Currency forecasting using Value at Risk

Kaustav Mukherjee

Senior Manager – Financial Services Analytics

Genpact LLC

kaustav.mukherjee@genpact.com

1. Abstract

Value at Risk ("VaR") models are used widely across the Banking industry as the standard measure for Market Risk. It is also the core of all regulatory quantifications of Market Risk assessments for Banks and FIs. Traditionally VaR models have been used to focus on only 1-tail of the loss distribution and have been used primarily as limits at the chosen level of confidence. It has been used as a measure to reflect the risk 'appetite' of the institution.

The literature is exhaustive in various techniques and methodologies employed in the forecasting of prices / value of financial instruments. It varies in complexity and diversity of approaches – as an outcome of multivariate macro-econometric models, autoregressive approaches, judgmental and trend based among others.

This paper explores an alternative usage / application of VaR. Within the confines of the adopted risk policy of an institution as related to its choice of VaR model and data history, we explored using VaR as a measure of forecasting currency over a certain horizon. The business problem at hand was to ensure sufficient margin was baked in to an initial price quoted on the currency at the *inception* of the deal such that any volatility in the forex rate for the currency at eventual close was already baked in – the typical time period between inception to eventual close was anywhere between 2days to 1 month. Within the broad framework of the VaR policy, we built a VaR based currency forecasting tool that would enable the user to choose the currency pair and the forecast period so as to return the potential margins and various probabilistic ranges of the currency pair over the forecast horizon.

Key Words – Value at Risk, VaR, Forecasting, Historic Simulation, Fx, Forex

Paper Type – Risk, Finance

2. VaR based Currency forecasting approach

VaR model chosen was un-weighted Historic simulation over rolling 4years of daily market prices. We recognize the areas of further refinements and expansion of this model / approach and also understand the limitations of VaR. As with any other VaR based model, this model also performed satisfactorily over the shorter horizons of 1-2 months over 'normal' market periods. Refinements to model scope and approaches are the next steps.

The daily end of day (EOD) spot forex rates vs USD for 90+ currencies were obtained for the last 4 years. All quotes were transformed into indirect quotation with USD as base. User is allowed to choose any currency pair and the direction of the base currency – Buy / Sell and the forecast period in days. All days reflect business days. For any chosen forecast period, the utility will calculate the VaR for various confidence intervals using
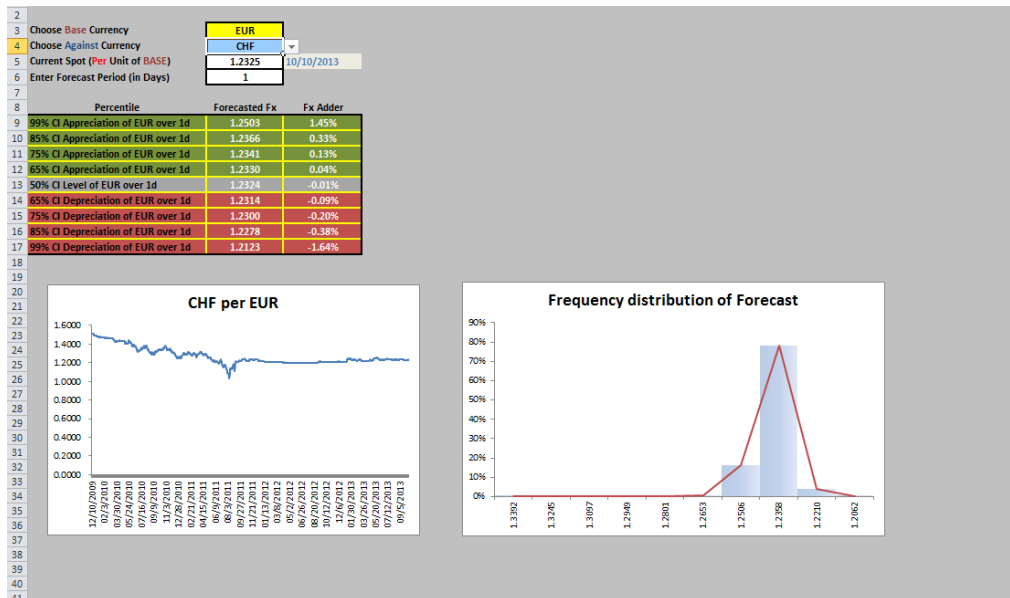
the 'natural' risk horizon days - so a 1 month forecast will rely on looking on changes at 1monthly intervals in the 4year data set while a 1 week forecast will trigger calculations based on natural 1weekly changes in the historic data set. We did not use the 'square-root' of time formulae to scale up for daily VaR for various limitations and assumptions that is available in the literature. Given a finite set of historic data points, the number of simulations is dependent on the chosen forecast horizon and hence the shorter the horizon greater is the number of simulations taking place with a maxim um number of simulations occurring for a forecast of 1day.

Given the chosen forecast horizon, the tool will provide point estimates of "appreciation" or "depreciation" of the base currency relative to trade currency at certain chosen levels of significance. We also provide a trend graph of the past 4years as well as a frequency

Currency forecasting using Value at Risk

distribution depicting the class intervals and various probabilities associated with the same. We provide potential margins to current spot rate that one could bake-in given risk appetite and head-room in the deal making process.

A critical component of any VaR estimation especially historical simulation utilizing multi-year data is the quality of the data itself. In this model of a single risk factor i.e Spot Fx rates only, we instituted a one-time data quality check for the historical spot rates and instituted a process to check the marginal data inputs on a go forward basis. The model was also validated against standard Risk system results as well as back-tested for sample basket of currencies over varying forecast horizons.

Currency forecasting using Value at Risk

3. Concluding Remarks

In our opinion this is an alternative approach to currency forecasting without going into Statistical distributions or assumptions about choice of a forecasting model typically GBM for forex. It is a basic framework to utilize the applications of VaR and simplistic in its approaches. This is also an intuitive approach to communicate with senior management and an important component of the planning exercises. Tighter class intervals and weighting of observations are logically among the first things to look at refinement within the aegis of historical simulation approach of VaR modeling. Also as with any VaR model we recognize the limitations of this model to be consistent with limitations of VaR itself. The basic premise of the un-weighted historical simulation approach is that past events have an equal likelihood of occurrence in the future. As long as VaR is used as a measure of Risk and is embedded in the organization's risk policy, our approach seeks to extend the application of the same. We find applications of this tool in Operating plan sessions; Earnings forecasts also has a need for such a tool; proactive risk management will look to use this tool to limit any kind of concentration build-up in a currency; asymmetric distribution particularly for longer time horizons ensures bias at tail confidence limits however, for the purpose of forecasting, it's the central part of the distribution that has more significance in this exercise. While refinements are necessary this approach looks to provide a framework for alternative usage of VaR.

Currency forecasting using Value at Risk