Serial Correlations in Investment Returns

Autocorrelations:

The investment world loves correlations. Option hedgers love correlations. Everyone loves correlations. Across assets. But how about across time, within the same asset? To what extent do the returns today depend on the returns yesterday, the month before, 3 months before or a year ago? Positive correlations with past returns are a sign of momentum, negative correlations, of mean reversion. Assets can exhibit both, all at once. Smoothing of returns also shows up as serial correlation or a moving average. Liquid markets with efficient price discovery tends to exhibit little serial correlation. Here is a quick — non rigorous — illustrative view of serial correlations in different markets.

Equities:

MSCI World autocorrelations. The strongest autocorrelations of the MSCI world are in the 1 month lags. That said, this autocorrelation is not statistically significant. You can see how unstable the autocorrelations look over time. Equities are liquid and price discovery is efficient and as expected, data appears not to be autocorrelated.

MSCI World Autocorrelations (Simple)*

Hedge Funds:

Hedge fund autocorrelations are weak and display little structure over time as well. There have been studies into hedge fund autocorrelations which find evidence of smoothing. Over a 2 year period, tests for autocorrelations are not significant and graphically one can see how unstable the autocorrelations look over time. This is certainly true of the HFRI Hedge Fund Index. A similar pattern is seen in the HFRI Fund of Funds Index. Of course there are strategies which exhibit autocorrelation. These tend to be strategies in illiquid markets or securities where the pricing of the underlying assets are less efficient. Assets that have their valuations smoothed, are valued on appraisal value as opposed to transacted values, are based on comparable transactions with a lag, which are marked to model, tend to exhibit serial correlation. The HFRI Indices exhibit little serial correlation primarily because of the preponderance of liquid equity and macro strategies. Strategies involved in assets such as the illiquid range of credit, PIPEs, private equity, tend to exhiit serial correlation.

HFRI Hedge Fund Index Autocorrelations (Simple)*

HFRI Fund of Hedge Fund Index Autocorrelations (Simple)*

Real Estate:

Real estate returns display high autocorrelation and the 1 month autocorrelation is statistically significant. Variances

(and hence volatility) are therefore understated, sometimes severely, as are correlations to other assets. The Case Shiller data goes back about 10 years but the UK IPD index goes back over 20. In both cases one can see the stability of the 1, 2 an 12 month autocorrelations.

S&P Case Shiller Autocorrelations (Simple)*

IPD UK Property Autocorrelations (Simple)*

Issues with Serial Correlation:

Where returns are serially correlated:

- Volatility is not consistently estimated and is often underestimated
- An estimator for the true volatility can be estimated but there is error of estimation involved.
- Correlations are not consistently estimated and are often underestimated
- Portfolio level risk measurement is therefore not consistently estimated and is often underestimated

Opportunities in Serial Correlation:

Whatever the true underlying volatility of the real estate markets, the Case Shiller and UK IPD real estate indices will be smoothed. Currently it appears that they are on a recovery path and will likely be positive for the next 12 to 18 months. Real estate indicators will likely remain positive despite the

true picture on the ground.

Serially correlated assets have underlying volatility that is under-estimated. Correlations with other assets, even liquid, non-serially correlated ones will be under-estimated as well. That means that a volatility of a portfolio of such assets will be under-priced.

*note that the autocorrelations shown here in the charts are simple pairwise autocorrelations and not the rigorous a multi lag model as the graphical representation of the results is hard. Tests for significance are done with the multi lag models.