Revisiting the Relationship Between Power Cycles and Violent Conflict Using a New Country Power Index that Goes Back to 1494

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Abstract

This paper revisits Power Cycle Theory and reevaluates it using much longer time series of country power (or capability) and wars (1494 to 1945 versus 1816 to 1980). It finds that conflicts initiated by countries tend to occur in the upward phase of a cycle or near the top of the cycle.

INTRODUCTION

The study of countries' power and how their power changes over time enjoys a long history. One aspect of that change that has received a modest amount of attention is how each country's power when compared to that of its neighbors often goes through a cycle of increasing and decreasing power (Knorr, 1956; Dehio,1962; Kennedy, 1987). Of particular interest to this vein of research is how where a country is in this shifting of relative power relates to the foreign policy behavior and number of conflicts in which the country engages. Charles Doran (1991) developed a theory pertaining to this phenomenon that has been dubbed power cycle theory. Power cycle theory specifies a mechanism and rationale that defines at which points in the cycle conflict is most likely to occur.

[SECTION FLESHING OUT POWER CYCLE THEORY]

This paper describes the current state of my project to more fully explore the role of power cycles in international politics. It presents preliminary findings about the relationship between different points or phases in the power cycle and the amount of warfare that countries experience when they are at those different points or in those different phases. The remainder of the paper consists of four parts:

1) The nature of my measure of country power, an index measure defined in terms of countries' relative capabilities,
2) The conflict dataset(s) used to determine the amount of warfare,
3) An analysis of variance-based exploration of the relationship,
4) An alternative, graphical analysis of the relationship,
5) Tentative conclusions

A NEW MEASURE OF POWER FOR TWELVE COUNTRIES

To make a new, thorough analysis of power cycles, we need a longer time series of country power (capability) than those going back to 1816 used by Doran and Parsons (1980) and Doran (1991). However, making such a longer time series constrains what data are available.

An index of country power should consist of measures that capture both a countries' actualized military power and its latent power (Mearsheimer, 2001). Actualized military power is, at least until the nuclear era, generally conceived of as being closely, but not perfectly, related to the size of the armed forces. The size of the armed forces can be measured with a number of yardsticks. The simplest measures are the number of soldiers and the number of major pieces of military hardware. The Correlates of War project chose as their measures of military capability the number of military personnel and the government's military expenditures (Singer, 1987). Unfortunately, this author is not aware of any compilation of military personnel or military expenditure statistics that extend to years earlier than 1816, but data pertaining to the simplest measures are available and are described below.

In what is perhaps the first attempt to create a power measure that encompasses a long time frame, Thompson (1986) created an index of global reach capabilities derived from shares of state-owned, major, naval combat vessels. Clearly a measure operationalized in terms of major pieces of military hardware, this index is both useful and important because it gives a measure of seapower. The data used to generate that index can be found in Modelski and Thompson (1988). Thompson used this index because (he argued) there is no dataset encompassing a number of capabilities that contribute to determining a country's power that spans a timeframe commensurate with testing long cycle theory. The global reach capabilities index at least provides a measure that goes from 1494 to 1983, and it is, arguably, a reasonable proxy for other capabilities measures. The dataset described in this paper hopes to address that concern.

For 11 of the 12 countries for which I was able to make the power index (Portugal, Spain, Netherlands, Italy, Austria-Hungary, United Kingdom, France, Germany, Russia, Sweden, Japan, and the United States), I took Modelski and Thompson's data for each country for each year and entered them into my spreadsheet. Sweden needed to be treated differently. Modelski and Thompson have a variety of estimates for the number of major naval combat vessels possessed by Sweden in an appendix. I took those estimates and made a time series out of them by starting with the first provided value and continuing to use that value until the year of the next estimate. If there was more than one estimate, I used the value that was most comparable to preceding and succeeding values. For each year the number of ships was summed and each country's share of the total calculated. This is the seapower component of the index.

A significant limitation of Thompson's global reach capabilities index is that it does not provide a measure relevant to essentially non-naval states such as Austria-Hungary or Prussia. Luckily, Rasler and Thompson (1994) provide the data to address that limitation by including a time series of the size of field combat armies for 11 major countries from 1490 to 1945. I took the Rasler and Thompson data for each country and entered them into my spreadsheet. Rasler and Thompson provide estimates for 5-year intervals (e.g. 1490-1494), and I used those estimates for each of the years. Portugal, like Sweden above, is treated differently. For the period 1494 to 1580 (the period during which Portugal was a major power), Portugal appears to not have had a standing army.[1] For the wars that

[1] William R. Thompson informed me via email correspondence that he believed Portugal did not have a standing army for that period.

occurred, armies were mustered and contained mostly mercenaries.[2] In the spreadsheet Portugal thus has zeros for all years. With respect to the entire set of countries, for each year the number of troops was summed and each country's share of the total calculated. This is the army size component of the power index.

Major naval combat vessels and field army troops thus comprise the military power or capabilities component of the power index. Latent power is next addressed. Discussions of latent power focus on capacity to support the machinery of war (Waltz, 1979; Mearsheimer, 2001). Proxies for that notion of capacity typically include the size of the economy and the size of the population.

Fortunately, estimates of the population of different countries going back to 1400 and even earlier are available in McEvedy and Jones (1978). Even better, these estimates include taking into account changes in the character and expanse of the countries as they have changed, sometimes dramatically, over the years we are concerned about.

Consequently, a third component for a country power index was created as follows. For each of the 12 countries, estimates of the populations at different points in time (e.g. 1600, 1650, 1700 and more precise dates where there were inflection points) were extracted from the graphs provided by McEvedy and Jones. These points served as the skeleton or anchor points for an interpolation procedure (*ipolate* command in Stata), and the resulting interpolated numbers served as the year-by-year population figures. The country population numbers were summed to a total population number for each year, and each country's share of the total population was calculated for each year. It is worth noting that Thompson (1996) and Kim (1992) created long-term, three-component indices of country power consisting of navy ships, army troops, and population.

The fourth and final component of the country power index attempts to capture the ability of the economy to support a conflict and provide the material for waging the conflict. A commonly used measure is Gross National Product (GNP) or its close sibling, Gross Domestic Product. Mearsheimer (2001), for instance, uses GNP as a measure of a country's

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[2] One can find statements to that effect in Kohn (1999).

wealth, which he believes is the best single measure of a country's latent power.

That assertion is debatable. It is not clear to this author that the sheer size of an economy as measured by GNP is the best measure of latent power from the economy. GNP includes economic activities such as agriculture and services that are quite far removed from a war fighting capability. The manufacturing sector is the part of an economy most essential to supporting a war effort. In that light, a measure of a country's industrial production is arguably superior to GNP as a measure of the country's latent power.

Happily, relevant data exist, although they do not go as far back as 1494. A compilation of various countries' industrial production going back to 1750 can be found in Bairoch (1982). Three articles by Bairoch (1976, 1979, and 1981) present analogous GNP or GNP per capita data, but for most of the 12countries, the data go back only to 1830. Consequently, for the purpose of creating a long-term index of country power, industrial production has a second virtue over GNP in that the longest available time series go farther back in time.[3]

Consequently, the fourth component of the country power index was generated as follows. For 11 of the 12 countries, Bairoch's industrial production data for different dates (Tables 8, 11, 15, and 16) served as the anchor points for an interpolation procedure as was done for the population data. The resulting interpolated numbers served as the year-by-year industrial production figures. The country industrial production numbers were summed to a total industrial production number, and each country's share of the total was calculated for each year.

Holland was treated slightly differently. The first two datapoints for Holland were for 1800 and 1830 and had the value of .6. That value was also used for 1750 under the plausible (but admittedly debatable) assumption that industrialization did not take off in Holland until after that

[3]Frank (1997) asserts that GNP calculations done by Paul Bairoch going back to 1750 can be found in in Braudel (1992). However, examination of Braudel's book does not provide the reader with GNP data of sufficient detail to match the industrial production data.

date and thus the level of industrial production in the earlier period was probably reasonably stable and thus reasonably close to the 1800 value.

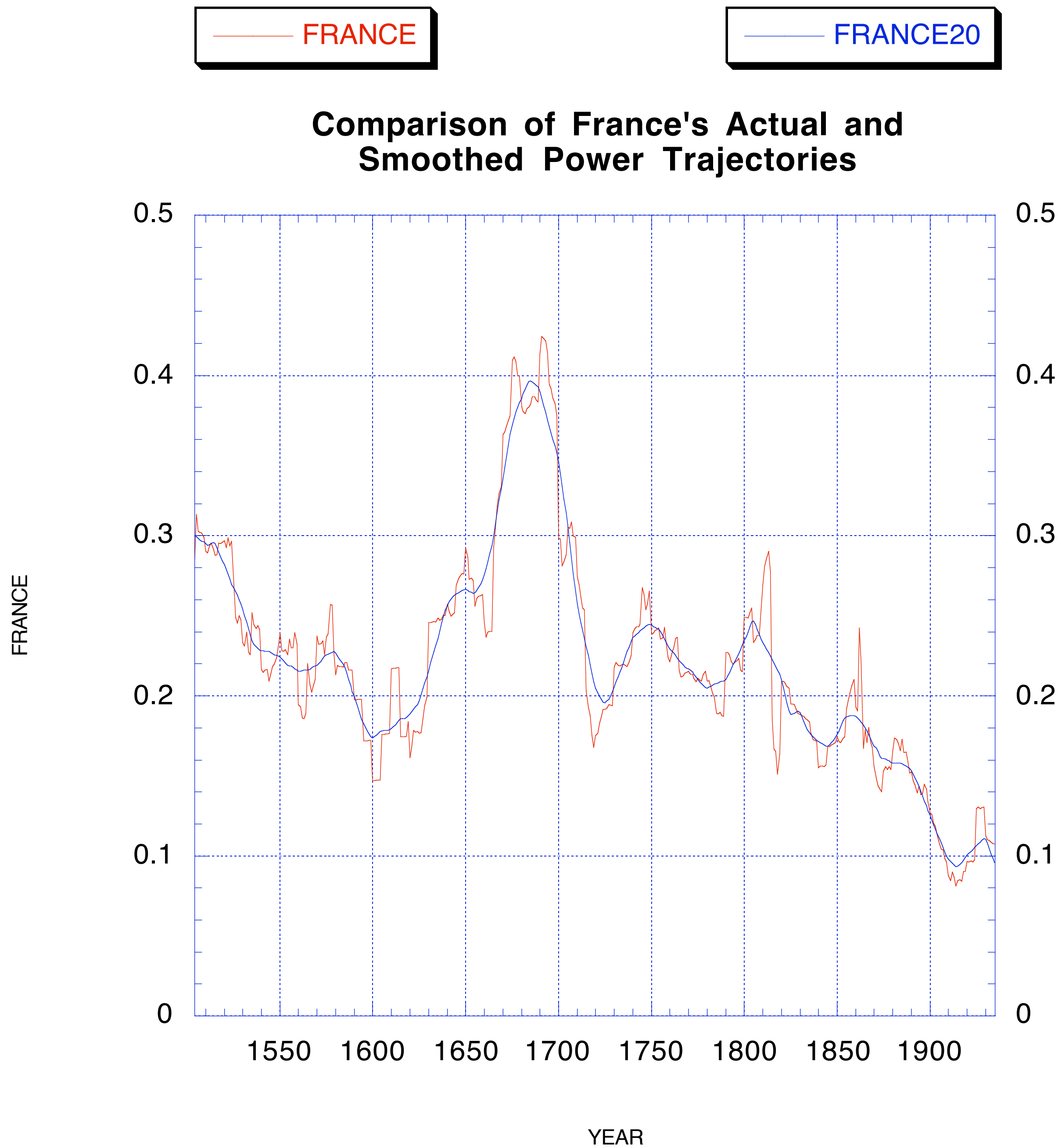
The index of country power, which is each country's share of the 12 countries' total power, was determined by calculating the simple average of the country's share for each of the components. Given the available data, the first year of the time series for the index is 1494 and the last year is 1945. The military power measures and the population measure cover that time frame. The industrial production data go back to only 1750 (which is reasonable), so the power index consists of three equally weighted components or measures from 1494 to 1749 and four equally weighted components from 1750 to 1945.

It must be noted that this index of power explicitly does not include a measure of political capacity such as that found in Kugler and Domke (1986). The reason is not data availability, although that would be a significant challenge. More importantly, their measure of power attempts to get at the power behind war outcomes. This paper is concerned with an often different measure of a country's power, the power assessed in the decision of whether to go to war or not.

Smoothing the Time Series for Power Cycle Analysis

The time series of country power or capability indices that emerge from the procedure described above exhibit considerable "noise" and do not resemble the sine-wave curves used by Doran to depict the power cycle. To reduce the noise and get power trajectories at least somewhat resembling sine waves, I created smoothed versions of the actual power score time series. Smoothing was done through a centered, 20-year moving average process in SPSS. Of many alternatives for smoothing time series data, this one provided the best combination of following the actual data while eliminating short-term spikes and dips. As an example, Figure 1 contains both the actual and smoothed trajectories for France. It should be noted that because of the smoothing process, the time series were truncated to a maximum span of 1504 to 1935.

FIGURE 1



The interested individual may also wish to compare these power trajectories with those generated by Doran and Parsons (1980).

CONFLICT DATASETS USED

I conducted this preliminary analysis using a dataset that merges three different existing, published, conflict datasets. This dataset was derived by combining the interstate wars in the Correlates of War International and Civil War dataset (Singer and Small, 1994), the European wars in the Major-Minor Power Wars dataset (Midlarsky, 1988; Midlarsky and Park, 1994), and the wars in the Great Power Wars dataset (Levy, 1983; Levy, 1994). This was done in order to obtain a list of large conflicts going back to 1494 and that included the wars pertaining to the twelve countries for which we had power cycles data.

INITIAL ANALYSIS OF RELATIONSHIP

The first attempt to analyze the relationship between where countries are with respect to a power cycle trajectory and the amount of warfare they experienced started from simple observation of the historical trajectories. Most notably, the actual trajectories (smoothed) did not resemble sine waves. Because of that, an analysis centered around inflection points seemed less fruitful than Doran portrayed it. That observation led me to try something else, so I developed a categorization scheme of trajectory types that may be behaviorally important. They are listed below:

1. Flat with minor changes (less than .05 or 5 percentage points)

2. Rising a significant amount quickly (more than .05 in less than 50 years)

3. Declining a significant amount quickly

4. Rising a significant amount slowly

5. Declining a significant amount slowly

6. Rise (resurgence) within a long-term decline

7. Decline within a long-term ascendance

8. Plateaus

I then demarcated on the power trajectory graph for each country where the country appeared to transition from one trajectory type to another and from that determined the years that a country was in a particular trajectory type. I then, with significant help from my students, went through the list of conflicts in the combined dataset and identified for each of the 12 countries when it was in a war and, more specifically, in which of each of the trajectory types was each war. From that we could determine what share of a country's wars were in a particular trajectory type. We also calculated what share of a country's years where it had a power cycle trajectory were in each of the trajectory types. Then we calculated the ratio of the share of conflicts in each trajectory type with the share of years in each trajectory type.

If trajectory type had no impact on war involvement, we would expect that ratio to be near 1. If a particular trajectory type had ratios (across the 12 countries) well above zero, that would be evidence for that trajectory type being conflict-prone. If the ratios were well below zero, the trajectory type could be considered to be relatively pacific. This is a simple analysis of variance type of problem.

We then entered the trajectory type and ratios data into the JMP statistical package and did an analysis of variance test. The test indicated no relationship. Figure 2 shows why. With the exception of trajectory type 3, the error bars for the trajectory types cross the 1.0 line, meaning that one cannot conclude that the sample means are indeed different than zero.

GRAPHICAL ANALYSIS OF THE RELATIONSHIP

This outcome sent us back to the drawing board. I decided that a more straightforward approach would be to simply plot an "X" on the power trajectory curves at each point in time when a conflict originated. We did this for the twelve countries. Unfortunately, visual examination of the resulting graphs failed to unearth an obvious pattern. In order to combine the results from the countries, we took the following approach. On a sine-wave (idealized power cycle) curve we plotted the conflicts (with X's) on that part of the curve most comparable to its location on the actual power trajectories. Even though it is fraught with possible inaccuracies, we nevertheless gave this approach a chance. Interestingly (but not too surprizingly given the analysis of variance results), the conflicts were distributed all over the sine-wave curve.

This outcome again forced us to rethink our approach. Upon reflection we recalled that power cycle theory concerns the conditions shaping decisionmakers choosing to take actions that lead to war or not. Consequently, the proper test is not the wars that the countries were in; a much better test is the wars that the country originates. We then reconducted the graphical analysis plotting only those wars that the country originated. When we subsequently combined the conflicts onto a sine-wave curve as before, we obtained the results depicted on Figure 3.

Quite to our surprize, the conflicts concentrated on the ascending slope of the sine wave and the apex. Moreover, the spots with the highest concentration of conflicts tended to be the inflections points determined by Doran to be most conflict-prone.

FIGURE 2

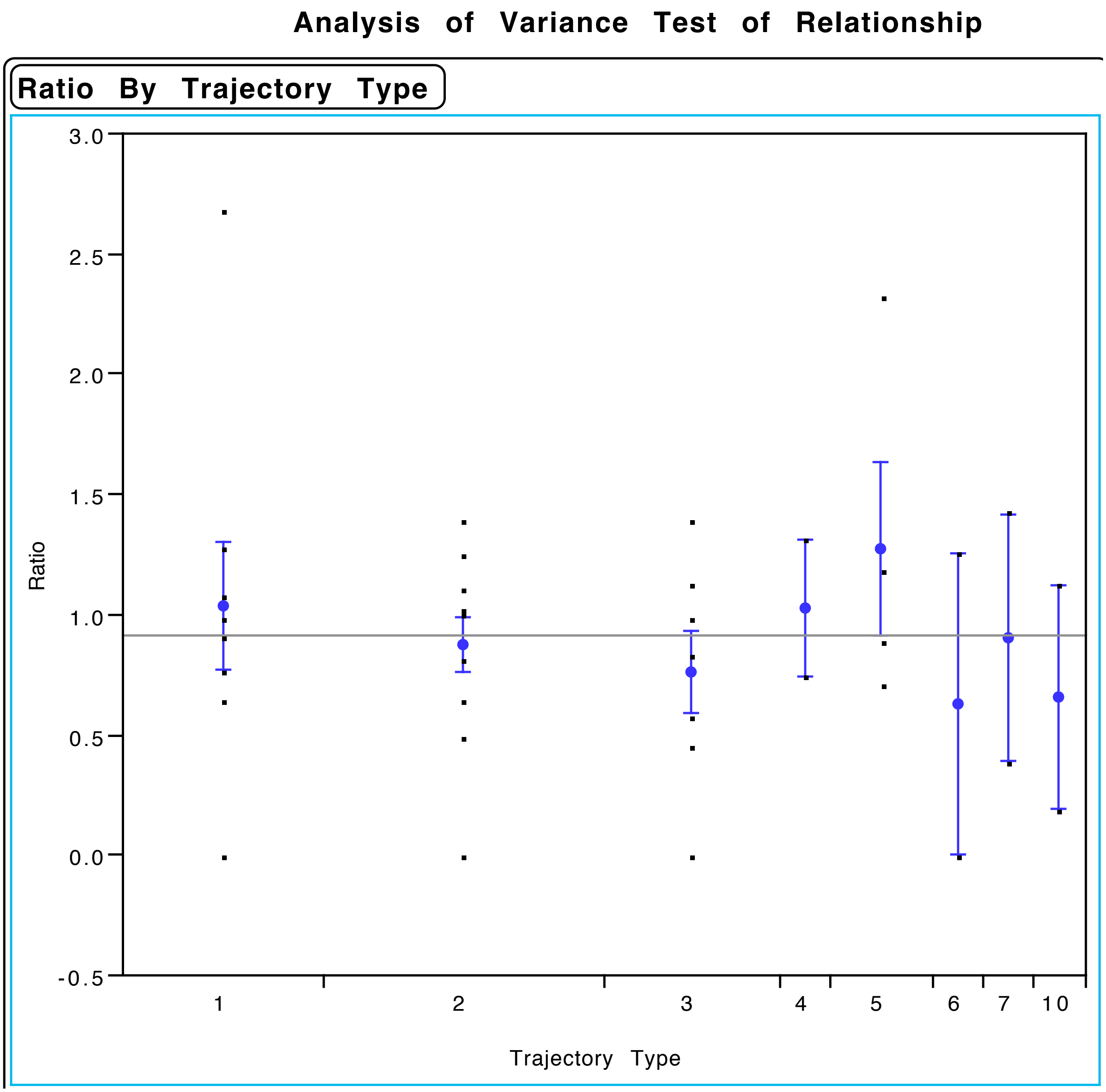
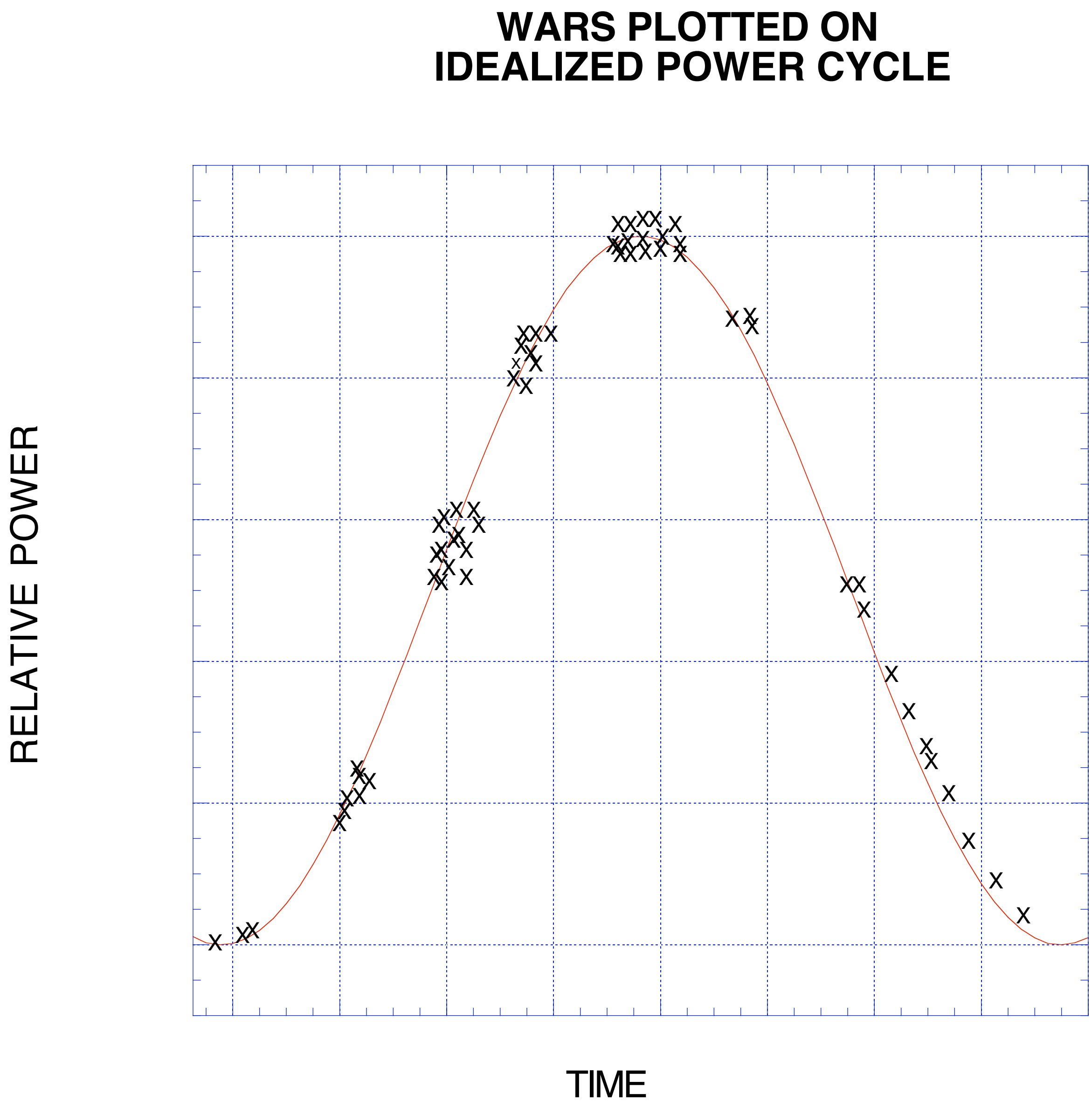

Analysis of Variance Test of Relationship
Ratio By Trajectory Type
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
Ratio
1
2
3
4
5
6
7
10
Trajectory Type

FIGURE 3



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