“Assessing the Success of the State Quarter Program as a Model of Collecting Behavior.”

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Available at: https://works.bepress.com/matt_bogard/36/

Abstract:

The 50 States Commemorative Coin Program Act (Public Law 105-124) was signed into law on December 1, 1997 by President Clinton. The design of the program incorporated some of the key components of collecting behavior, including nostalgia and set completion. Since many current empirical models of collecting tend to focus on the investment aspect of collecting, this collecting program provided a good example of an item that is merely collected for "fun". While we choose to use collectible quarters in this model, what we learn has implications for many products that can easily be given collectible properties (e.g., matchbooks, coffee cups, thimbles, magnets, etc.). We use a unique data set provided by the Federal Reserve to estimate the demand for quarters to assess the impact of the State Quarter Program (SQP) on the demand for quarters. We find a positive significant impact that can likely be attributed to actual collecting. We model the impact of the SQP on the demand for quarters using the Box-Jenkins (1970) modeling procedure for ARIMA models combined with Box-Tiao (1975) intervention analysis in an attempt to discern the potential magnitude and duration of impact of the SQP. Our estimations reveal a positive permanent impact on quarter demand.
Following (McDowall, McCleary, Meidinger, and Hay, 1980), we tested several variations of possible interventions. The step effect was modeled as a level increase, \( \omega_0 X_t^{IS} \), as a level increase with exponential decay (a gradual increase in interest in the quarters after the initial introduction), \( \frac{\omega_0}{(1- \delta_1 \beta)} X_t^{IS} \), and as a level increase with a wave decay (increased collector interest dampens over time), \( \frac{\omega_0}{(1- \delta_1 \beta - \delta_2 \beta^2)} X_t^{IS} \). We also modeled the impact as a pulse with exponential decay, \( \frac{\omega_0}{(1- \delta_1 \beta)} X_t^{IP} \), to test for a possible temporary effect of collecting behavior. These results can be found in Table 4. The functions \( X_t^{IS} \) and \( X_t^{DPI} \) could be thought of as the additional effects of the SQP and changes in real disposable personal income over the usual noise model (Box and Tiao, 1975). The parameters \( \omega_0 \) and \( \omega_1 \) represent the zero order immediate effects. The parameter \( \delta \) represents first (and second) order dynamic decay. The ARIMA(5,1,0)(0,1,1) models with these alternative interventions are specified below:

3. Step function with level increase (sudden permanent effect):

\[
Y_t = \omega_0 X_t^{IS} + \omega_1 X_t^{DPI} + \frac{(1-\theta_1 \beta^{12})}{(1-\beta)(1-\beta^{12})(1-\theta_1 \beta-\theta_1 \beta^2-\theta_1 \beta^3-\theta_1 \beta^4-\theta_1 \beta^5-\theta_1 \beta^6)} \sigma_t \tag{6}
\]

4. Step function with exponential decay (gradual onset with permanent effect):

\[
Y_t = \frac{\omega_0}{(1- \delta_1 \beta)} X_t^{IS} + \omega_1 X_t^{DPI} + \frac{(1-\theta_1 \beta^{12})}{(1-\beta)(1-\beta^{12})(1-\theta_1 \beta-\theta_1 \beta^2-\theta_1 \beta^3-\theta_1 \beta^4-\theta_1 \beta^5-\theta_1 \beta^6)} \sigma_t \tag{7}
\]

5. Step function with wave/dampened decay (gradual onset with gradual decay):

\[
Y_t = \frac{\omega_0}{(1- \delta_1 \beta - \delta_2 \beta^2)} X_t^{IS} + \omega_1 X_t^{DPI} + \frac{(1-\theta_1 \beta^{12})}{(1-\beta)(1-\beta^{12})(1-\theta_1 \beta-\theta_1 \beta^2-\theta_1 \beta^3-\theta_1 \beta^4-\theta_1 \beta^5-\theta_1 \beta^6)} \sigma_t \tag{8}
\]

6. Pulse function with exponential decay (abrupt onset with temporary duration)

\[
Y_t = \frac{\omega_0}{(1- \delta_1 \beta)} X_t^{IP} + \omega_1 X_t^{DPI} + \frac{(1-\theta_1 \beta^{12})}{(1-\beta)(1-\beta^{12})(1-\theta_1 \beta-\theta_1 \beta^2-\theta_1 \beta^3-\theta_1 \beta^4-\theta_1 \beta^5-\theta_1 \beta^6)} \sigma_t \tag{9}
\]