

Post Hoc Ergo Propter Hoc: Were the Economic Consequences of Pearl Harbor, the Assassination of President John F. Kennedy and 9/11 Predictable for the United States of America?

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Abstract

This paper looks at the effects of three national tragedies on the economy of the United States of America. Three ten-year periods are analyzed: the ten years following Pearl Harbor, the ten years following the Kennedy Assassination, and the ten years following the 9/11 attack. A historical summary of each period is presented. A multiple regression is then developed that predicts the Change in Real Annual GDP based on the major components of GDP along with a Dummy Variable representing the occurrence of each event. The model is then modified to study the interrelation of all of the components of GDP with the dummy variable. Each interaction component is then tested individually to study the effects on Annual Real GDP. Based on the regression results and the historical summary of the times, it appears that the economic consequences of national tragedies are predictable. This is because such events are generally followed by American involvement in a foreign war.

Keywords: Econometric Modeling, Forecasting and Simulation: Models and Applications; National Security and War: Government, War, Law, International Relations, and Regulation; Economic Growth and Aggregate Productivity; Economywide Country Studies

JEL: C5, E27 H56 N4, O4, O5

1. Introduction

Over the last one-hundred years, three events have had a profound effect on the American psyche. They are the attack on Pearl Harbor (December 7, 1941), the assassination of President John F. Kennedy (November 22, 1963), and the attack on the World Trade Center and the Pentagon (September 11, 2001). Each of those events also had a significant impact on the United States economy. This paper will study the ten-year effect of each of these events on the percentage change in Real Gross National Product (GDP) of the United States. A historical summary of the key events occurring in each time frame is presented. Data from 1930-2013 will be analyzed. A regression model will be developed to predict the growth rate in Real GDP during the ten-year period following each of these historic events (Berenson, Levine & Krehbiel 2012, pp. 599-605). The interaction of these events with the different components of Real GDP will be explored. The model and the subsequent analysis will be used to forecast how the occurrence of such events could affect the growth rate of the American economy in the future.

2. Historical Summary of the Periods

2.1 The Period 1942-1951

On December 7, 1941, the Japanese navy attacked the U.S. naval base at Pearl Harbor, Hawaii, leaving almost 2,500 dead and sinking or disabling much of the U.S. fleet. The next day, President Franklin D. Roosevelt declared war on Japan. Three days later, Germany and Italy declared war on the United States (Stone & Kuznick, 2012, p. 98). But as early as 1940, World War II created a demand for the products of American industry. Unemployment, which was close to 6% at the end of 1941 vanished as wartime mobilization began (Hughes & Cain, 2011, p. 525). GDP, which was approximately \$126 billion dollars in 1941, was \$223 billion by 1945 (Hughes & Cain, 2011, p. 527).

War expenditures increased family incomes and the subsequent spending increased demand for goods and services. Gross Private Domestic Investment fell during the war years, and then surged after the end of hostilities. Real GDP dropped in 1946, but with the lifting of price controls, rebounded to its 1945 level by 1950. Unemployment stabilized at about 4% annually (Hughes & Cain, 2011, p. 527).

A short peace existed between 1945 and 1950 (Hughes & Cain, 2011, p. 544). In 1950, the Korean War broke out. President Harry S. Truman committed American ground forces. However, the Korean War had little effect on the United States economy. The defense budget for fiscal 1951 almost quadrupled, from \$13.5 billion to \$48.2 billion. U.S. defense spending soared to \$54 billion (Stone & Kuznick, 2012, p. 246). However, the war was financed entirely through tax revenues, and, as a result, unemployment dropped and economic growth continued through the end of the Korean War in 1953 (Hughes & Cain, 2011, p. 545).

2.2 The Period 1964-1973

Following the assassination of President John F. Kennedy on November 22, 1963, Lyndon Baines Johnson assumed the presidency. From 1964-1968, President Johnson fought a War in Vietnam abroad and a War on Poverty at home while attempting to build his vision of Great Society for America. At the time of President Kennedy's assassination, the United States had committed only 16,000 troops to the Vietnamese conflict (Stone & Kuznick, 2012, p. 305). On his second day in office, Johnson assured his advisors of his intention to aggressively defend the U.S. interests in Vietnam (Stone & Kuznick, 2012, p. 326). By April of 1965, President Johnson had committed 75,000 combat troops to South Vietnam (Stone & Kuznick, 2012, p. 330). By April 1967, U.S. troop levels approached 525,000 (Stone & Kuznick, 2012, p. 338).

Tax cuts during the Kennedy administration combined with an increase in government spending during the Johnson administration ignited economic growth in the United States. The War in Vietnam, the War on Poverty and Great Society programs enabled U.S. industrial production to grow at an annual rate of 2.4% during the period 1965-1973 (Hughes & Cain, 2011, p. 592). By the end of his presidency, Johnson's foreign and domestic spending had bolstered economic growth to 4.9% annually, increased inflation to 4.7% annually and created a large balance of payments deficit (Amadeo, n.d.).

During the Presidency of Richard M. Nixon (1969-1974), the Vietnam War ended (1973), but not before U.S. troops in Southeast Asia numbered 543,000 (Stone & Kuznick, 2012, p. 360). Domestically, President Nixon attempted to create prosperity at home without war by imposing wage-price controls, ending the gold standard, imposing a 10% import tax, and increased import prices to consumers in order to reduce the balance of payments. These actions created a recession and spurred inflation which continued through the 1970's (Amadeo, n.d.).

2.3 The Period 2002-2011

The terrorist attack on the World Trade Towers and the Pentagon on the morning of September 11, 2001 had a significant economic effect on the U.S. economy for the next decade. Prior to 9/11, the federal government had produced four straight budget surpluses. In 2011, the federal government had a deficit of \$1.3 trillion dollars (Miley, 2011). The U.S. debt increased from \$6.4 trillion in 2003 to more than \$14 trillion (Agence France-Presse, n.d.). Military actions in Afghanistan and Iraq initiated by President George W. Bush caused the Pentagon budget to grow from 16% to 20% of federal spending (Bartash, 2011). Researchers project that the wars in Afghanistan and Iraq have cost between \$3.2 and \$4 trillion (Watson Institute for International Studies, 2011). A recession in the US economy required tax cuts, which exacerbated the crisis. President Barack Obama continued the War on Terror. From 2008-2011, he requested \$477 billion to fight terrorism (Amadeo, n.d.). This meant that fewer funds were available for stimulus programs to boost the economy out of the financial crisis of 2008. In fact, the 2008 meltdown may have been due at least in part to the war (Stiglitz & Bilmes, 2008). These wars may have drained money away that would have sustained growth and either eased the crisis when the U.S. housing bubble burst, or strengthened the nation's ability to respond to it (Agence France-Presse, n.d.).

3. Research Methodology

3.1 Using a Dummy Variable in the Regression Model

To predict the percentage change in real GDP for the USA, we include a dummy variable. Where appropriate, the value of 0 is assigned to the periods where the effect of national tragedy was absent and a value of 1 is assigned to the ten-year period immediately following a national tragedy.

The multiple regression model is as follows:

$$Y_i = B_0 + B_1X_{1i} + B_2X_{2i} + B_3X_{3i} + B_4X_{4i} + B_5X_{5i} + e_i \quad (1)$$

Where Y_i is the annual percentage change in Real GDP for year i ;

B_0 is the Y intercept;

B_1 is the slope of the annual percentage change in Real Consumption;

X_{1i} is the annual percentage change in Real Consumption, holding constant the effect of the other independent variables;

B_2 is the slope of the percentage change in Real Investment;

X_{2i} is the annual percentage change in Real Investment, holding constant the effect of the other independent variables;

B_3 is the annual percentage change in Real Government Spending

X_{3i} is the annual percentage change in Real Government Spending, holding constant the effect of the other independent variables;

B_4 is the annual percentage change in Real Net Exports

X_{4i} is the annual percentage change in Real Net Exports, holding constant the effect of the other independent variables;

B_5 is the slope of the dummy variable;

X_{5i} is the dummy variable representing the incremental effect of occurrence of a national tragedy, holding constant the effect of the other independent variables;

e_i is the stochastic error term.

3.2 Data for the Regression Model with a Dummy Variable

The Data for Equation (1) is in Table 5 in the Appendix. It is the percentage change in the Real Components of GDP along with the appropriate dummy variable for the Period 1929-2013 as provided by the Bureau of Economic Analysis.

3.3 Results of the Regression Model with the Dummy Variable

Table 1

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept (B_0)	-0.8872	-2.2810	0.0253
% Change in Consumption (B_1)	1.1402	10.6499	0.0000
% Change in Investment (B_2)	0.0164	1.2202	0.2261
% Change in Government Spending (B_3)	0.1783	12.6967	0.0000
% Change in Net Exports (B_4)	-0.0698	-3.5725	0.0006
Dummy Variable (B_5)	-0.1608	-0.3458	0.7304

Table 2

Regression Statistics					
Multiple R					0.9202
R Square					0.8467
Adjusted R Square					0.8369
Standard Error					2.0025
ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	5	1727.5979	345.5196	86.1620	0.0000
Residual	78	312.7892	4.0101		
Total	83	2040.3870			
Observations					84

3.4. Evaluating the Regression Model with Several Interactions

To determine if whether adding interaction terms makes a significant contribution to the regression model, ten interaction terms are constructed as follows:

- $X_6 = X_1 * X_2;$
- $X_7 = X_1 * X_3;$
- $X_8 = X_1 * X_4;$
- $X_9 = X_1 * X_5;$
- $X_{10} = X_2 * X_3;$
- $X_{11} = X_2 * X_4;$
- $X_{12} = X_2 * X_5;$
- $X_{13} = X_3 * X_4;$
- $X_{14} = X_3 * X_5;$
- $X_{15} = X_4 * X_5.$

The regression model is now

$$Y_i = B_0 + B_1X_{1i} + B_2X_{2i} + B_3X_{3i} + B_4X_{4i} + B_5X_{5i} + B_6X_{6i} + B_7X_{7i} + B_8X_{8i} + B_9X_{9i} + B_{10}X_{10i} + B_{11}X_{11i} + B_{12}X_{12i} + B_{13}X_{13i} + B_{14}X_{14i} + B_{15}X_{15i} + e_i \tag{2}$$

3.5 Data for the Regression Model with Several Interactions

Equation (2) employs the data used in equation (1) along with the calculations shown in Table 6 in the Appendix.

3.6 Results for the Regression Model with Several Interactions

Table 3

<i>Regression Statistics</i>					
Multiple R					0.9810
R Square					0.9624
Adjusted R Square					0.9541
Standard Error					1.0626
Observations					84
<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	15	1963.6039	130.9069	115.9326	0.0000
Residual	68	76.7832	1.1292		
Total	83	2040.3870			

To test whether the ten interactions improve the regression model, we use a partial F test. To use the partial F test for the simultaneous contributions of ten variables to a model, we use the formula below.

$$F_{Stat} = \frac{[SSR(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}) - SSR(X_1, X_2, X_3, X_4, X_5)]/10}{MSE(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15})}$$

$$F_{Stat} = [1963.6039 - 1727.5979]/10/1.1292 = 20.900283$$

Using a level of significance of 0.01, the critical F value is approximately 2.63, indicating that the interactions make a significant contribution to the model. Next, we then need to test the contribution of each of the interactions separately in order to determine which interaction terms to include in the model.

3.7 Determining the Interaction Terms to Include in the Model

$$Y_i = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_nX_iX_j + e_i \quad (3)$$

Where B_n is the nth coefficient of the X_iX_j interaction.

3.8 Data for Determining the Interaction Terms to Include in the Model

The data for Equation (3) came from Table 5 and Table 6 in the Appendix.

3.9 Results of Determining the Interaction Terms to Include in the Model**Table 4**

Interaction	Coefficient	t-Stat	P-Value	Multiple R²
Interaction Between Consumption and Investment	-0.0067	-5.6864	0.0000	0.9445
Interaction Between Consumption and Government Spending	0.0103	4.4753	0.0000	0.9372

Interaction	Coefficient	t-Stat	P-Value	Multiple R²
Interaction Between Consumption and Net Exports	-0.0144	-7.8322	0.0000	0.9564
Interaction Between Consumption and the Dummy Variable	-0.5876	-3.1081	0.0026	0.9294
Interaction Between Investment and Government Spending	0.0010	5.0130	0.0000	0.9404
Interaction Between Investment and Net Exports	-0.0010	-7.1960	0.0000	0.9531
Interaction Between Investment and the Dummy Variable	-0.1116	-7.1842	0.0000	0.9530
Interaction Between Government Spending and Net Exports	0.0015	6.2047	0.0000	0.9475

Interaction	Coefficient	t-Stat	P-Value	Multiple R²
Interaction Between Government Spending and the Dummy Variable	0.0830	2.6026	0.0111	0.9269
Interaction Between Net Exports and the Dummy Variable	-0.2155	-8.3714	0.0000	0.9590

4. Analysis

All of the interactions are statistically significant. Focusing on the interaction between the growth rate in different components of Real GDP and the dummy variable, the coefficient for the interaction between the percentage change in consumption and the dummy variable, the coefficient for the interaction between the percentage change in investment and the dummy variable and the coefficient for the interaction between the percentage change in net exports and the dummy variable are all negative. This indicates that a national tragedy in the USA had dampened consumption spending, investment spending and net exports. The coefficient for the interaction between government spending and the dummy variable is positive, indicating that a national tragedies increases government spending. This may be explained by the fact that each of these national tragedies was followed by a war. The bombing of Pearl Harbor brought the USA into World War II. That ten year period ended with the United States participation in the Korean War. The assassination of President John F. Kennedy and the presidency of Lyndon Johnson led to an escalation in our involvement in Vietnam. The attack of 9/11 on the World Trade Towers and the Pentagon lead to wars in both Iraq and Afghanistan.

Focusing on the interaction between the growth rates of different components of GDP, the model indicates that the interaction between the growth rate in Consumption and Government Spending, the interaction between the growth rate in Investment and Government Spending and the interaction between growth rate in Government Spending and Net Exports are positively related. More Government Spending on military and domestic projects would lead to higher levels of Consumption, Investment and Net Exports as the economy grows. The interaction between the growth rate in Consumption and Investment, the interaction between the growth rate in Consumption and Net Exports and the interaction between growth rate in Investment and Net Exports are negatively related. All of these effects can be explained as the result of the crowding out of business spending by increased taxes or deficit spending, barriers to trade, and the relocation of America industries abroad due, at least in part, to cheaper foreign labour.

5. Conclusions and Suggestions for Future Research

This paper attempts to determine if the economic consequences of Pearl Harbor, the Kennedy Assassination and 9/11 were predictable. The model developed answers this question in the affirmative. The reason is that each tragedy was followed by a prolonged military conflict. In his farewell remarks to the nation in January of 1961, President Dwight D. Eisenhower warned about the military-industrial complex. This is the tendency of weapons producers to influence policy and expenditures and to link excessively the overall prosperity of the country to continuous Cold War (Hughes & Cain, 2011, pp. 554-555). If the inevitable result of national tragedies for the United States of America is war, then future research could focus on how and to what extent the military-industrial complex exerts economic influence over U.S. economy.

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Appendix

Data for Equations 1, 2 and 3

Table 5¹

Year	% Change in GDP Y _i	% Change in Consumption X ₁	% Change in Investment X ₂	% Change in Government Spending X ₃	% Change in Net Exports X ₄	Dummy Variable X ₅
1930	-8.6	-5.3	-33.3	10.2	-17.3	0
1931	-6.4	-3.0	-37.2	4.3	-16.9	0
1932	-13.0	-8.9	-69.8	-3.3	-21.7	0
1933	-1.4	-2.3	47.5	-3.6	0.5	0
1934	10.8	7.0	80.6	12.8	11.2	0
1935	9.0	6.2	85.1	3.0	5.5	0
1936	12.9	10.2	28.2	16.0	5.0	0
1937	5.3	3.7	25.0	-3.6	26.0	0
1938	-3.5	-1.6	-33.9	7.5	-1.0	0
1939	8.1	5.6	28.6	9.1	5.6	0
1940	8.5	5.2	39.3	1.5	13.5	0
1941	17.1	7.2	22.2	66.1	2.7	0
1942	18.4	-2.4	-47.2	134.7	-34.3	1
1943	16.5	2.7	-41.0	49.1	-16.6	1
1944	8.2	2.9	-23.6	12.8	7.5	1
1945	-1.2	6.3	32.1	-12.9	41.5	1
1946	-11.1	12.3	153.7	-65.6	117.7	1
1947	-0.7	2.0	-3.6	-14.6	14.2	1
1948	4.3	2.2	27.7	7.1	-21.3	1
1949	-0.6	2.7	-23.7	11.7	-1.0	1
1950	8.7	6.4	41.5	0.0	-12.5	1
1951	7.6	1.5	0.3	36.1	22.6	1
1952	4.0	3.2	-9.5	21.0	-4.7	0
1953	4.6	4.8	4.7	7.0	-6.7	0
1954	-0.7	2.1	-4.6	-6.9	4.9	0
1955	7.1	7.2	24.4	-3.7	10.6	0
1956	2.0	2.9	-1.3	0.1	16.6	0
1957	2.0	2.5	-4.3	4.4	8.7	0

¹ Source: U.S. Bureau of Economic Analysis, National Income and Product Accounts of the United States 1929-1997: Volume 2, Table 8.2, percent change from Preceding Period in Real Gross Domestic Product 1969-2003 Table 1.5.1; % Change in Net Exports estimated from 1998-2013 as Percentage Change in Real Exports minus percentage change in Real Imports.

Year	% Change in GDP Y_i	% Change in Consumption X_1	% Change in Investment X_2	% Change in Government Spending X_3	% Change in Net Exports X_4	Dummy Variable X_5
1958	-1.0	0.8	-8.4	3.2	-13.7	0
1959	7.2	5.6	20.5	5.6	0.9	0
1960	2.5	2.7	0.0	0.0	20.8	0
1961	2.3	2.0	-0.7	4.8	1.7	0
1962	6.0	4.9	12.7	6.0	5.4	0
1963	4.3	4.1	6.7	2.4	7.5	0
1964	5.8	6.0	8.3	2.0	13.3	1
1965	6.4	6.3	14.0	3.1	2.0	1
1966	6.6	5.7	8.8	9.0	6.7	1
1967	2.5	3.0	-4.6	7.5	2.2	1
1968	4.8	5.7	5.8	3.2	7.3	1
1969	3.1	3.7	5.6	0.2	5.4	1
1970	0.2	2.4	-6.1	-2.0	10.8	1
1971	3.3	3.8	10.3	-1.8	0.7	1
1972	5.2	6.1	11.3	-0.5	8.1	1
1973	5.6	5.0	10.9	-0.3	21.9	1
1974	-0.5	-0.8	-6.6	2.3	9.5	0
1975	-0.2	2.3	-16.2	2.2	0.7	0
1976	5.4	5.6	19.1	0.5	5.9	0
1977	4.6	4.2	14.3	1.2	2.5	0
1978	5.6	4.4	11.6	2.9	10.5	0
1979	3.2	2.4	3.5	1.9	9.6	0
1980	-0.2	-0.3	-10.1	1.9	10.7	0
1981	2.6	1.5	8.8	1.0	1.1	0
1982	-1.9	1.4	-13.0	1.8	-7.1	0
1983	4.6	5.7	9.3	3.8	-2.4	0
1984	7.3	5.3	27.3	3.6	8.4	0
1985	4.2	5.3	-0.1	6.8	2.7	0
1986	3.5	4.2	0.2	5.4	7.4	0
1987	3.5	3.4	2.8	3.0	11.2	0
1988	4.2	4.2	2.5	1.3	16.1	0
1989	3.7	2.9	4.0	2.9	11.8	0
1990	1.9	2.1	-2.6	3.2	8.7	0
1991	-0.1	0.2	-6.6	1.2	8.5	0
1992	3.6	3.7	7.3	0.5	6.2	0
1993	2.7	3.5	8.0	-0.8	3.3	0
1994	4.0	3.9	11.9	0.1	8.9	0
1995	2.7	3.0	3.2	0.5	10.3	0

Year	% Change in GDP Y_i	% Change in Consumption X_1	% Change in Investment X_2	% Change in Government Spending X_3	% Change in Net Exports X_4	Dummy Variable X_5
1996	3.8	3.5	8.8	1.0	8.2	0
1997	4.5	3.8	11.4	1.9	12.3	0
1998	4.4	5.3	9.5	2.1	-9.4	0
1999	4.8	5.5	8.4	3.4	-6.8	0
2000	4.1	5.1	6.5	1.9	-4.4	0
2001	1.0	2.5	-6.1	3.8	-2.8	0
2002	1.8	2.5	-0.6	4.4	-5.3	1
2003	2.8	3.1	4.1	2.2	-2.7	1
2004	3.8	3.8	8.8	1.6	-1.6	1
2005	3.4	3.5	6.4	0.6	-0.1	1
2006	2.7	3.0	2.1	1.5	2.8	1
2007	1.8	2.2	-3.1	1.6	6.6	1
2008	-0.3	-0.4	-9.4	2.8	8.3	1
2009	-2.8	-1.6	-21.6	3.2	4.6	1
2010	2.5	2.0	12.9	0.1	-1.3	1
2011	1.8	2.5	4.9	-3.2	2.2	1
2012	2.8	2.2	9.5	-1.0	1.3	0
2013	1.9	2.0	5.4	-2.2	1.3	0

Data for Equations 2 and 3

Year	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅
1966	50.16	51.3	38.19	5.7	79.2	58.96	8.8	60.3	9	6.7
1967	-13.8	22.5	6.6	3	-34.5	-10.12	-4.6	16.5	7.5	2.2
1968	33.06	18.24	41.61	5.7	18.56	42.34	5.8	23.36	3.2	7.3
1969	20.72	0.74	19.98	3.7	1.12	30.24	5.6	1.08	0.2	5.4
1970	-14.64	-4.8	25.92	2.4	12.2	-65.88	-6.1	-21.6	-2	10.8
1971	39.14	-6.84	2.66	3.8	-18.54	7.21	10.3	-1.26	-1.8	0.7
1972	68.93	-3.05	49.41	6.1	-5.65	91.53	11.3	-4.05	-0.5	8.1
1973	54.5	-1.5	109.5	5	-3.27	238.71	10.9	-6.57	-0.3	21.9
1974	5.28	-1.84	-7.6	0	-15.18	-62.7	0	21.85	0	0
1975	-37.26	5.06	1.61	0	-35.64	-11.34	0	1.54	0	0
1976	106.96	2.8	33.04	0	9.55	112.69	0	2.95	0	0
1977	60.06	5.04	10.5	0	17.16	35.75	0	3	0	0
1978	51.04	12.76	46.2	0	33.64	121.8	0	30.45	0	0
1979	8.4	4.56	23.04	0	6.65	33.6	0	18.24	0	0
1980	3.03	-0.57	-3.21	0	-19.19	-108.07	0	20.33	0	0
1981	13.2	1.5	1.65	0	8.8	9.68	0	1.1	0	0
1982	-18.2	2.52	-9.94	0	-23.4	92.3	0	-12.78	0	0
1983	53.01	21.66	-13.68	0	35.34	-22.32	0	-9.12	0	0
1984	144.69	19.08	44.52	0	98.28	229.32	0	30.24	0	0
1985	-0.53	36.04	14.31	0	-0.68	-0.27	0	18.36	0	0
1986	0.84	22.68	31.08	0	1.08	1.48	0	39.96	0	0
1987	9.52	10.2	38.08	0	8.4	31.36	0	33.6	0	0
1988	10.5	5.46	67.62	0	3.25	40.25	0	20.93	0	0
1989	11.6	8.41	34.22	0	11.6	47.2	0	34.22	0	0
1990	-5.46	6.72	18.27	0	-8.32	-22.62	0	27.84	0	0
1991	-1.32	0.24	1.7	0	-7.92	-56.1	0	10.2	0	0
1992	27.01	1.85	22.94	0	3.65	45.26	0	3.1	0	0
1993	28	-2.8	11.55	0	-6.4	26.4	0	-2.64	0	0
1994	46.41	0.39	34.71	0	1.19	105.91	0	0.89	0	0
1995	9.6	1.5	30.9	0	1.6	32.96	0	5.15	0	0
1996	30.8	3.5	28.7	0	8.8	72.16	0	8.2	0	0
1997	43.32	7.22	46.74	0	21.66	140.22	0	23.37	0	0
1998	50.35	11.13	-49.82	0	19.95	-89.3	0	-19.74	0	0
1999	46.2	18.7	-37.4	0	28.56	-57.12	0	-23.12	0	0
2000	33.15	9.69	-22.44	0	12.35	-28.6	0	-8.36	0	0
2001	-15.25	9.5	-7	0	-23.18	17.08	0	-10.64	0	0
2002	-1.5	11	-13.25	2.5	-2.64	3.18	-0.6	-23.32	4.4	-5.3
2003	12.71	6.82	-8.37	3.1	9.02	-11.07	4.1	-5.94	2.2	-2.7
2004	33.44	6.08	-6.08	3.8	14.08	-14.08	8.8	-2.56	1.6	-1.6
2005	22.4	2.1	-0.35	3.5	3.84	-0.64	6.4	-0.06	0.6	-0.1
2006	6.3	4.5	8.4	3	3.15	5.88	2.1	4.2	1.5	2.8
2007	-6.82	3.52	14.52	2.2	-4.96	-20.46	-3.1	10.56	1.6	6.6

Data for Equations 2 and 3 Continued

Year	X₆	X₇	X₈	X₉	X₁₀	X₁₁	X₁₂	X₁₃	X₁₄	X₁₅
2008	3.76	-1.12	-3.32	-0.4	-26.32	-78.02	-9.4	23.24	2.8	8.3
2009	34.56	-5.12	-7.36	-1.6	-69.12	-99.36	-21.6	14.72	3.2	4.6
2010	25.8	0.2	-2.6	2	1.29	-16.77	12.9	-0.13	0.1	-1.3
2011	12.25	-8	5.5	2.5	-15.68	10.78	4.9	-7.04	-3.2	2.2
2012	20.9	-2.2	2.86	0	-9.5	12.35	0	-1.3	0	0
2013	10.8	-4.4	2.6	0	-11.88	7.02	0	-2.86	0	0