22.14.3 Real Proof: PaR Backward Testing

"Real proof" requires more than just forward testing. For one thing, you may not have included a sufficient degree of reality. Backward testing overcomes much of this, and is also a required step for parameterising strategies to market conditions. For example, the discussion of vol arbs above indicated that some arb strategies may be "market condition contingent", and then backward testing is required to specify those parameters.

Backward testing based PaR requires even more trading expertise compared to that required for forward PaR, and is well beyond the current scope. Detailed treatment begins in [2], [8.a], [8.c], and [14], and often requires proprietary methods.

Introductory examples of backward PaR are also found in [1], [3.a], and [4].

Here, a short illustration is provided to give a sense of backward PaR analysis. In a sense, backward PaR is closely related to forward PaR. In the simplest case, very much of the same machinery can be used, where the forward prices (instead of being "predicted"), are replaced with actual prices from real trades and market histories. A comprehensive implementation can be extremely useful in eliminating many "assumptions". For example, if the historical data includes "everything", such as underlying prices, option prices (or implied vols), repo rates, etc. etc., then the backward testing is devoid of virtually all (explicit) model assumptions. In these cases, effectively the "only" (explicit) assumption is the rebalancing model (not the valuation model, since the history provides real traded valuations[667]). That is, the only thing left up for "adjustment" is, say, how Delta's are calculated (e.g. BSM, or some other model).

For example, suppose you had a "hunch" that a particular options structure was routinely miss-priced by the market and that you had a very comprehensive and "clean" data history of every real trade/mark-to-market and related market (traded) information for not only all the relevant options of all strikes and terms, but also all the underlyings, repos, etc. Then you could run simulated strategies just as with the forward PaR, but now all the prices etc being sourced from the data history. The only "assumption" for this analysis is that the Greeks and rebalance ratios are based on BSM.

Figure 22.14 – 1 a) shows about 5,000 net-holding period P&L's. That is, each data point in that plot is the net P&L of running your strategy over a prescribed holding period relying entirely real traded market data. Figure 22.14 – 1 b) shows the same results if the data set's Max/Min surfaces were plotted. That is, all the point in a) define a "volume" that is contained between the surfaces in b).

[667] Though those would "implicitly" include model assumptions, since those traded prices were heavily dependent on the valuation models used at the time of the trade.

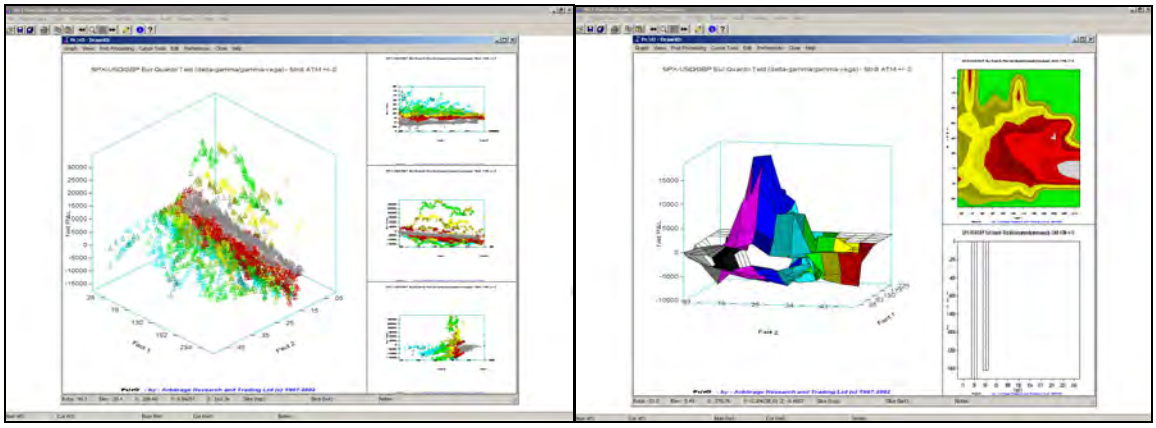

Figure 22.14 – 1. a) Three dimensional representation of many thousands of holding period net-P&Ls for a particular trading strategy. b) Fitted "max/min" surfaces to assist in locating trading opportunities or trade analysis.

The plot axes are P&L along the vertical and two market factors (here referred to as Factor 1, and Factor 2) along the "floor" of the "cube". The colouring of the data points in a) represents yet another "dimension" or "trading factor". The specifics of what these Factors are proprietary but you may imagine them to be some manner of "usual" market parameters relating to prices, vols, OHLC "efficiency", etc.

One immediate observation is that when Factor 1 is between 10 and 30, and also Factor 2 is greater than 100, the strategy consistently and reliably generates substantial P&L.

Is this an arb? At this point we have not provided sufficient information about the circumstances to answer that question, since, for example, you don't know what "risks" may exist. However, and although there is some P&L variability, the P&L is almost always positive for certain market conditions. Thus, even if this is not an arb, it may be a very good directional trade, on the occasions when the market conditions are "right" as parameterised by the PaR analysis.

Analysis of this type is crucial not only for substantiating strategies found via forward analysis, but also in providing "reliability verifications", and market parameterisation.

Importantly, exactly this analysis may be applied to a trader's, a desk's, or an entire trading operation's trading history to assess how well the traders and the firm performed. For example, this type of back-testing of a trader's P&L can be used to asses their trading efficiency or the desk's trading policy (e.g. is the trader or desk actually producing a sufficiently high risk-adjusted P&L to meet the firm's performance objectives).