

Analysis of the up-down dynamics of the foreign exchange market using statistical symmetries

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We analyze the up-down price dynamics of the US Dollar/Japanese Yen in the Foreign Exchange Market using the concept of statistical symmetry. Defining statistical symmetry as invariance of a probability distribution under transformation, we take the symmetries of independence and time reversion to characterize binary sign time series data of price difference. Applying a local hypothesis test with a Markov model, we are able to classify different periods of the market as symmetric or not.

We find that (i) for high resolution the foreign exchange market present several periods classified as not independent, but only few of them are present in coarser resolution; (ii) the direction of price movements appears to be essentially time reversible, but this symmetry is broken when there is a strong external influence, e.g., the Japanese government intervention in October, 2011. We also study the durations of the symmetric and asymmetric intervals, obtaining fat-tailed distributions that deviate from the random case.

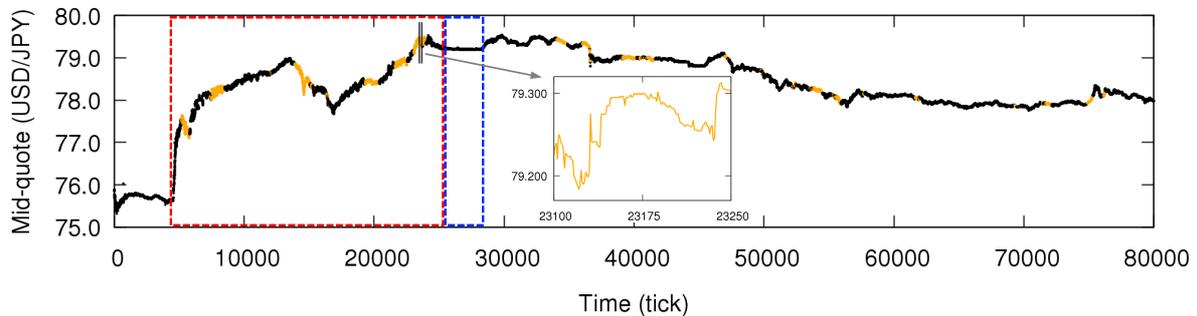


Figure1: Local analysis of the time reversion statistical symmetry for the currency pair USD/JPY in the beginning of the week from 2011, October, 30th to 2011, November, 5th: mid-quote time series with intervals evaluated as time reversion asymmetric shown in orange. Red box indicates the quick increase in the mid-quote and the blue box the period of almost constant mid-quote during the Japanese government intervention. Time irreversible intervals only occur in the intervention and a short period right after it.

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