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Dynamic Financial Analysis (DFA) and Portfolio Management at Recent Stress Scenario

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Extended Abstract: Current observations we can see source of uncorrelated returns (independent of financial markets). The strategic inclusion in a portfolio - could lower the portfolio's volatility, dampen its risk profile and our approaches towards an utilization of excess Capital for larger Profitability and Risk Reduction via: 1. *Stabilized Risk-Asset allocation:* DFA allows you to *assess* current health of Risks (liabilities) as well as Assets. Marginally and jointly the entire portfolio should be analyzed and have stabilized volatility (with respect to *Line of Business, geography, and deal variations*). So, ideally, a new entrant should be from a field, which is independent of the current set of insurance basket. 2. *Incremental Profit-Risk evaluation:* Lets you assess if new deal is suitable or not in view of incremental expected profits Vs. Incremental Risks. Also it lets user find 'Gaps" that can be filled to make overall portfolio better. Even a deal which appears to be lucrative initially gives rise to volatility to the overall portfolio is practically a bad choice as a new contract. 3. *Cautious Steps for Recession prone Market:* Given the market turmoil – where risk assessment has been in question (independence of different entities that gets used to increase diversity and decrease variance / risk). We allow user to modify those assumption as well as allow user to make changes. Sub-Prime bought zero-beta firmly into focus. Now considering the current market situation, where recession is rampant all over the world, surviving should be the prime objective. We suggest methods like trend fitting and exponential smoothing for price forecasting and GARCH/ FIGARCH techniques are also used. The findings suggest it would be wise idea to invest as it may give 3%-12% half yearly return.

Keywords: *Dynamic Financial Analysis (DFA), Correlation, Stochastic Volatility, GARCH, Holt's Linear Exponential Smoothing, Risk Measure.*

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1. Consequences

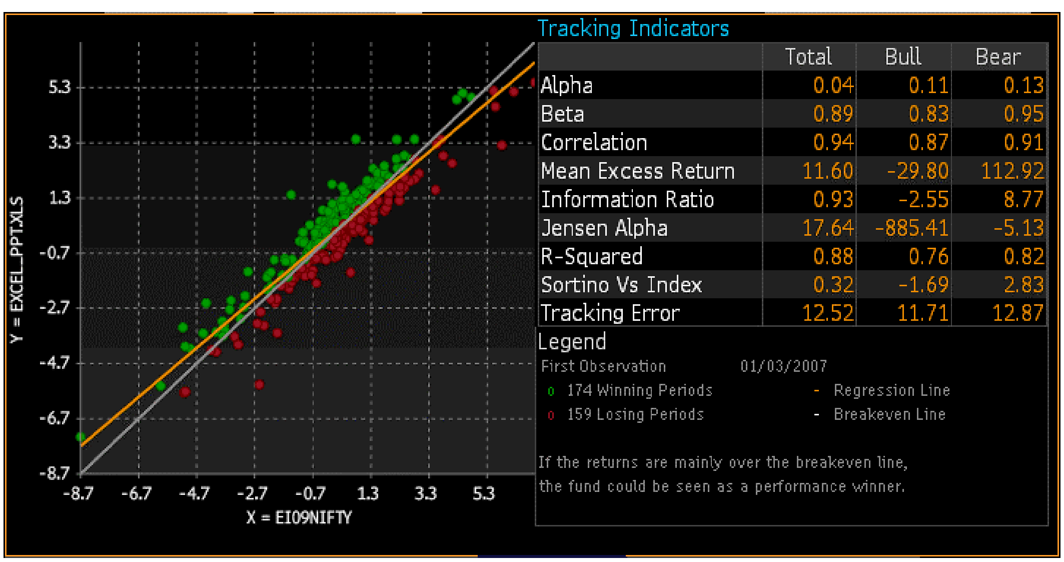
Markets are still moving with an unseen speed and volatility. The credit crunch provides extreme market movements, which are so unpredictable that even investors and traders with years of experience lose their assets on the trading floors. Banks and funds is tumbling, security portfolios are getting insecure. The unfolding financial crisis brings new questions into the debate between mark-to-market versus "mark-to-model" or "mark-to-what-model". When all correlations go to one (1), the concept of hedging is almost gone. The only chance is that correlations to 1 are only a brief moment, and then it can be an opportunity. But if it lasts more than a brief moment, the whole concept of hedging falls, and what we have now is a run on hedge funds and a massive de-leveraging, cash is more than king and this is going to be dangerous again and again. A savage deflation that not even 0 interest rates will be able to thaw. If even keeping the money in the Bank at 0 interest is good because the price of every asset falls and therefore your cash appreciates. Is the end of the blood circulation of the economy?

In this global financial recession: Risk management and co-operation between national jurisdictions should be improved through the creation, possibly within each country's central bank.

a. Developing an agreed risk appetite policy for key market-wide risk indicators, b. Monitor and manage risk indicators within that appetite, c. Publicly reporting macro risk indicators, and d. Facilitating risk identification and communication with appropriate decision-makers, at both the national and international levels.

Some traders use optimization procedures to generate portfolios, maximizing expected returns which are perfectly aligned with their stated risk preferences. Similar objectives apply to those who use simulation or DFA techniques. However, beyond the optimal portfolio itself, optimizers as part of their output also generate marginal economic signals, such as “implied” or “risk adjusted” probabilities which are important but underused and often misunderstood management tools. The purpose of this paper is to further illustrate the power of those economic signals.

The graph below shows the various tracking indicators on the daily observations of the Model Portfolio vs. Nifty Index from 1/2/2007 to 4/11/2008. (1.33 yrs) Source: ING2008.



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2. Introduction

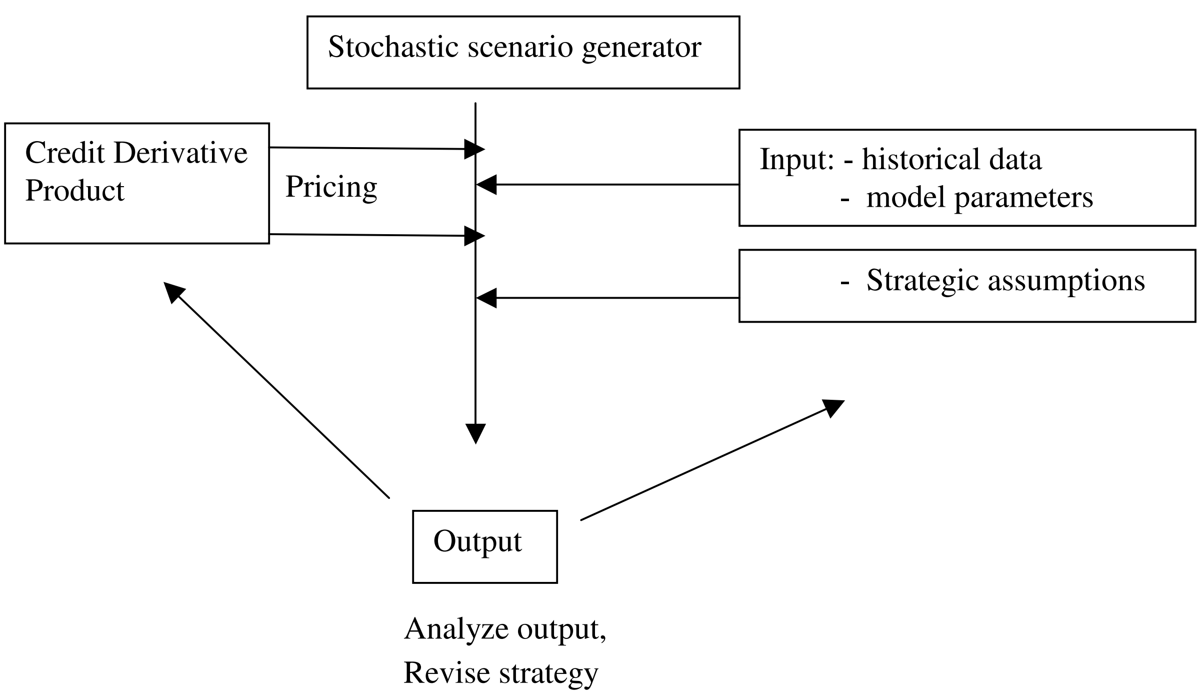
Our approach to lead the credit derivatives which will bring about greater efficiency of pricing and greater liquidity of all credit risks and insurance risk (credit derivative. ILS and reinsurance perspective). Just as the rapidly growing asset-backed securitization market is bringing investors new sources of credit assets, the credit derivatives market will strip out and repackage credit exposures from the vastly greater pool of risks that do not naturally lend themselves to securitization, either because the risks are unfunded (off balance sheet), or because they are not intrinsically transferable. By enhancing liquidity, credit derivatives achieve the financial equivalent of a free lunch, whereby both buyers and sellers of risk benefit from the associated efficiency gains. Dynamic Financial Analysis (DFA), which is based on stochastic simulation (also called Monte Carlo simulation because it is basically the only means that allows one to deal with the long time horizons present in insurance and with the combination of models for a large number of interacting risk factors).

The main motivation is that with this approach, from the requirement point of view we need to fix-up and which simultaneously incorporate the yield curves of currency rates. We optimize the expected discounted utility of future consumption as following (Blum, 2005):

$$\max_{c} E\left[\int_t^{\infty} e^{-\rho s} \zeta(c_s) ds \middle| F_t\right]$$

Where ζ (.) is the *von Neumann-Mogenstern* utility function of the representative agent, $c = (c_t)_{t\geq 0}$ is consumption stream and ρ is constant.

To recognize the few factors that will affect the asset liability cash flow are demand uncertainty, sales volatility, credit risk, volatility in the price of raw materials cost of capital to name a few. Each of these random variables can be stochastically simulated either based on the distribution of retrospective data or under strategic assumptions. When simulated in a combined way the future cash flows can be predicted which in return would dictate the capital requirements in the future. Depending on the capital structure of the company and simulated interest rate in the capital market the final earnings volatility of the company can be predicted to identify the return and associated risks.



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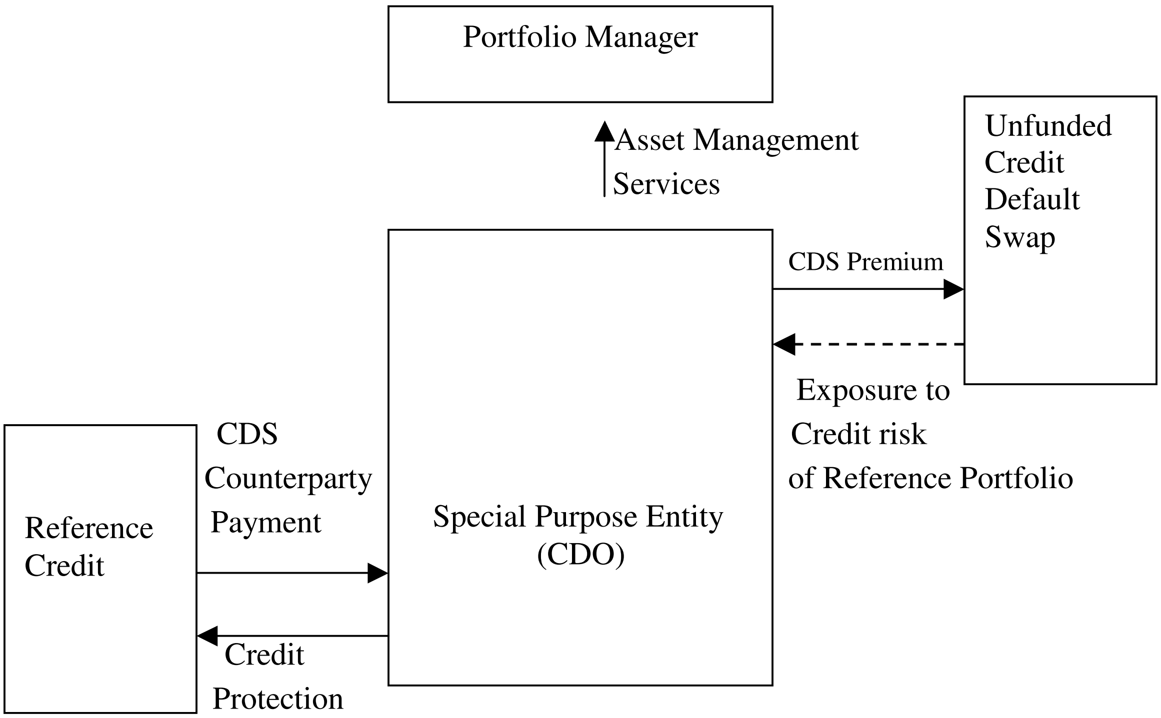
The above diagram shows all the parameters that are required to generate the output out of credit derivative models, which further needs to be analyzed to come out with the strategy for one take a position in CD.



The diagram above is a representation of the process activity in a typical unfunded CDS transaction. Protection buyer (who wants to hedge its reference credit) will buy protection from reference seller for a premium in return for which he will receive protection against any loss in case reference entity defaults. A portfolio manager will be assigned for a particular class of the asset, which will form the reference portfolio.

And we can analyze the risk-return factors towards forecasting of volatility using ARCH model. We use daily closing price for analysis of volatility and monthly average data for price forecast.

Monthly gold price data up-to December 2007 was used for analysis and remaining six-month data was used for validation.

3. Methodology

Let p_t denotes daily closing price (of an alternative investment product) and the corresponding return is r_t, where r_t is defined as

$$r_t = \log(p_t) - \log(p_{t-1}). \quad (1)$$

Figure 1 reveals some sudden spurts in return data indicating volatility in return. Volatility clustering is also there in the data from Figure-1

Figure-1 Daily closing spot return of an alternative investment product

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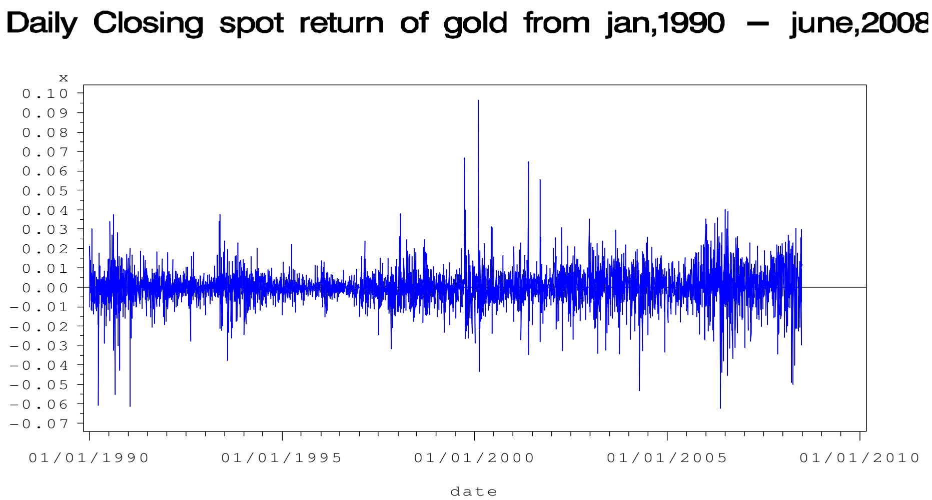

And return also can be model as:
$r_t = \mu + \varepsilon_t$ where ε_t has time varying variance. (2.2)
where μ is the mean of the series and ε_t is random noise t indicates time with increment of a trading day.

ARCH model

The ARCH (q) process introduced by Engle (1982) assumes that $\varepsilon_t | \psi_{t-1} \sim N(0, h_t)$ where h_t is time varying variance and ψ_{t-1} is the information set up to time t - 1. ARCH model assumes conditional variance as a function of squared past errors i.e.

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 . \tag{2.3}$$

where $\alpha_0 > 0$ and $\alpha_i \geq 0$ and $\sum_{i=1}^{q} \alpha_i < 1$. q is the order of the ARCH model and α_i's are unknown parameters.

All the parameters are updated using the iterative procedure and considering some initial values. Following are the calculation of initial values (See Chatfield and Yar (1988) for details):

$$a_0 = \sum_{t=1}^{s} \frac{p_t}{s} \tag{2.8}$$

$$b_0 = \frac{\sum_{t=1}^{s} \frac{p_t}{s} - \sum_{t=s+1}^{2s} \frac{p_t}{s}}{s} \tag{2.9}$$

$$s(0) = \left\{ \frac{p_t - \frac{(k-1)b_0}{2}}{a_0} \right\} \text{ for k=1, 2, ….s} \tag{2.10}$$

n period ahead forecast is given by:

$$p_{t+n} = (a_t + b_t n) S(t+n) \tag{2.11}$$

Through the iterations, the values converge closer to actual estimates. See Hamilton (1994) for details.

4. Result and Discussion

Data is negatively skewed and excess kurtosis is seen. It is clear that returns does not follow normal distribution from skewness (-0.0167) and kurtosis (8.30437) and it is also clear from Jarque-Bera test from Table-1 Appendix-2. Augmented Dickey-Fuller Unit Root Tests and Phillips-Perron Unit Root Test clarify that data is stationary. ARCH tests (Portmanteau Q and Engel's LM Test) suggest that, ARCH effect is there in the data.

So far model fitment is concerned, ARCH (9) is fitting quite well with the data (Table-1 Appendix-2); all the estimated parameter values are significant at 1% level of significance. GARCH is not fitting well because;

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sum of the estimated parameters is equal to one. EGARCH also not a good fit for the data, the leverage parameter is non negative that means data is not too much asymmetrical. Based on the estimated parameter we make the volatility forecast also.

The fitted ARCH model is

$$h_t = .0000184 + .1377\varepsilon_{t-1}^2 + .0631\varepsilon_{t-2}^2 + .1263\varepsilon_{t-3}^2 + .1215\varepsilon_{t-4}^2 + .0435\varepsilon_{t-5}^2 + .135\varepsilon_{t-6}^2 + .022\varepsilon_{t-7}^2 + .1761\varepsilon_{t-8}^2 + .0968\varepsilon_{t-9}^2 \qquad (3.1)$$

Estimated volatility of daily spot return is shown in Figure 2. Using model (2.2) along with (3.1), 150 trading day ahead volatility forecasts are obtained and is shown in Figure 3.

Figure-2: Time vs. estimated volatility of daily spot return

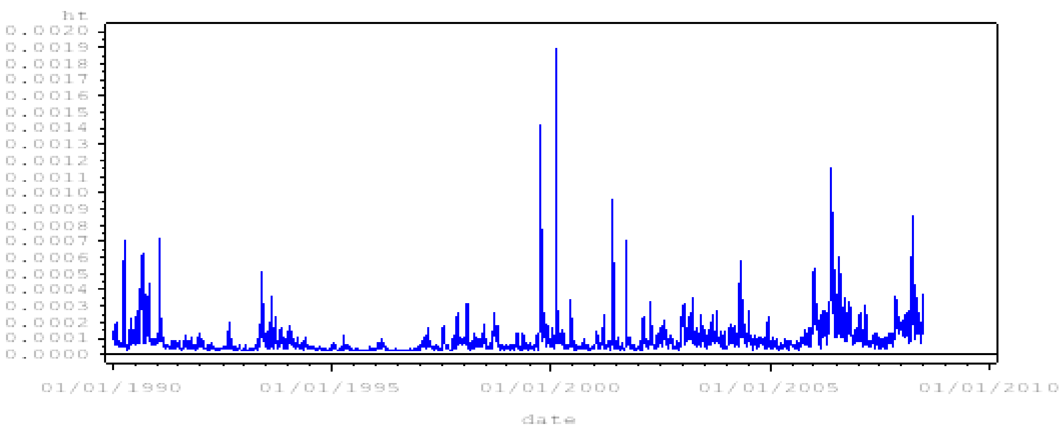
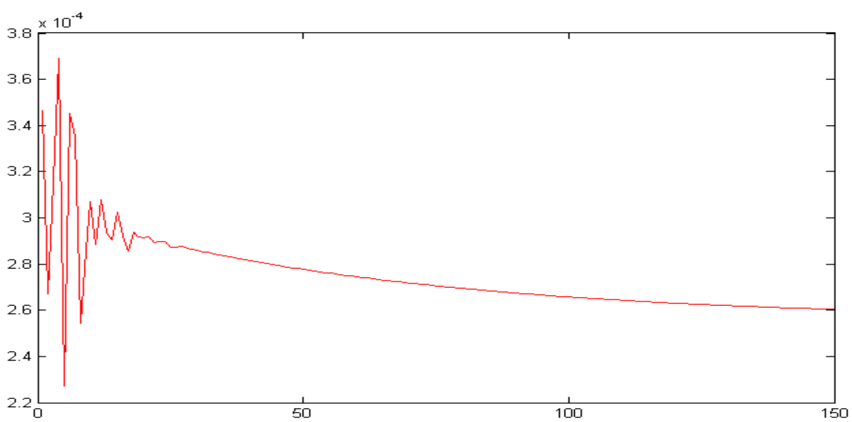


Figure-3: 150 trading day ahead Volatility forecast of spot return



Holt linear exponential smoothing has been used for forecasting the monthly average price of gold. There are different types of exponential smoothing in literature. Holt-Winters method is widely used for modeling time series data with trend. For this data set, Holt's method gives very good fit and forecast. The model fits well to the data (R^2 = 0.968436), mean error is 0.514 and mean percent error is 0.0672.

The parameter estimates for Holt-linear exponential model for price data are a_t = 810.2806 and b_t = 24.432834. $S(t)$ is the seasonal parameter for each month and it has calculated for 12 months.
For n = 1, 2, …, h the forecasting formula:

$$p_t = (810.2806 + 24.4328 * n)S(t) \qquad (3.2)$$

5. Conclusion

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The price movement is very closely related to some factors and return follows an ARCH (9) process and all the estimated parameter are significant in 1% level of significance. This model has been used to forecast the future volatility, proxy to the squared return. 150 days ahead volatility forecast calculated here. From the graph, it is seen that after some time volatility is decreasing. After some period forecasted variance is flat, it is because of long forecasting horizon. The average price may remain above $965 and the average volatility will remain 0.0002835.

The re-defined re-modeled CD market is going to get bigger and better with its age. As it turns its focus to optimizing returns, reducing risk, and attracting money from non-traditional investors through the effective use of new products and technology; large electronic trade markets are developing, massive amounts of money are being committed to Credit Derivatives, and the industry is moving towards standardization and trade warehousing to speed up trading and processing. More optimized and realistic models for pricing CD are also among top agenda in near future.

Finally, Asset risk encompasses uncertainty regarding: default rates, future market value of equity assets, and liquidity of assets. In addition to these inherent asset risks, model builders should take care to look beyond the general description of the various asset classes to make sure that all relevant risk characteristics are incorporated in the model. This precaution increases in importance as capital markets develop a greater range of non-equity investments that have many of the risk characteristics of equity investments. Appropriate data and methods are critical to the development of ranges of assumptions to reflect asset risk in the projected performance of the insurer. Historical data developed for investment managers is readily available, including time series of default rates of various classes of assets as a function of age ■

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