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# The Persistent Presidential Dummy

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*Abstract*

Whether Republican or Democratic presidents are better for the the stock market has been closely scrutinized for years. Although much of it is discussed only in casual terms, a recent academic study by Santa Clara and Valkanov (2003) documenting that the market does "significantly" better under Democratic regimes was widely quoted in the financial press. Indeed, a link to the study's results was posted to the Kerry/Edwards website. This paper shows that the statistical tests applied by the authors of the study were wrong, and that, once corrected, the difference in stock market returns under different presidential regimes is not meaningful. The lessons of the paper extend well beyond the presidential efffect and emphasize the importance of proper research design in carrying out statistical investigations.

Documentation of significantly higher stock market returns under Democratic than Republican administrations by Santa-Clara and Valkanov [2003] is interesting and thought-provoking. They report that the excess return of the CRSP value-weighted market index over the one-month Treasury bill rate is on average nine percent higher under Democratic than Republican administrations during the period January 1927 through December 1998—16 percent higher using the excess return of the CRSP equal-weighted market index. Confronted by this puzzle, Santa-Clara and Valkanov [2003] (hereafter, SV) employ an extensive battery of robustness checks to determine whether the result is spurious. Included are examining the effects of outliers, studying the consistency of the results within sub-samples, and using a bootstrap procedure to correct for small-sample inference problems. Without fail, the differential effect persists. They conclude the difference is, indeed, significant.

Obviously, such a conclusion, if correct, has great importance. Consequently, the experimental design deserves close scrutiny. In their empirical work, SV regress the monthly stock index returns on a dichotomous explanatory variable (i.e., a dummy variable) that switches on and off according to whether a Republican or a Democrat is in office during the month. If Republican months are coded as "1" and Democratic months are coded as "0", the coefficient on the dummy has the interpretation of being the incremental stock market performance of Republicans over Democrats. If the coefficient on the dummy is significantly positive (negative), the null hypothesis that stock market performance is the same under both types of administrations is rejected in favor of the alternative that performance under Republican (Democratic) administrations is better. SV find that the coefficient is significantly negative.

The use of dummy variables is commonplace in the economics literature. Usually they are used in a regression model to test a significant difference in the intercept and/or

slope where the data are observed under different environments (e.g., a time-series regression model that includes war-time and peace-time observations). What is sometimes overlooked, however, is that a dichotomous explanatory variable is like any other stochastic regressor and may be extremely persistent through time. A recent study by Ferson, Sarkissian and Simin [2003] demonstrates that the spurious regression problem analogous to Yule [1926] and Granger and Newbold [1974] can arise when stock returns are regressed on continuous explanatory variables that are persistent (i.e., highly auto-correlated) through time. The problem is exacerbated by data mining for explanatory variables, since highly persistent variables are more likely to display apparent significance. If there is high autocorrelation in a regressor, the error term inherits the autocorrelation causing the standard error of the estimate to be downward biased and a significant relation to appear when none actually exists. In retrospect, persistence in the presidential dummy comes hardly as a matter of surprise when monthly returns are used. The run of zeros or ones must be at least 48 months long with each successive administration.

To take account of the potential influence of persistence, we conduct simulations in the spirit of Ferson, Sarkissian and Simin [2003] to assess the extent to which the spurious regression problem interacts with data mining to affect dummy variable regression results. To conduct the simulations, the presidential regime dummy variable is modeled as randomly switching between zero and one according to a transition matrix that represents the probability of remaining in or exiting a particular political regime due to a presidential election. Simulated stock market returns are then regressed against an independently simulated presidential dummy variable to obtain a benchmark for the influence of spurious regression on the regression results, with the benchmark taking into account the number of series that are searched for potentially significant regression

relations. The simulation results indicate that the regression adjusted $R^2$ values and the estimated coefficients obtained in political regime return difference studies are less than would be expected by chance.

In addition to addressing the spurious regression problem, we also focus on the issue of sample selection. Like so many empirical studies in finance, the start of the sample period is dictated by the start date of the CRSP monthly data base. Unfortunately, this means that nearly seventy years of valuable information is discarded since distinct differences in the ideologies of the Republican and Democratic parties date back to 1856. Moreover, some have argued that the distinctions between party ideologies were even greater during the late 1800s than they are today. Using market data dating back to 1856, we nearly double the SV sample size, and find that stock market performance under the two presidential regimes is even less distinguishable. The longer sample period also allows us to dispel data mining concerns.

The paper is organized as follows. The first section summarizes the properties of the SV presidential regime study data sample and documents the fact that the dichotomous variable is highly persistent. The second section describes the simulation procedure that is used to assess the influences of political regime dummy variable persistence and data mining on presidential return regression results. The third section uses out-of-sample testing to check the robustness of the results. The final section provides a brief discussion of the potential influence of the spurious regression problem when using dichotomous explanatory variables in time-series regression analysis and contains a summary.

**PRESIDENTIAL REGIME STOCK MARKET RETURN DIFFERENCES**

Popular interest in stock market performance under Democratic and Republican administrations has been around for decades.[1] Herbst and Slinkman [1984] document the existence of a 48-month stock market cycle that is closely associated with U.S. presidential elections. Huang [1985] reports that the mean annual stock market return is 9.2 percent higher under Democratic than Republican administrations during the period 1929 through 1980 and that the difference is significant at the ten percent probability level. Hensel and Ziemba [1995] show that much of the average return differential arises from small stocks, which apparently perform better under Democratic administrations.

SV conduct a careful empirical analysis of differential stock market performance under different presidential regimes. They employ an extensive battery of tests to determine whether a significant difference exists. Center stage in the analysis is a dummy variable regression model designed to test for return differences between Republican and Democratic presidential administrations. The presidential regime dummy variable ($\pi_t$) is equal to one if a particular party is in power at the beginning of a particular month and zero otherwise.[2] The annualized stock market index return differential over the month, $r_{t+1}$, is regressed on the dummy using the model,

$$r_{t+1} = \alpha + \beta \pi_t + u_{t+1} . \qquad (1)$$

The presidential party political dummy variable designations in SV are $RD_t$ =1 if a Republican president is in power during month $t$ and $RD_t$ = 0 otherwise, and $DD_t$ = 1 if a

[1] Hirsch and Hirsch [2005] is the 38th edition of *The Stock Trader's Almanac*. They have documented a wide array of stock market anomalies including market performance (i.e., movement in the DJIA 30) under Republican and Democratic administrations since the late 1960s.

[2] Technically speaking, the SV dummy variable definition implies that a new administration does not take effect until February of the year following the election, although they do not explicitly state that they did so. We assume the new administration takes the reins of power in January since the "lame-duck" administration is unlikely to have any meaningful impact on the marketplace. Given the similarity in our results and those of SV, it appears that our variable definitions are consistent.

Democratic president is in power during month $t$ and $DD_t$ = 0 otherwise. Since the dummy variables are complementary, we ignore the $DD_t$ variable and focus exclusively on $RD_t$. Thus, $\pi_t \equiv RD_t$. The null hypothesis that presidential regimes have no effect on stock market return differentials implies $\beta = 0$.

SV estimate the regression model (1) using annualized monthly market index return differentials during the sample period January 1927 through December 1998. The return differentials are based on four different monthly series. *VWR* and *EWR* are the CRSP value- and equal-weighted log market returns, *TBL* is the log return on a 30-day T-bill, and *INF* is the log monthly inflation in the CPI. These series are used to calculate value- and equal-weighted excess and real return series. The four differential return series are denoted $VWR - TBL$, $VWR - INF$, $EWR - TBL$, and $EWR - INF$. SV report that the presidential regime dummy variable $RD_t$ has statistically significant explanatory power in three of the four regressions.

As a first step in our analysis, we gather the same data as SV from the CRSP monthly data files for the period January 1927 through December 1998. With the raw rates of return in hand, we create the logged variables, *VWR, EWR, TBL*, and *INF*. Slight differences in the *TBL* and *INF* variables are possible since SV use 30-day T-bill and inflation rates from Ibbotson Associates, Inc. rather than CRSP. The differences are trivial, however. Exhibit 1 provides summary statistics for our monthly return differentials, which we can compare to the values in the SV study (see Table I, p. 1846). The results are virtually identical. For the series $VWR - TBL$, for example, we estimate a mean and standard deviation of 6.44 percent and 19.18. SV have 6.46 percent and 19.20 percent, respectively. For $EWR - TBL$, we have 8.74 percent and 25.28 percent, while SV have 8.76 percent and 25.32 percent, respectively. The difference between the average

levels of $VWR-TBL$ and $EWR-TBL$ is a reflection that small stocks had higher returns (and risks) than large stocks during the sample period.

Aside from documenting the fact that we are working from the essentially the same data as SV, Exhibit 1 also reveals extreme persistence in the presidential dummy variable, which is used as the independent variable in the regression model (1). The first-order autocorrelation in *RD* is a whopping 0.983! In addition, all four of the return differential series also have positive first-order autocorrelation, albeit at lower levels. These are the symptoms of a potential spurious regression problem. Ferson, Sarkissian and Simin [2003] point out that, with a high level of persistence in the independent variable and at least partial persistence in the dependent variable, spurious regression results may arise, especially when data sets are mined for potentially significant regression relations.

**[Exhibit 1 about here]**

**Simulated Cut-off Significance Values for Presidential Regime Stock Market Return Differences**

With documented persistence in a regressor, the potential for spurious regression results looms large. The error term inherits the autocorrelation in the regressor, causing the standard error of the estimate to be downward biased and a significant relation to appear when none actually exists. One way of working around this potential problem is to simulate critical cut-off values for the coefficient estimates, the *t*-statistics, and the adjusted $R^2$ for testing whether the coefficients and significance levels estimated using regression model (1) are less than would be expected by chance. Our simulation procedure, patterned after that used in Ferson, Sarkissian and Simin [2003], is conducted under the assumptions that the dependent and independent variables are uncorrelated, but

that the autocorrelation properties of the variables match those present in the actual data. Below we outline the simulation procedure.

*The Dependent Variable*

From Exhibit 1, we know that the monthly excess and real return series are positively auto-correlated. Consequently, the dependent variable stock index return series is generated as

$$r_t = \alpha_r + \rho_r r_{t-1} + e_t \qquad \text{for } t = 2, 3, \ldots, n \ , \tag{2}$$

where $n$ is the sample length in months, $\alpha_r$ is the intercept and $\rho_r$ is the first-order autocorrelation coefficient. The unconditional mean and variance of the dependent variable are

$$\mu_r = \frac{\alpha_r}{1-\rho_r}$$

and

$$\sigma_r^2 = \frac{\sigma_e^2}{1-\rho_r^2},$$

where the parameters $\mu_r$, $\sigma_r^2$ and $\rho_r$ are estimated using the actual stock index data (see Exhibit 1). The dependent variable simulation is started at the unconditional mean $\mu_r$ and the error term for process (2) is generated from a normal distribution with a mean of zero and a variance of $\sigma_r^2(1-\rho_r^2)$.

*The Independent Variable*

The presidential regime dummy variable is generated using a transition matrix that represents the conditional probability of remaining in or exiting a particular political regime on a presidential election date. The transition matrix conditional probabilities are

estimated from the actual election data.[3] Appendix A contains the history of U.S. presidential election results, and Appendix B summarizes the information from which the transition probabilities for the period 1927 through 1998 are computed. The presidential regime independent variable series $\pi_i$ ($i$ = 1,…, $I$) is generated as a first-order Markov chain such that the transition probabilities for potential presidential regime changes at 48-month intervals are

$$\Pr(\pi_i = 0 \,|\, \pi_{i-1} = 0) = q$$

$$\Pr(\pi_i = 1 \,|\, \pi_{i-1} = 0) = 1 - q$$

$$\Pr(\pi_i = 1 \,|\, \pi_{i-1} = 1) = p$$

$$\Pr(\pi_i = 0 \,|\, \pi_{i-1} = 1) = 1 - p\,,$$

where the subscript $i$ represents presidential inauguration dates and $I$ is the total number of elections in the sample. Once the presidential inauguration has occurred then the presidential regime dummy variable remains the same for the following 47 months. The presidential regime series starting value $\pi_{i=0}$ is generated according to the unconditional probability of a Republican presidency occurring during the sample period.[4] The presidential regime dummy variable series is generated independently of the stock index return series.

[3] The diagonal elements of the transition matrix therefore ensure that the persistence of the simulated series matches the persistence of the actual series (see Exhibit 1); the higher are the diagonal element values, the more persistent is the generated series.

[4] The unconditional and conditional probability estimates used in the simulation procedure are obtained using the actual presidential history during the sample period 1927 to 1998. The sample includes 19 presidential elections. Nine were won by a Republican president, so the unconditional probability of a Republican presidential victory is 9/19. The conditional transition probabilities are dependent on the previous presidential administration. Nine elections occurred with a Republican president in power, and nine with a Democrat in power. The transition from (a) Republican to Republican occurs five times (i.e. the one-to-one conditional transition probability is 5/9), (b) Republican to Democrat occurs four times, (i.e. the one-to-zero conditional transition probability is 4/9), (c) Democrat to Republican occurs three times (i.e. the zero-to-one conditional transition probability is 3/9), and (d) Democrat to Democrat stays occurs six times (i.e. the zero-to-zero conditional transition probability is 6/9).

*Cut-offs for Spurious Regression Bias*

A dependent variable series and an uncorrelated independent variable series are simulated for a time period equal to 864 months (January 1927 through December 1998), and a regression is then run on the simulated series using presidential return difference regression model (1). The process is repeated 10,000 times. The coefficient estimates and *t*-statistics as well as the adjusted $R^2$ s are recorded for each simulated regression and are ranked from lowest to highest. The 95$^{th}$ percentile adjusted $R^2$ as well as the 2.5$^{th}$ and 97.5$^{th}$ percentile coefficient estimates and *t*-statistics are then recorded as the five percent critical cut-off values. The cut-off adjusted $R^2$ value is compared to the actual adjusted $R^2$ that is estimated using the original data to assess the overall significance of the estimated regression relation (see Foster, Smith and Whaley [1997]; Ferson, Sarkissian and Simin [2003]). The critical cut-off coefficient estimates and *t*-statistics are similarly used to evaluate whether the regression estimates obtained using the actual data are less than would be expected by chance.

*Cut-offs for Spurious Regression Bias with Data Mining*

A second set of modified cut-off statistics are also reported that use Bonferonni correction intervals to take account of the number of series that are examined in the search for potentially significant relations (see Lo and MacKinlay [1990]; Foster, Smith and Whaley [1997]; Ferson, Sarkissian and Simin [2003]; SV). SV examine five dependent variable series (the four CRSP return differential series reported in Exhibit 1 as well as a real Treasury bill return series), and prior studies cited by SV also examine nominal and real return series for the S&P500, small stocks, long-term corporate bonds, and long- and intermediate-term government bonds, thus implying that a total of fifteen return series have been tested for presidential regime return differences (see Huang [1985]; Hensel and Ziemba [1995]; Johnson, Chittenden and Jensen [1999]). In addition,

there are numerous ways to measure the political dummy variable, including presidential party, congressional party, and first or last two years of the presidential term. In other words, a total of sixty (i.e., fifteen times four) potential combinations are examined in political return difference studies. A conservative adjustment factor of five is used to determine the modified cut-off statistics (e.g., it is assumed that at least five dependent or independent series are examined in the search for statistical relations). This modification is equivalent in an operational sense to requiring a one percent level of significance rather than a five percent level due to the number of series being searched in presidential return difference studies.

*Simulated Cut-off Significance Values for the SV Sample*

Results for presidential regime return difference regression model (1) are reported in Exhibit 2. The coefficient estimates are within a few basis points of those reported in the SV study (Table II, p. 1851), thereby providing additional assurance that the values of the monthly variables are essentially the same. Below the coefficient estimates in Exhibit 2 are the lower and upper confidence bounds for the coefficient estimates and *t*-statistics are given in the second and third lines of each set of results, while the fourth and fifth lines report the modified lower and upper bounds that have been adjusted for the five regression variable series examined by SV. Interestingly, the dummy variable estimates are inside the corresponding coefficient estimate confidence bounds for three out of four series and are inside the corresponding modified confidence bounds for all four series. The *t*-statistic confidence interval bounds and the modified cut-off adjusted $R^2$ values reported in Exhibit 2 also support this conclusion. This evidence strongly suggests that the difference in returns under different political regimes is spurious in that it is less than would be expected by chance. The results of Exhibit 2 therefore indicate that spurious regression, combined with data mining, can be an important problem for dummy variable

regressions, just as it can be in time-series regressions that use continuous explanatory variables that are persistent.

**[Exhibit 2 about here]**

**OUT-OF-SAMPLE-TESTS**

To address the problem of data mining, out-of-sample tests are often performed. One option is to wait for more data to arrive. Another is to look back in time. SV offer two reasons why they restrict the analysis to the post-1927 period. The first is that the ideologies of the Democratic and Republican parties before WWI were not clearly delineated. The second is that data for most of the control variables were not available before 1927. The decision to discard nearly 70 years of potentially valuable information, however, should not be taken lightly. Since monthly stock market return and 30-day interest rate data are available dating back to January 1802 and January 1831 (see Schwert [1989, 1990]), respectively, the critical issue is at what point in time was there a clear distinction between the ideologies of the two political parties.

Two features of American political party history are important in answering this question. The first is the periodic realignment of political parties in the United States through time (Sundquist [1983]; Schofield, Miller, and Martin [2003]). The creation of the Republican party in the early 1850s by anti-slavery activists and proponents of free Western land grants was a crucial realignment. It established the current Republican party, replacing the then-existent Whig party, as the second party (together with the Democrats) within the two-party system. The Republican party burst on to the national scene when Colonel John C. Fremont, a popular hero of the time known as the "Pathfinder of the Pacific," galvanized anti-slavery and free land supporters in the 1856 presidential election. The victory of Abraham Lincoln in the polarizing 1860 presidential election and the

ensuing Civil War over southern secession and the abolition of slavery established the Republican party's reputation and political power base in the North.

The Democratic party has also gone through important realignments. The most successful of these, from a presidential election point of view, was the New Deal political realignment of the thirties instigated by the Great Depression (Sundquist [1983]; Burnham [1965]). Interestingly, a depression in the 1890s during the Democratic administration of Grover Cleveland also led to the most disastrous of the Democratic realignments (again, from an election point of view) when agrarian elements and proponents of monetary expansion gained control of the Democratic party. The Democrats were led by the firebrand orator William Jennings Bryan who deliberately heightened the polarization of the country along regional lines and rural versus industrial interests in the 1896 presidential election (Sundquist [1983]; Burnham [1965]). Failure in the 1896 election temporarily pushed the Democrats back to the southern power base they had maintained since the Civil War, a setback that was reversed when Franklin Delano Roosevelt once again seized the economic initiative with New Deal reforms.

The polarizing 1896 election provides, perhaps, the sharpest distinction between Democratic and Republican economic and socio-economic ideology. Key issues were the hardship of farmers as well as inequality in the distribution of wealth and income between regions and classes (Sundquist [1983]). The Democratic candidate, William Jennings Bryan, "…appealed for a coalition of the 'toiling masses' – farmers and urban working men, organized as an avowed class party against the interests that had exploited them." (Sundquist [1983], p. 155). His "Cross of Gold" Speech at the Democratic Convention, considered to be the most important in American political history, staked out the Democrat 's 20$^{th}$ century position and is still paraphrased today in support of policy:

> "The sympathies of the Democratic Party, as described by the platform, are on the side of the struggling masses, who have ever been the foundation of the Democratic Party.
>
> There are two ideas of government. There are those who believe that if you just legislate to make the well-to-do prosperous, that their prosperity will leak through on those below. The Democratic idea has been that if you legislate to make the masses prosperous their prosperity will find its way up and through every class that rests upon it." (Bryan [1896] p. 5)

The Republican position in the 1896 election was, contrastingly, pro-business, and in opposition to Bryan's "toiling masses". Eastern business interests, under threat, rallied behind Republican presidential candidate William McKinley. Sundquist ([1983], p. 156) notes that, as a consequence of this support, McKinley's campaign manager was able to raise massive campaign funds for the Republicans by the remarkable method of "…assessing major corporations at the rate of one-fourth of one percent of capital." Theodore Roosevelt, upon becoming president due to the assassination of McKinley in 1901, felt the most pressing issue of the time was ensuring the Republican principle of competition in a free market.

Bryan's appeal to industrial workers fell upon deaf ears in the East because they were not convinced that monetary expansion was the primary solution to their economic problems; they also felt excluded by Bryan's regional, agrarian-based coalition. It was not until Franklin Delano Roosevelt's reforms were aimed directly at workers that the Democrats gained ascendancy with the "toiling masses". Sundquist ([1983], p. 207) states "…the Democrats had at last staked out a position as the party of the masses against the classes…", but this position can clearly be traced back to Bryan's 1896 Cross of Gold speech (as quoted above). Bryan's speech ([1896], p. 2 and 3), in turn, looked to the founding father's of the Democratic party in support of his party's policy positions: "What we need is Andrew Jackson to stand as Jackson stood, against the encroachments of aggregated wealth.", and "Mr. Jefferson, who was once regarded as good Democratic

authority, seems to have a different opinion from the gentleman who has addressed us on the part of the minority. Those who are opposed to this proposition tell us that the issue of paper money is a function of the bank and that the government ought to go out of the banking business. I stand with Jefferson rather than with them, and tell them, as he did, that the issue of money is a function of the government and that the banks should go out of the governing business."

The economic ideology that sharply distinguished Republicans during the polarizing 1896 presidential election also had antecedents in the formative years of the party due to the party's early association with liberal capitalism and the party's "…unmistakable appeal to the economic interest of the business element." (Sundquist [1983], pp. 86-88). Sundquist ([1983], p. 81) also states "…the panic of 1857 closed banks and factories throughout the north and south and sent railroads into bankruptcy. Republicans blamed Democratic low tariff policies and gained a potent new issue." The Republican power base in the north during Civil War reconstruction helped to create an increasingly close affiliation of the party with eastern industrial interests, thus foreshadowing Calvin Coolidge's sentiments by many decades when he famously proclaimed in 1925 that "the chief business of the American people is business".

A second important feature of American political history is the secular decline in party affiliation, as quantitatively defined by split-voting (voting for one party in the presidential vote and another party in the vote for other offices) and roll-off (failure to vote a complete ticket), both of which are used to identify party linkage (Burnham [1965]). These measures indicated that party affiliation was intense in the latter half of the nineteenth century. In the words of Burnham ([1965], p.22): "The late 19$^{th}$-century voting universe was marked by a more complete and intensely party-oriented voting participation among the American electorate than ever before or since."

Strong party affiliation and generally high voter turnout during the latter half of the 19th century meant that presidential landslides were only possible when turnout of one party's voters fell for some reason, and were not a result of swing voters. Split-ticket voting and roll-off increased sharply and voter turnout fell precipitously following the 1896 Democratic party realignment, a pattern attributed to the collapse of two-party systems in some states following 1896 and the concurrent rise of direct primaries (Burnham, [1965]). The trend was only partially reversed by the New Deal realignment elections in 1932 to 1944 and is an important but dynamic feature of the current political landscape.

The sharply distinct ideologies of the Republican and Democratic party during the polarizing 1896 presidential election suggest that it would be difficult to argue against the post-1896 period being included in a sample of presidential regime return differences. In fact, it is probably difficult to exclude any part of the history of Democratic versus Republican presidential elections, since both parties' sharply distinct 1896 ideological positions and the justifications of these positions can be traced back to the early years of each party. Very strong party affiliation during the latter half of the 19th century also supports this view. Notwithstanding these observations, the sharp falloff in party affiliation following the 1896 realignment suggests that the post-1896 time period could be an interesting sub-sample to examine in comparison to the full sample.

*Monthly Return Results*

To test the hypothesis that there exists no difference between Democratic and Republican administrations over a longer sample period, we use monthly data dating back to 1856 when John C. Fremont became the first Republican nominee for President under the slogan: "Free soil, free labor, free speech, free men, Fremont." For the period January 1926 through December 2004, we use the monthly value-weighted index returns and 30-

day T-bill rates provided by CRSP.[5] For the period January 1857 through December 1925, our data comes from two sources. First, monthly stock market returns were downloaded from http://schwert.ssb.rochester.edu/gws.htm. The construction of this monthly stock market return series is described in detail in Schwert [1990]. In brief, he compiles a historical single, continuous, stock market price index return series from five historical sources. While the monthly series dates back to February 1802, we use only the data after the November 1856 presidential election. Second, monthly short-term interest rates were generously provided by Bill Schwert. The rates are based on four to six month commercial paper yields reported in Macaulay [1938] and are adjusted so that the level of the series is comparable to the CRSP short-term series. The transformation used to make the adjustment is described in Schwert ([1989], p. 1148).

The methodology used to test the hypothesis that there exists no difference between monthly market returns under Democratic and Republican administrations is, again, the dummy variable regression model (1). The construction of the dummy is straightforward, given the presidential election result summary provided in Appendix A. To develop the appropriate cut-off values for coefficient estimates, *t*-ratios, and adjusted $R^2$'s, estimates of unconditional and conditional probabilities are obtained from the frequency distributions reported in Appendix B. Each sample period has a different distribution. Finally, aside from the transition probabilities, each simulation requires estimates of the mean and standard deviation of the monthly return differential series, $VWR - TBL$, as well as its first-order autocorrelation. These values are reported in Appendix C. The extreme persistence of the presidential dummy variable is, again, apparent. The first-order auto-correlation in $VWR - TBL$ is, again, positive and

[5] While monthly equal-weighted market returns and inflation rates are unavailable during the earlier period, the cost is not large. After all, stock market performance is defined as the market capitalization weighted average returns of all stocks and the 30-day T-bill rate subsumes the short-term inflation rate.

statistically significant. For the period beginning January 1857 and ending December 2004, its standard error is $1/\sqrt{1,776} = .023$.

Exhibit 3 contains the regression results and critical cut-off levels for the extended sample period. Overall the entire history of the Republican party, the null hypothesis that there is no difference in stock market performance during the different presidential regimes cannot be rejected at the five percent level. Both the estimated coefficients and their *t*-ratios are well within their bands, and the adjusted $R^2$'s are below their critical levels. In other words, increasing the sample size by using the entire history of elections in which Republicans were pitted against Democrats has made it increasingly difficult to distinguish between the market return performance under the two presidential regimes, thereby reinforcing the message that data mining combined with explanatory variable persistence plays an important role in presidential regime return difference results.

**[Exhibit 3 about here]**

*Four-year Return Results*

The regression results reported for the full sample in Exhibit 3 offer strong statistical support for the hypothesis that there is no significant difference in monthly stock market performance under the different political regimes. Using monthly data made the statistical inference more tedious than was necessary, however. After all, only one value of the presidential dummy variable is observed each four years. Consequently, only the total return over the entire four-year presidential term is relevant. A simpler, more intuitive, testing procedure is to run the regression model (1) using one observation every four years. The dependent variable is simply the annualized four-year return differential, $VWR - TBL$. Appendix D contains the summary statistics for annualized four-year

returns. These, together with the transition information in Appendix B, are used to simulate critical cut-off levels. Exhibit 4 contains the results.

The results reported in Exhibit 4 provide the same inference as those in Exhibit 3—there is no significant difference in excess market returns during Republican and Democratic administrations. All coefficient estimates and *t*-ratios remain within their confidence bands, and the adjusted $R^2$ is well below its critical level. The coefficient estimates of $\alpha$ and $\beta$ are the same in Exhibits 3 and 4 since we are using annualized logarithmic returns. The confidence intervals are wider since we have fewer return observations.

**[Exhibit 4 about here]**

## CONCLUSION

Dichotomous explanatory variables can be highly persistent in a time-series regression context. If they are, spurious regression results can arise. This is especially the case when data sets are mined for significant explanatory variables, since highly persistent variables are more likely to display apparent significance. This paper uses a simulation procedure to correct potentially misleading inference in such regressions. The simulation is based on a procedure outlined by Ferson, Sarkissian and Simin, [2003] for highly persistent continuous explanatory variables. Specifically, we regress simulated stock market returns against an independently generated presidential regime dummy variable series. This provides an assessment of the extent to which dummy variable persistence combined with data mining can affect the significance of presidential regime return difference regression model results. The simulation procedure results indicate that the adjusted $R^2$ s and the coefficient estimates obtained in presidential regime return difference studies are less than would be expected by chance. The conclusion that

presidential regime differences are insignificant is further reinforced by extending the data sample back to the mid-1800s when the Republican and Democratic ideologies became distinguishable from one another.

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**Exhibit 1**
**Summary Statistics of Market Index Return Differentials**

Monthly differential returns are based on four measures: *VWR*, CRSP value-weighted index log return; *EWR*, CRSP equal-weighted index log return; *TBL*, one-month T-bill log return; and *INF*, log monthly inflation. *RD* is 1 if a Republican is in office at time t, and is 0 otherwise. The sample begins in January 1927 and extends through December 1998. All data are obtained from CRSP.

| | *VWR-TBL* | *VWR-INF* | *EWR-TBL* | *EWR-INF* | *RD* |
|---|---|---|---|---|---|
| Annualized mean (%) | 6.44 | 7.05 | 8.74 | 9.35 | 0.47 |
| Annualized standard deviation (%) | 19.18 | 19.22 | 25.28 | 25.26 | 0.50 |
| *Autocorrelation* | | | | | |
| 1 | 0.102 | 0.103 | 0.182 | 0.181 | 0.983 |
| 2 | -0.007 | -0.015 | 0.024 | 0.017 | 0.965 |
| 3 | -0.108 | -0.111 | -0.095 | -0.098 | 0.948 |
| 4 | 0.014 | 0.008 | -0.048 | -0.052 | 0.930 |
| 5 | 0.086 | 0.088 | 0.022 | 0.021 | 0.913 |

**Exhibit 2**
**Political Regime Return Differential Regression Using Monthly Returns**

OLS regression of annualized monthly differential returns on presidential dummy variable,

$$r_{t+1} = \alpha + \beta RD_t + u_{t+1}$$

where $r_{t+1}$ denotes monthly annualized return over the interval *t* to *t+1*, and $RD_t$ is 1 if a Republican is in office at time *t* (i.e., the beginning of the month), and 0 otherwise. Monthly differential returns are based on four measures: *VWR*, CRSP value-weighted index log return; *EWR*, CRSP equal-weighted index log return; *TBL*, one-month T-bill log return; and *INF*, log monthly inflation. The sample begins in January 1927 and extends through December 1998. $\overline{R}^2$ denotes adjusted $R^2$. All data are obtained from CRSP. Regressions are estimated by OLS and *t*-statistics are adjusted for autocorrelation and heteroskedasticity using Newey-West [1987]. Rows labelled "Lower" and "Upper" are 95 percent confidence bounds obtained by simulation.

| Variable | *n* | $\alpha$ | $t(\alpha)$ | $\beta$ | $t(\beta)$ | $\overline{R}^2$ |
|---|---|---|---|---|---|---|
| *VWR-TBL* | 864 | 10.58 | 3.72 | -8.77 | -1.85 | 0.32% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | -0.65 | -0.18 | -10.36 | -2.03 | 0.42% |
| | Upper | 13.46 | 4.04 | 10.13 | 2.01 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -3.09 | -0.82 | -13.33 | -2.62 | 0.75% |
| | Upper | 15.96 | 4.66 | 12.98 | 2.54 | |
| *VWR-INF* | 864 | 9.42 | 3.19 | -5.02 | -1.06 | 0.03% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | 0.02 | 0.01 | -10.37 | -2.04 | 0.42% |
| | Upper | 14.21 | 4.27 | 10.19 | 2.00 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -2.03 | -0.56 | -13.51 | -2.65 | 0.81% |
| | Upper | 16.77 | 4.99 | 13.25 | 2.64 | |
| *EWR-TBL* | 864 | 16.47 | 3.79 | -16.39 | -2.53 | 0.76% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | -1.36 | -0.26 | -14.52 | -2.05 | 0.53% |
| | Upper | 18.90 | 3.97 | 14.69 | 2.07 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -4.86 | -0.91 | -19.79 | -2.76 | 1.02% |
| | Upper | 22.33 | 4.69 | 19.99 | 2.78 | |
| *EWR-INF* | 864 | 15.32 | 3.48 | -12.63 | -1.95 | 0.40% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | -0.67 | -0.13 | -14.93 | -2.10 | 0.54% |
| | Upper | 19.53 | 4.17 | 14.62 | 2.05 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -4.13 | -0.74 | -19.68 | -2.78 | 1.02% |
| | Upper | 22.99 | 4.82 | 19.73 | 2.80 | |

**Exhibit 3**
**Political Regime Return Differential Regression Results Using Monthly Returns**

OLS regression of annualized monthly differential returns on presidential dummy variable,

$$r_{t+1} = \alpha + \beta RD_t + u_{t+1}$$

where $r_{t+1}$ denotes monthly annualized excess return over the interval $t$ to $t+1$, and $RD_t$ is 1 if a Republican is in office at time $t$ (i.e., the beginning of the month), and 0 otherwise. Market return, *VWR*, is based on the monthly returns compiled by Schwert [1990] for the period January 1857 through December 1925 and the CRSP value-weighted index for the period January 1926 through December 2004. Excess return equals the difference between the monthly market return and the 30-day T-bill rate, where the 30-day T-bill rate, *TBL*, is based on the monthly rates compiled by Schwert [1989] for the period January 1857 through December 1925 and the 30-day T-bill rate provided by CRSP for the period January 1926 through December 2004. Regressions are estimated by OLS and *t*-statistics are adjusted for autocorrelation and heteroskedasticity using Newey-West [1987]. $\overline{R}^2$ denotes adjusted $R^2$. Rows labelled "Lower" and "Upper" are 95 percent confidence bounds obtained by simulation.

| Variable | *n* | $\alpha$ | $t(\alpha)$ | $\beta$ | $t(\beta)$ | $\overline{R}^2$ |
|---|---|---|---|---|---|---|
| *Panel A: January 1857 - December 2004* | | | | | | |
| *VWR-TBL* | 1,776 | 6.27 | 2.65 | -2.61 | -0.85 | -0.01% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | -0.20 | -0.08 | -6.46 | -2.05 | 0.21% |
| | Upper | 9.76 | 4.04 | 6.46 | 2.04 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -1.93 | -0.75 | -8.56 | -2.68 | 0.39% |
| | Upper | 11.35 | 4.73 | 8.29 | 2.62 | |
| *Panel B: January 1897 through December 2004* | | | | | | |
| *VWR-TBL* | 1,296 | 8.32 | 3.32 | -4.52 | -1.26 | 0.05% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | 0.44 | 0.15 | -7.68 | -2.00 | 0.28% |
| | Upper | 11.15 | 4.31 | 7.59 | 2.01 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -1.76 | -0.58 | -9.76 | -2.57 | 0.53% |
| | Upper | 13.27 | 4.88 | 10.31 | 2.67 | |

**Exhibit 4**
**Political Regime Return Differential Regression Results Using Four-Year Returns**

OLS regression of annualized four-year differential returns on presidential dummy variable,

$$r_{t+1} = \alpha + \beta RD_t + u_{t+1}$$

where $r_{t+1}$ denotes monthly four-year excess return over the interval *t* to *t+1*, and $RD_t$ is 1 if a Republican is in office at time *t* (i.e., the beginning of the term), and 0 otherwise. Market return, *VWR*, is based on the monthly returns compiled by Schwert [1990] for the period January 1857 through December 1925 and the CRSP value-weighted index for the period January 1926 through December 2004. Excess return equals the difference between the monthly market return and the 30-day T-bill rate, where the 30-day T-bill rate, *TBL*, is based on the monthly rates compiled by Schwert [1989] for the period January 1857 through December 1925 and the 30-day T-bill rate provided by CRSP for the period January 1926 through December 2004. Regressions are estimated by OLS and *t*-statistics are adjusted for autocorrelation and heteroskedasticity using Newey-West [1987]. $\overline{R}^2$ denotes adjusted $R^2$. Rows labelled "Lower" and "Upper" are 95 percent confidence bounds obtained by simulation.

| Variable | *n* | $\alpha$ | $t(\alpha)$ | $\beta$ | $t(\beta)$ | $\overline{R}^2$ |
|---|---|---|---|---|---|---|
| *Panel A: January 1857 - December 2004* | | | | | | |
| *VWR-TBL* | 37 | 6.27 | 2.90 | -2.61 | -0.95 | -1.31% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | 0.13 | 0.06 | -6.82 | -2.21 | 7.14% |
| | Upper | 9.36 | 5.08 | 6.66 | 2.20 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -1.63 | -0.68 | -9.11 | -2.90 | 13.75% |
| | Upper | 11.20 | 6.28 | 9.08 | 3.10 | |
| *Panel B: January 1897 through December 2004* | | | | | | |
| *VWR-TBL* | 27 | 8.32 | 4.98 | -4.52 | -1.76 | 0.44% |
| | *Cutoffs for spurious regression bias* | | | | | |
| | Lower | 0.95 | 0.35 | -7.97 | -2.32 | 9.30% |
| | Upper | 10.78 | 5.92 | 7.91 | 2.19 | |
| | *Cutoffs for spurious regression bias with five variables examined* | | | | | |
| | Lower | -1.24 | -0.46 | -10.31 | -3.17 | 17.70% |
| | Upper | 12.57 | 7.54 | 10.65 | 3.25 | |

## Appendix A
## History of U.S. Presidential Election/Inauguration Dates Since 1856

| President | Republican/ Democrat | Election date | Inauguration date |
|---|---|---|---|
| James Buchanan | D | 18561104 | 18570304 |
| Abraham Lincoln | R | 18601106 | 18610304 |
| Abraham Lincoln/Andrew Johnson | R | 18641108 | 18650304 |
| Ulysses S. Grant | R | 18681103 | 18690304 |
| Ulysses S. Grant | R | 18721105 | 18730304 |
| Rutherford B. Hayes | R | 18761107 | 18770305 |
| James A. Garfield/Chester A. Arthur | R | 18801102 | 18810304 |
| Grover Cleveland | D | 18841104 | 18850304 |
| Benjamin Harrison | R | 18881106 | 18890304 |
| Grover Cleveland | D | 18921108 | 18930304 |
| William McKinley | R | 18961103 | 18970304 |
| William McKinley/Theodore Roosevelt | R | 19001106 | 19010304 |
| Theodore Roosevelt | R | 19041108 | 19050304 |
| William H. Taft | R | 19081103 | 19090304 |
| Woodrow Wilson | D | 19121105 | 19130304 |
| Woodrow Wilson | D | 19161107 | 19170304 |
| Warren G. Harding/Calvin Coolidge | R | 19201102 | 19210304 |
| Calvin Coolidge | R | 19241104 | 19250304 |
| Herbert Hoover | R | 19281106 | 19290304 |
| Franklin D. Roosevelt | D | 19321108 | 19330304 |
| Franklin D. Roosevelt | D | 19361103 | 19370120 |
| Franklin D. Roosevelt | D | 19401105 | 19410120 |
| Franklin D. Roosevelt/Harry S. Truman | D | 19441107 | 19450110 |
| Harry S. Truman | D | 19481102 | 19490120 |
| Dwight D. Eisenhower | R | 19521104 | 19530120 |
| Dwight D. Eisenhower | R | 19561106 | 19570120 |
| John F. Kennedy/Lyndon B. Johnson | D | 19601108 | 19610120 |
| Lyndon B. Johnson | D | 19641103 | 19650120 |
| Richard M. Nixon | R | 19681105 | 19690129 |
| Richard M. Nixon/Gerald R. Ford | R | 19721107 | 19730120 |
| Jimmy Carter | D | 19761102 | 19770120 |
| Ronald Reagan | R | 19801104 | 19810120 |
| Ronald Reagan | R | 19841106 | 19850120 |
| George H. Bush | R | 19881108 | 19890120 |
| William J. Clinton | D | 19921103 | 19930120 |
| William J. Clinton | D | 19961105 | 19970120 |
| George W. Bush | R | 20001107 | 20010120 |
| George W. Bush | R | 20041102 | 20050120 |

**Appendix B**
**Frequency of Presidential Transitions During Different Sample Periods**

| | 1927-1998 | 1857-2004 | 1869-2004 | 1897-2004 |
|---|---|---|---|---|
| No. of presidential elections | 19 | 37 | 35 | 27 |
| No. of Republican administrations | 9 | 22 | 21 | 15 |
| No. of Democratic administrations | 10 | 15 | 14 | 12 |
| | | | | |
| Republican to Republican | 5 | 14 | 13 | 9 |
| Republican to Democrat | 4 | 7 | 7 | 5 |
| Democrat to Democrat | 6 | 7 | 7 | 7 |
| Democrat to Republican | 3 | 8 | 7 | 5 |

**Appendix C**
**Summary Statistics for Annualized Monthly Return Data**

Computed based on annualized monthly excess returns. Market return, *VWR*, is based on the monthly returns compiled by Schwert [1990] for the period January 1857 through December 1925 and the CRSP value-weighted index for the period January 1926 through December 2004. Excess return equals the difference between the monthly market return and the 30-day T-bill rate, where the 30-day T-bill rate, *TBL*, is based on the monthly rates compiled by Schwert [1989] for the period January 1857 through December 1925 and the 30-day T-bill rate provided by CRSP for the period January 1926 through December 2004. The presidential dummy variable, *RD*, is coded "1" for Republican and "0" for Democrat.

| Period | Variable | *n* | Mean (%) | Standard deviation (%) | Autocorrelation 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|
| January 1857 through December 2004 | *VWR-TBL* | 1,776 | 4.72 | 17.50 | 0.084 | -0.006 | -0.053 | 0.012 | 0.076 |
| | *RD* | 1,776 | 0.59 | 0.49 | 0.982 | 0.964 | 0.946 | 0.928 | 0.909 |
| January 1865 through December 2004 | *VWR-TBL* | 1,680 | 4.63 | 17.00 | 0.084 | 0.007 | -0.078 | 0.009 | 0.087 |
| | *RD* | 1,680 | 0.60 | 0.49 | 0.982 | 0.964 | 0.947 | 0.929 | 0.911 |
| January 1897 through December 2004 | *VWR-TBL* | 1,296 | 5.81 | 17.89 | 0.086 | 0.007 | -0.082 | 0.018 | 0.089 |
| | *RD* | 1,296 | 0.56 | 0.50 | 0.984 | 0.968 | 0.951 | 0.935 | 0.919 |

## Appendix D
## Summary Statistics for Annualized Four-Year Return Data

Computed based on annualized four-year excess returns over presidential terms. Market return, *VWR*, is based on the monthly returns compiled by Schwert [1990] for the period January 1857 through December 1925 and the CRSP value-weighted index for the period January 1926 through December 2004. Excess return equals the difference between the monthly market return and the 30-day T-bill rate, where the 30-day T-bill rate, *TBL*, is based on the monthly rates compiled by Schwert [1989] for the period January 1857 through December 1925 and the 30-day T-bill rate provided by CRSP for the period January 1926 through December 2004. The presidential dummy variable, *RD*, is coded "1" for Republican and "0" for Democrat.

| | | | | Standard | Autocorrelation | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Period | Variable | *n* | Mean (%) | deviation (%) | 1 | 2 | 3 | 4 | 5 |
| January 1857 through December 2004 | *VWR-TBL* | 37 | 4.72 | 10.57 | -0.474 | 0.228 | -0.008 | -0.029 | -0.067 |
| | *RD* | 37 | 0.59 | 0.50 | 0.130 | -0.179 | -0.152 | 0.054 | 0.035 |
| January 1865 through December 2004 | *VWR-TBL* | 35 | 4.63 | 10.44 | -0.459 | 0.242 | 0.034 | -0.100 | -0.007 |
| | *RD* | 35 | 0.60 | 0.50 | 0.148 | -0.181 | -0.152 | 0.067 | 0.048 |
| January 1897 through December 2004 | *VWR-TBL* | 27 | 5.81 | 11.07 | -0.460 | 0.221 | 0.005 | -0.102 | -0.088 |
| | *RD* | 27 | 0.56 | 0.51 | 0.220 | -0.343 | -0.156 | 0.115 | 0.002 |