Mathematical Modeling and Consulting

Sponsor

The Center for Responsive Politics

Midterm Presentation

Measuring Economic Effects of Presidential Elections

Team

Yen Theng Tan, Economics Department
yen@jhu.edu

Academic Mentor

Dr. N. .H. Lee, Applied Mathematics and Statistics
nhlee@jhu.edu

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Abstract

While there exist studies documenting the effects of the economy on a presidential candidate's chances of winning the election, there are few that investigate the effects of the presidential campaign on the economy. Besides the direct effects from presidential campaigns that are getting progressively more elaborate and more expensive, the increasing political inaction from fear of criticism is indirectly costly as well. We are tasked by our sponsor, the Center for Responsive Politics, to investigate if, during the period before and after historical presidential elections, there exists statiscally significant fluctuations that can be tied to events related to the presidential election, specifically, the announcement of election results. First we identified two measures of the economy - 1) the Standard & Poor's 500, a stock market index based on the common stock prices of 500 top publicly traded American companies, as determined by S&P, and 2) the price of U.S. 1-year Treasury Bills ('T-Bills'), short term loans issued to, and backed by the full faith and credit of, the United States Government. These data for these two indicators, generally perceived to be good representations of the market and indicators of the U.S. economy, are collected for the 5 years before and after the 2004 presidential election. The time series of these two indicators are then analyzed using change-point detection. Changepoints are times of discontinuities in a time series that can be induced from changes in observation, and thus a notable occurrence during the announcement of the presidential results would indicate a statistically significant event. From this analysis, we can then come to a reasonable assessment of to what extent the presidential elections affect the economy.

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Introduction

The author is Yen Theng Tan. He is currently a senior at Johns Hopkins University, majoring in Applied Mathematics and Statistics, as well as Economics.

The sponsor is the Center for Responsive Politics, which is the nation's premier research group tracking money in U.S. politics and its effect on elections and public policy. Nonpartisan, independent and nonprofit, the organization aims to create a more educated voter, an involved citizenry and a more transparent and responsive government. In short, the Center's mission is to (1) inform citizens about how money in politics affects their lives, (2) empower voters and activists by providing unbiased information, and (3) advocate for a transparent and responsive government.

Appendix A

Lemmas

Appendix B

Glossary

Ascending node. The point where the satellite crosses through the equatorial plane in a northerly direction.

Earth-centered inertial frame. A frame of reference whose origin is the center of the earth and which does not rotate with respect to inertial space.

Earth-centered rotating frame. A frame of reference whose origin is the center of the earth but which rotates with the earth.

Footprint. The intersection of a visibility cone with the surface of the earth.

Great circle of arc. The shortest path between two points on the surface of the earth.

Groundtrack.The location of the center of a visibility cone footprint on the surface of the earth.

Inclination. The angle between the normal to the orbit plane and the normal to the equatorial plane.

LEO. An orbit with an altitude approximately below 2,000 km.

Molniya orbit. A highly elliptical orbit with an orbital period of half a day.

Projection distance. The distance between the center of the visibility cone footprint and a point of interest projected onto the plane orthogonal to the vector defining the visibility cone center and tangent to the earth surface.

Right ascension of the ascending node. The angle between the unit vector $\boldsymbol{X}$ and the point where the satellite crosses the ascending node, measured counterclockwise when viewed from the north side of the equatorial plane.

Appendix C

Abbreviations

ECI. Earth-centered inertial frame

ECR. Earth-centered rotating frame

LEO. Low Earth Orbit

RAAN. Right ascension of the ascending node