Limiting Spectral Distribution of High Dimensional Hayashi's Estimator in Presence of Asynchronicity for $p/n \to 0$

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***Abstract*—**In this study, the estimation of the Integrated Covariance matrix for high dimensional stock price process is considered. In one-dimension, Integrated variance over a fixed interval can be consistently estimated by Realized variance provided the data is observed at sufficiently high frequency. However, when extended to multi-dimension Realized Covariance becomes a biased estimator because of the underlying assumption that the price movements of different stocks are observed in a synchronous manner- which does not hold in practice. Hayashi and Yoshida proposed an alternative to Realized covariance that does not involve force synchronization of financial data. Although works well with low dimension this estimator becomes inconsistent and unreliable for high dimensional data. One possible way out is to study the bulk spectrum of this matrix and to see how it is connected to the true covariance matrix. In this paper the limiting spectral distribution of high dimensional Hayashi's estimator has been established when the dimension to sample size ratio tends to 0.

***Keywords*—**Integrated Covolatility Process, Random matrix theory, Limiting Spectral Distribution, High Dimensional Stock Price Process.