Serial Dependence in the Stock Market: What Can We Learn from Derivatives?

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Serial Dependence by the $Q$-approach

Do past returns on the market “forecast” future returns?

- Let $X = R_{t \rightarrow t+T_1}$ and $Y = R_{t+T_1 \rightarrow t+T_1+T_2}$ denote gross holding period stock market returns in two consecutive periods, respectively.

- In a regression model, $Y = \alpha_{t \rightarrow t+T} + \beta_{t \rightarrow t+T} X + \epsilon$, where $\text{Cov}(X, \epsilon) = 0$

$$\beta_{t \rightarrow t+T} = \frac{\text{Cov}(X,Y)}{\text{Var}(X)} \quad (1)$$

- The derivative market plays an essential role in revealing the underlying market information from recent studies (Ross, 2015; Martin, 2017; Schneider and Trojani, 2019; Jensen, Lando, and Pedersen, 2019).

The derivative market serves as a benchmark to compare several different methodologies in statistical inference to compute market statistics. The results support the Nagel and Xu’s (2021) fading memory distribution and reject the sample distribution, and Adam, Matveev, and Nagel’s (2021) risk-neutral measure with derivative data.

Three major implications to the stock market

In this paper

- We find the regression coefficients, $\{\beta, \alpha\}$, and market autocorrelation, $\text{corr}(X,Y)$, without using historical data or having to estimate any parameters, and imposing minimal theoretical structure, from a forward-looking perspective, and in real time.

- The method is free of distributional assumptions, robust to different choices of pricing kernel process, and provides a real-time conditional point of view on the stock market.

Three major implications to the stock market

1. From a forward-looking perspective, $\text{corr}(R_{t \rightarrow t+1\text{mo}}, R_{t+1\text{mo} \rightarrow t+2\text{mo}}) \approx -20.9\%$

   - A persistent and robust short-term reversal of the monthly market return

   - The short-term reversal identified by the derivative market is economically relevant in timing the market

2. The $Q$-approach serves as a benchmark to compare several different methodologies in statistical inference to compute market statistics.

   - The results support the Nagel and Xu’s (2021) fading memory distribution

   - And reject the sample distribution and Adam, Matveev, and Nagel’s (2021) risk-neutral measure with derivative data.

3. We also conduct the first study on the term structure of the conditional expected future return using derivatives only.

   - The $Q$-approach provides a new angle to “forecast” the equity risk premium: around 3.409% per annum.

References


