

Technical Appendix to “Yen and Yang: The Response of the Nikkei to the Yen”

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We regress daily percent changes in the Nikkei (N) on daily percent changes in the yen–dollar spot rate (S), using log differences to approximate growth rates:

$$\Delta \ln N_t = \alpha + \beta \Delta \ln S_t + \varepsilon_t$$

There are several reasons why direct estimation of the relationship may result in measurement error on the coefficient of interest, β . As mentioned in the post, the Nikkei is driven by many factors, some of which are correlated with the exchange rate, and this gives rise to an omitted variable bias. There may also be reverse causality in the relationship as the yen reacts to innovations in Japanese equities; this would hinder one’s ability to claim that the correlation reflects the yen-driven change in the Nikkei.

In an effort to address these measurement issues, we use an instrument for the exchange rate. A suitable instrument in this instance is one that influences the Nikkei, but only through its effect on the value of the yen. The covered interest rate parity (CIRP) condition suggests that the yield on U.S. bonds may suffice. CIRP, which relates the yen spot rate (S) and forward rate (F) to the international relative yields of government bonds ($r_{\$}$ for yields on U.S. government bonds; $r_{¥}$ for yields on Japanese government bonds), can be expressed as follows:

$$\Delta \ln \left[\frac{F_t}{S_t} \right] = \Delta \ln [1 + r_{t,¥}] - \Delta \ln [1 + r_{t,\$}]$$

CIRP implies that, holding Japanese government bond yields constant, changes in U.S. yields pass through on a one-for-one basis into the ratio of yen spot and forward rates. Furthermore, under the assumption that U.S. government bond yields are largely driven by domestic U.S. factors, they may be only weakly related to the domestic factors driving the Japanese economy and their respective influence on the Nikkei. This latter assumption implies that variation in U.S. yields identifies changes in the yen that are exogenous to domestically driven changes in the Nikkei. We implement these instruments, namely the one-month, three-month, one-year, two-year, and five-year U.S. yields, in each specification using two-stage least squares.