical gold is leading the race in terms of forming an ideal portfolio.
- For long term perspectives, Gold is still maintaining the race .Futures is the next best alternative, which can be taken into consideration. The importance of Gold stock in relation to optimum portfolio construction depends on the prevailing stock market condition.
- It is seen that Gold ETF have always remained out of the scene. The reason may be the introductory phase of Gold ETF Indian Market .As of now, this product has shown the highest growth in the international market. Also, the period taken for study in only two years, the result may be different if the period is extended further. Gold ETF may give better result in that case. Also, awareness level of this product is still very less.
- Finally, it can be concluded that investors can earn handsome return while maintaining the portfolio of above with returns over and above that of other fixed income instruments.

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ANNEXURE :I

HYPOTHESIS

Null Hypothesis: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$

Alternate Hypothesis: $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4 \neq \mu_5$

For calculating ANNOVA, the Monthly NAV are been converted to Quarterly NAV by averaging method .NAV taken is given below.

FINDINGS / ANALYSIS

There are 5 samples in total .Sample size for each Fund.

Sample- 1 - Benchmark Gold ETF (n_1)= 10
Sample -2 -UTI Gold ETF (n_2) = 10
Sample -3 -Kotak Gold ETF (n_3) = 9
Sample -4 -Reliance Gold ETF (n_4) = 7
Sample -5 -Quantum Gold ETF (n_5) =6
Totals items in the population is 42

For finding ANNOVA we have to Find Variance between columns & Variance within columns

N	Sample mean (1)	Grand mean (2)	sample mean - grand mean (3)	(sample mean - grand mean)^2 (4)	N(sample mean - grand mean)^2 (5)
10	1188.202	1234.28	-46.078	2123.182084	21231.82084
10	1210.005	1234.28	-24.275	589.275625	5892.75625
9	1243.844	1234.28	9.564	91.470096	823.230864
7	1255.688	1234.28	21.408	458.302464	3208.117248
6	1312.223	1234.28	77.943	6075.111249	36450.66749
					67606.5927
Total items =42 Total sample = 5				Variance between columns	16901.64817

$s1^2$	44294.02	10774.22108
$s1^2$	46939.75	11417.77703
$s3^2$	40151.62	8681.431351
$s4^2$	17170.76	2784.447568
$s5^2$	13342.98	1803.105405
	Variance within	35460.98243

Where $s1^2$ $s2^2$ $s3^2$ $s4^2$ $s5^2$ are sample variance of 5 samples
Calculated value of F test = Variance between columns / variance within columns = 0.476

Table value of F test for (5-1, 42-5) = (4, 37) degree of freedom for 5 % significance level = 2.45 & for 1 % significance level = 3.32
Since Calculated value < table value for both significance level, Null Hypothesis is accepted.
So it is concluded that all the funds gives more or less returns or there is no significant difference in their returns.

ANNEXURE II :RETURN & RISK ANALYSIS

06- 07	**Deccan gold mine stock return**	**Gold Futures return**	**Gold ETF return**	**physical gold return**
December 2006				
January 2007	0.032905997	0.022791		-0.0037854
February 2007	-0.0483371	-0.0052		0.0197321
March 2007	-0.053352659	0.002145		-0.0068584
April 2007	0.06699654	-0.00567	-0.0023	-0.0015762
May 2007	-0.007526956	-0.02105	-0.0223	-0.021438
June 2007	-0.001216512	-0.01531	-0.0085	-0.0085669
July 2007	0.01260653	0.003643	0.00207	0.0020963
August 2007	-0.017506943	0.008036	0.00341	0.004803
September 2007	0.169678602	0.017992	0.0231	0.0219326
October 2007	0.04938917	0.032673	0.01695	0.0179338
November 2007	0.269702896	-0.00562	0.02718	0.0270943
December 2007	0.369331172	0.027206	-0.0019	-0.0022581
Annualized return	**84.2670737**	**6.163089**	**5.028785**	**4.9109199**
	0.842670737	**0.061631**	**0.050288**	**0.0491092**
Standard deviation	**0.132280234**	**0.017016**	**0.015795**	**0.0146304**
07- 08	**Deccan gold mine stock return**	**Gold Futures return**	**Gold ETF return**	**physical gold return**
January 2008	-0.213530568	0.027401	0.04038	0.0410784
February 2008	-0.105370563	0.049904	0.02191	0.0222956
March 2008	-0.080428963	-0.03913	0.02726	0.026686
April 2008	0.105079467	-0.01424	-0.0312	-0.0290733
May 2008	-0.090338361	0.026275	0.01159	0.0126921
June 2008	-0.162586148	0.029513	0.00664	0.0065558
July 2008	0.022727766	-0.02096	0.0241	0.0232694
August 2008	0.009886805	-0.02862	-0.0469	-0.0425884
September 2008	-0.184195975	0.049273	0.01765	0.0145963
October 2008	-0.181459615	-0.03893	0.02112	0.0181694
November 2008	0.059003581	0.026651	-0.0298	-0.021223
December 2008	0.085733227	0.043054	0.03298	0.0271786
Annualized return	**-73.54793464**	**11.01983**	**9.567473**	**9.963688**
	-0.735479346	**0.110198**	**0.095675**	**0.0996369**
Standard deviation	**0.113629468**	**0.034759**	**0.028224**	**0.0255951**

08- 09	Deccan gold mine stock return	Gold Futures return	Gold ETF return	physical gold return
January 2009	-0.009390517	0.026143	0.01897	0.0192785
February 2009	-0.034564385	0.028031	0.04273	0.0404626
March 2009	-0.056160251	-0.01312	0.01189	0.0133857
April 2009	0.043646699	-0.00276	-0.0263	-0.0222903
May 2009	0.212761641	0.012107	0.00225	0.0020426
June 2009	-0.050646411	-0.00638	0.0017	0.0021852
July 2009	-0.061518038	0.010422	0.00231	0.0014849
August 2009	0.058778001	0.023331	0.00746	0.0071658
September 2009	0.171176983	-0.0041	0.02132	0.0215736
October 2009	-0.019586052	0.025213	0.00416	0.0041903
November 2009	0.063610324	0.011033	0.02243	0.0214067
Annualized return	**34.70269034**	**11.99073**	**11.88248**	**12.096623**
	0.347026903	**0.119907**	**0.118825**	**0.1209662**
Standard deviation	**0.092707008**	**0.014714**	**0.017277**	**0.0160339**
06- 09	**Deccan gold mine stock return**	**Gold Futures return**	**Gold ETF return**	**physical gold return**
December 2006				
January 2007	0.032906	0.022791		-0.00379
February 2007	-0.04834	-0.0052		0.019732
March 2007	-0.05335	0.002145		-0.00686
April 2007	0.066997	-0.00567	-0.0023	-0.00158
May 2007	-0.00753	-0.02105	-0.0223	-0.02144
June 2007	-0.00122	-0.01531	-0.0085	-0.00857
July 2007	0.012607	0.003643	0.00207	0.002096
August 2007	-0.01751	0.008036	0.00341	0.004803
September 2007	0.169679	0.017992	0.0231	0.021933
October 2007	0.049389	0.032673	0.01695	0.017934
November 2007	0.269703	-0.00562	0.02718	0.027094
December 2007	0.369331	0.027206	-0.0019	-0.00226
January 2008	-0.21353	0.027401	0.04038	0.041078
February 2008	-0.10537	0.049904	0.02191	0.022296
March 2008	-0.08043	-0.03913	0.02726	0.026686
April 2008	0.105079	-0.01424	-0.0312	-0.02907
May 2008	-0.09034	0.026275	0.01159	0.012692
June 2008	-0.16259	0.029513	0.00664	0.006556
July 2008	0.022728	-0.02096	0.0241	0.023269
August 2008	0.009887	-0.02862	-0.0469	-0.04259
September 2008	-0.1842	0.049273	0.01765	0.014596
October 2008	-0.18146	-0.03893	0.02112	0.018169
November 2008	0.059004	0.026651	-0.0298	-0.02122
December 2008	0.085733	0.043054	0.03298	0.027179
January 2009	-0.00939	0.026143	0.01897	0.019279
February 2009	-0.03456	0.028031	0.04273	0.040463
March 2009	-0.05616	-0.01312	0.01189	0.013386
April 2009	0.043647	-0.00276	-0.0263	-0.02229
May 2009	0.212762	0.012107	0.00225	0.002043
June 2009	-0.05065	-0.00638	0.0017	0.002185
July 2009	-0.06152	0.010422	0.00231	0.001485
August 2009	0.058778	0.023331	0.00746	0.007166
September 2009	0.171177	-0.0041	0.02132	0.021574
October 2009	-0.01959	0.025213	0.00416	0.00419
November 2009	0.06361	0.011033	0.02243	0.021407
Annualized Return	**0.145817**	**0.096598**	**0.090867**	**0.089017**
Annualized SD	**0.124704**	**0.023514**	**0.021181**	**0.01906**

ANNEXURE III : VARIANCE- COVARIANCE MATRIX

Annualized cov / var matrix	06-07: Deccan gold	06-07:Phys Gold	06-07:Gold futures	06-07:Gold ETF
Deccan gold	0.209976723	0.00692819	0.009460711	0.01005562
Phys Gold	0.006928194	0.00256859	0.000948573	0.00261173
Gold futures	0.009460711	0.00094857	0.003474719	0.00164717
Gold ETF	0.01005562	0.00261173	0.001647168	0.00299371

Annualized Cov/var matrix	07-08: Deccan gold	07-08: Phys Gold	07-08: Gold futures	07-08: Gold ETF
Deccan gold	0.154939872	-0.017227783	-0.00738363	-0.018597897
Phys Gold	-0.017227783	0.007861323	0.00256727	0.007908931
Gold Futures	-0.007383635	0.002567268	0.01449819	0.002709663
Gold ETF	-0.018597897	0.007908931	0.00270966	0.009559241

Annualized Cov/Var matrix	08-09: Deccan gold	08-09:Phys Gold	08-09:Gold futures	08-09:Gold ETF
Deccan gold	0.103135073	-0.00096508	-0.000700346	-0.001022106
Phys Gold	-0.000965084	0.003085031	0.000941299	0.003016568
Gold futures	-0.000700346	0.000941299	0.002598106	0.001092488
Gold ETF	-0.001022106	0.003016568	0.001092488	0.003581966

Annualized Cov/Var Matrix	06-09: Deccan gold	06-09:Gold futures	06-09:gold ETF	06-09:PhysicalGold
Decc gold	0.1866127	-0.00042379	-0.00548581	-0.004728
Gold futures	-0.000424	0.00663496	0.001914383	0.001565
gold ETF	-0.005486	0.00191438	0.00538373	0.004798
phys gold	-0.004728	0.00156477	0.004798438	0.004359

ANNEXURE IV : EFFICIENT FRONTIER AND CML CONSTRUCTION

Figure 1 (06-07)

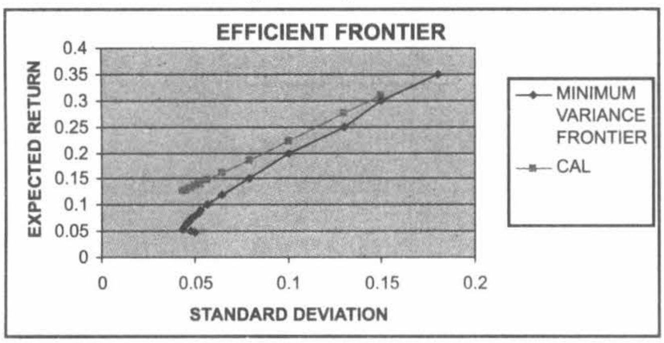


Figure -2 (07-08)

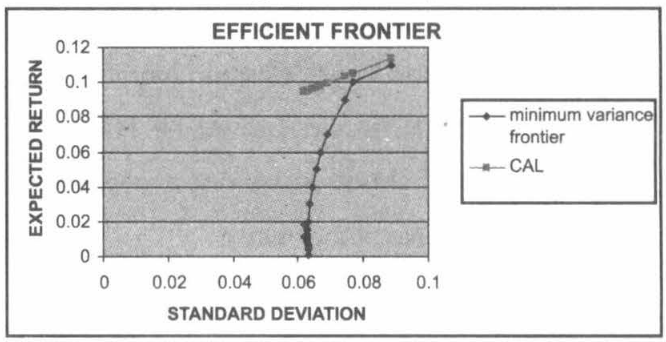


Figure -3 (08-09)

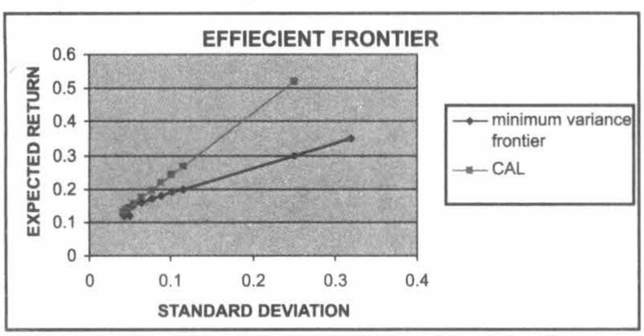
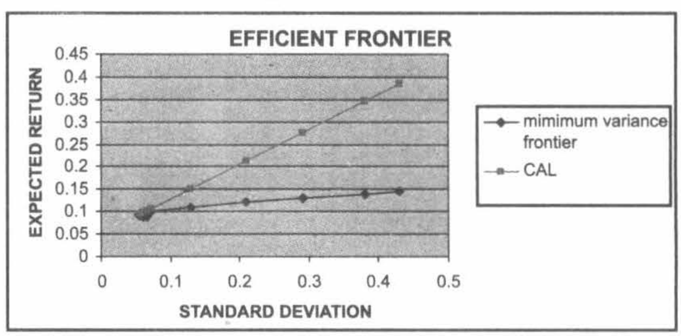


Figure 4 (06-07)



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