

An Intervention Function Analysis of Tariffs on Risk and Returns to Financial Markets

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The recent policies of tariffs, trade restrictions and possible trade war with China has resulted in major volatility in global financial markets. Every positive news in trade negotiations has caused an immediate upturn in major financial indices and a negative news has resulted in downturn in markets. Although it is not possible to quantify the effect of tariffs on financial markets at this early stages of trade policy changes, the effect of each announcement on risk and return of major indices can be estimated using intervention function analysis. Therefore, we treat each major announcement on trade as an intervention in market to estimate and compare the pre-announcement levels of stock market returns and risks with the post-announcement returns and risks using intervention function time series analysis. If an announcement results in a change in the level of returns, we then study the time path of the post-announcement returns using impulse response function.

The conventional method of analyzing the impact of a shock to a variable is to compare the mean and the variance of the variable before and after the shock and then test for the statistical significance of the changes. Such a test is probably inappropriate in time-series analysis because, in most time series data, successive values of a variable are serially correlated and some of the effects of the pre-shock period may “carry over” to the next period. This makes any statistical inference based on the conventional methods of comparing the mean values and variances of the pre-shock and post- shock periods biased. To avoid such “carry over” effects, the mean values of different periods has been compared using the Intervention Analysis technique as well as the conventional method.

Intervention analysis allows for a formal test of a change in the mean of a variable with a time series characteristic. It requires running the best fitting ARIMA on the variable under study for the longest span of data before or after intervention, to find the order of ARIMA, and then running the same ARIMA for the entire study period by including the intervention variable and testing for the significance of the coefficient of the intervention variable.

The model to be tested in this study is:

$$SP_t = a_0 + A(L)SP_{t-1} + c_0Z_t + B(L)e_t$$

where, SP is the index of stock returns, Z is the intervention variable, and A(L) and B(L) are polynomials in lag operator L.

There are several ways to model the intervention function. These are: impulse function, pure jump, gradually changing function, and prolonged impulse. In this study, two types of intervention functions are considered: Impulse function and gradually changing function. Impulse function is best characterized by a purely temporary intervention, in this study, a one-time tariff on imports. Gradually changing function assumes intervention happens gradually, with a certain growth or decay pattern to be estimated from the actual trade data.

Of particular interest are the sign and significance of SP response to the intervention variable, Z. Once the coefficient of the intervention variable is estimated, the dynamic response of the returns to interventions and the post-intervention adjustment path of the returns to the new equilibrium levels will be estimated using impulse response functions.