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**EVENT STUDY OF RUSSIAN FOREIGN EXCHANGE
MARKET**

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Event Study of Russian Foreign Exchange Market

This paper will seek to identify events in Russian and world economic and political news that significantly affected the value of the Russian rouble. Most conventional events studies name the events in question first, and then test for significance. As in "Turning Points in the Civil War: Views from the Greenback Market" (Willard, Guinnane, and Rosen, 1996), this paper will let the data identify the events. Significant turning points can then be compared to a historical record (Russian and English newspapers) of national and world news, clarifying the role of particular dates in the rouble price. The period studied includes daily exchange rates from January 1992 through November 1999.

Relevance

Saying that an event is "important" might suggest one of two things: either the event is important to us as later observers, or the event was important to contemporary market agents at the time it became known. The two statements are not necessarily synonymous. Historians' hindsight might be 20-20, but market decisions are made without this omniscient view of the world. Not imposing a priori assumptions on which events permanently affect the rouble, but finding these turning points in the time series data itself, would seem to offer better proof of the given events' "importance."

How does the rouble react to news events? It is possible that it reacts very quickly, or the response might take several days. News might not reach all participants at the same time, or market agents might not be sure what to do after a given event. In defining "important," we will also have to decide what constitutes a permanent shift in the rouble price, and what is considered transitory. In other words, what is a "turning point, and what is just a "blip"? Conversely, not all price shifts will come from news events--liquidity trading and other noise in the markets will cause their own results in the foreign exchange market.

Answering these questions will be of both policy and historical importance. As the Russian Federation has shifted from a totally fixed exchange rate system to a floating rate system, and now back to a currency-band system, knowing the sensitivity of the rouble to economic, political, and legislative events seems quite relevant. Though government and central bank policy cannot control world news, a better understanding the long-term effects of such events on the foreign exchange market might assist policy-makers in their choice of responses.

Event Study Literature

The event study is "one of the most frequently used analytical tools in financial research".¹ The goal of event studies is to examine whether any abnormal or excess returns are earned by asset holders accompanying a specific event. Such "events" might include new laws, tax changes, merger announcements, stock splits, or political events among others. In most studies, an event is chosen first, and its impact on asset prices is then analyzed.

Thus much of the methodology involves defining the event period, and defining "abnormal" or "excess" returns. Such returns are usually defined as the actual observed returns minus those predicted in the estimated model. Other issues to consider will include how long the effects of an event will last (and thus the sample estimation period), and pinpointing the exact time of the event--the "focal date." For example, news can be announced one day, but reported the next. When the news actually reaches market participants is then in question.

Choosing Time Periods

Event studies will use two measures of return: normal or predicted returns versus abnormal or excess returns. Statistical analysis will compare the normal versus abnormal, and check for significant differences

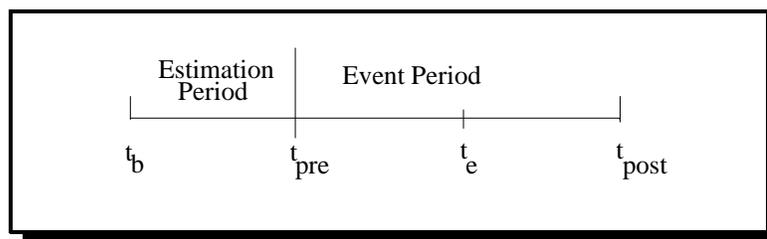
¹ Pamela P. Peterson, "Event Studies: A Review of Issues and Methodology"

associated with a given event. But before this is possible, the model builder must decide on estimation periods. For estimating "normal" returns, there are two choices: using a sample period sometime before the event, or employing a period that occurs after the event:

Period Before Event: Used if determinants of normal returns likely to change due to the event.

Period After Event: Used if the determinants are likely to change due to the event.

In the case of an estimation period prior to the event date, a time might look like the following:



where the following variables are represented:

- t_b **First** period used in estimation of **normal** returns
- t_{pre} **First** period used in estimation of **abnormal** returns
- t_e **Event** period
- t_{post} **Last** period used in estimation of **abnormal** returns

Examples with the estimation period set after the event include Eades, Hess, and Kim (1985). And some studies have tried a mix of pre- and post-event estimation periods: Dann and Mikkelson (1984) and Dodd and Leftwich (1980).

Estimation of Expected (Normal) Returns

Three techniques have developed to calculate normal returns--those expected had no event occurred.

1. Market Models
2. Mean Adjustment Models
3. Market Adjusted Models

A simple OLS market model version was introduced by Fama, Fisher, Jensen, and Roll (1969). Here the returns of security i were regressed on concurrent aggregate market returns. Examples include DeAngelo, DeAngelo, and Rice (1984); Dodd (1980); Mikkelson and Partch (1986); and Smith (1977). The potential for statistical bias in such estimators is discussed in Cohen, Hawanini, Maier, Schwartz, and Whitcomb (1983); Dimson (1979); and Scholes and Williams (1977). Such bias might come from non-synchronous trading--where security i and the rest of the market differ in terms of trading delays or in trading frequency. Scholes and Williams (1977) offered one method for dealing with infrequently traded assets. Examples of their method are shown in Moore, Peterson, and Peterson (1986); and Rendleman, Jones, and Latane (1982). Similarly, Dimson (1979) introduced a process to avoid bias in the estimation of parameters with

daily returns and infrequent trading. This method used multiple regressions on lagged, current, and lead variables, with the final slopes taken as averages of those estimated. Examples are shown in Bhagat (1983); and Basu (1983). Criticism of Dimson's method is shown in Cohen, Hawanini, Maier, Schwartz, and Whitcomb (1983).

Mean Adjusted Return Models assume expected returns on security i is a constant, R_i :

$$R_i = \frac{1}{T} \sum_{j=1}^T R_{ij}$$

The normal return is simply the mean over T periods. A simple example is introduced in Kalay and Loewenstien (1985). Asquith (1983), Asquith and Mullins (1986), and Bradley (1980) use mean adjusted models, grouping like assets into several portfolios. The mean return for its assigned portfolio is used as an asset's normal returns.

The final method for estimating expected returns is the market adjusted method. This method assumes that the best predictor of returns for a given security is simply the current market return. An example in the literature is Dennis and McConnell (1986).

Estimation of Excess Returns

Event studies compare differences between normal (expected) and actual returns. The difference is labeled the prediction error, or "abnormal returns." Such abnormal returns can be defined as:

$$AR_i = R_{it} - R_{it}^*$$

where AR_i is abnormal returns, R_{it} is actual returns, and R_{it}^* is expected returns. The expected returns can come from one of the methods discussed earlier (where R_{mt} is the market return):

- | | |
|---------------------|--|
| a. OLS | $R_{it}^* = \alpha_i + \beta_i R_{mt}$ |
| b. Scholes-Williams | $R_{it}^* = \alpha_{iSW} + \beta_{iSW} R_{mt}$ |
| c. Dimson | $R_{it}^* = \alpha_{iD} + \beta_{iD} R_{mt}$ |
| d. Mean Adjusted | $R_{it}^* = R_i$ |
| e. Market Adjusted | $R_{it}^* = R_{mt}$ |

Standardized abnormal returns then reflect statistical error in the determination of expected returns. The model builder will ask whether the abnormal returns are due to the event, or simply statistical error in estimation. There are three major methods to standardize abnormal returns. They use:

1. Standard error or error of forecast of an asset's mean return in estimation period
2. Standard error of the security return deviation from the predicted in the estimation period for all securities in the sample, for all periods in estimation period.

3. Sample cross-sectional standard error for period t in the event period.

Discussion of the choice in methodology is listed in Peterson (1989). Examples of items #1 and #2 are used in Dodd and Warner (1980); Hite and Owers (1983); Linn and McConnell (1983); Mikkelson and Partch (1985); Moore, Peterson, and Peterson (1986). The last method is shown in Masulis (1980); Dann and Mikkelson (1984).

Other Issues in Event Studies

Several additional issues in event study modelling have arisen in the literature. Under each subject are listed a number of related papers:

1. **Aggregation of a Group of Securities**

Brown and Warner (1980, 1985)
 Lewellen, Loderer, and Rosenfeld (1985)
 Mikkelson and Partch (1986)
 Mikkelson and Ruback (1985)
 Bradley, Desai, and Kim (1983)
 Dennis and McConnell (1986)
 Hess and Bhagat (1986)
 Ruback (1982)
 Asquith, Bruner, and Mullins (1983)
 DeAngelo and Rice (1983)

2. **Explaining Abnormal Returns with Asset-Specific Variables**

Asquith, Bruner, and Mullins (1983)
 Asquith and Mullins (1983)
 Eckbo (1986)
 Grinblatt, Masulis, and Titman (1984)
 Lewellen, Loderer, and Rosenfeld (1985)
 Hess and Bhagat (1986)

3. **Two-Day Events**

Sometimes, events can't be pinpointed to a single "focal date," as discussed in Masulis (1980), and Dann (1981). A couple of methods have evolved to handle events that stretch over multiple periods:

- A. **Re-estimate normal returns using 2-day returns**

Dann and Mikkelson (1984)
 Brown and Warner (1985)
 DeAngelo and Rice (1983)

- B. **Average Day-1 and Day-2 Returns**

Asquith and Mullins (1983)
 Dennis and McConnell (1986)
 Brown and Warner (1985)

4. **Choice of Market Index in Market models**

Brown and Warner (1980)

5. **Non-constant Variance: Increasing around Event Day**

Patell and Wolfson (1984)
 Kalay and Lowenstien (1985)
 Brown and Warner (1985)

6. **Missing Returns, Missing Observations**

Eades, Hess and Kim (1985)
 De Angelo and Rice (1983)
 Brown and Warner (1985)

7. **Event Clustering: Several Events in a Row**

Brown and Warner (1980)

General Recommendations

Peterson (1989) and Brown and Warner (1980 and 1985) offer a few general recommendations in event studies for both daily and monthly returns:

1. If event clustering is not present, the alternative estimators of normal returns differ little in their ability to detect abnormal returns.
2. Tests with daily returns are more powerful than those with monthly returns.
3. Non-Normality of asset returns doesn't impact test statistic properties.
4. Scholes-Williams and Dimson procedures reduce estimator bias, but are not always superior to OLS.
5. The greater precision in determining the "focal date," the more powerful the testing.
6. Time series procedures are better than cross-sectional if there is no variance increase around the event, and if the increase is dissimilar across securities.

Event Studies and Foreign Exchange Markets

Brown and Warner's (1980, 1985) studies outline event study methodology applied to common stock data. Other researchers have then argued that the same models can be used to look at returns on other markets: preferred stocks, bonds, options, commodities and other assets. Kwok and Brooks (1990) apply event study methodology to currency markets. Using various experimental conditions--choice of currency, sample size, length of estimation period, market return proxy, and the level of abnormal shock--to show that many, though not all of Brown and Warner's findings apply to the foreign exchange market.

Some papers have used a multiple regression technique to analyze the affects of public announcements on currency rates. Examples included Frenkel (1981), Ito and Roley (1987), and Hardouvelis (1988). But others did the same analysis using regular event study analysis--Cosset and Doutriaux de la Rainderie (1985) and also Sheffrin and Russel (1984).

Sheffrin and Russel (1984) looked at the impact of oil discoveries in the North Sea on the British Pound. They found no proof of the popular argument that the new oil caused a pound appreciation. Cosset and Doutriaux de la Rainderie (1985) examined the business environment's influence on exchange rates. They found that news warning of political instability causes exchange rates to vary. Kwok and Brooks (1990) suggest other uses for the event study and exchange markets: announcement effects of money supply, trade account balances, current account balances or other BOP measures.

The definition of returns in currencies can be taken as the nominal return on speculation in the money market or foreign exchange market when interest-rate parity prevails (Kwok and Brooks (1990)):

$$R_{jt} = \frac{S_{j,t} - S_{j,t-1}}{S_{j,t-1}} - (r_{n,t-1} - r_{j,t-1})$$

where the following variables are represented:

R_{jt}	= Return on Currency
$S_{j,t}$	= Spot Rate Between Currencies at time t
$r_{j,t}$	= Interest Rate in Currency j, at time t
$r_{n,t}$	= Interest Rate in Currency n, at time t

With this definition of returns, the same comparison of normal and abnormal returns can be used--along with the previously explained procedures used to calculate normal returns (Peterson (1989).)

Intervention Models

Intervention time series models were initially developed by Box and Tiao (1975), Campbell (1963), and Campbell and Stanley (1966). Before the term "intervention" became accepted, such models were often called "longitudinal analysis" or "event studies." Delurgio (1997) lists several examples of events that have been fit to intervention models:

<u>Events</u>	<u>Affected Variables</u>
October 1987 Stock Market Crash	Wealth, Income, Investment
1991 Gulf War	Defense contracts, petroleum, civil engineering
End of 55 MPH Speed Limit	Traffic Deaths, Gasoline, traffic tickets
European Union Creation	Global Competition, Free Trade
Fall of Soviet Union	Political Stability, Free Enterprise
NAFTA	Hourly Jobs, Lifestyles, Global competition
Hurricane Andrew, 1992	Insurance Claims, Profits, Construction
1993 Midwestern Flood	Construction, Insurance Costs, Bottled Water

In each of these examples, a time series is interrupted by an exogenous event. The effects of this event can be captured with a dichotomous (dummy) variable. The goal might be to measure the effect of the event itself, or to remove the effects of the event in order to better understand the underlying time series and its determinants. Common events include new laws, economic events, advertisements, earthquakes, wars, natural disasters, political events, and cultural events. Individual firms can use intervention models to examine the effects of product promotions, stockouts, new product introductions, management changes, competitor activities.

A typical intervention model consists of two parts: an intervention function and an ARIMA noise model. The intervention function is a function of a dummy variable to capture the effects of the event, and the ARIMA model is a time series process fit to the underlying time series:

Intervention Model = Intervention Function + ARIMA noise model

$$Y_t = f(I_t) + N_t$$

where the intervention function is $f(I_t)$ and

$$\begin{aligned} N_t &= \text{ARIMA}(p,d,q) \\ I_t &= 1 \text{ when event occurs, and } 0 \text{ otherwise} \end{aligned}$$

I_t can be specified in various ways. Most commonly, it is defined as 1 during the event period and 0 otherwise. The duration of an event can vary, so the value of the dichotomous variable will vary as well. Three common functions are the Pulse Function, the Sustained Pulse Function, and the Step Function:

<u>t</u>	=	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Pulse	=	0	0	0	1	0	0	0	0
Sustained Pulse	=	0	0	0	1	1	0	0	0
Step	=	0	0	0	1	1	1	1	1

The pulse function represents an event that lasts for one period. A sustained pulse lasts for more than one period, but is still temporary. Step functions are a permanent shift due to a given event.

The structure of intervention functions can be modified to include 1st and 2nd order polynomials, but the concept remains the same--structuring a dichotomous variable and its significance in explaining the changes in a given time series.

Recent literature focusses on the presence of a unit root in a time series. Given the presence of a unit root, ARIMA analysis suggests modelling the first differences of a time series. Intervention analysis can still be applied, but the structure of the desired dichotomous variables must be modified. To illustrate this point, we can look at two examples: a temporary intervention in a non-stationary time series, and then a permanent intervention in a non-stationary time series.

1. Permanent Intervention in Non-Stationary Series

<u>t</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Y_t	50	55	60	65	70	50	55	60	65	70
$d(Y_t)$		5	5	5	5	-20	5	5	5	5
$d(Y_t)-$		0	0	0	0	-25	0	0	0	0
I_t (Step)	0	0	0	0	0	1	1	1	1	1
$d(I_t)$		0	0	0	0	1	0	0	0	0

If Y_t is modeled in levels, the proper dummy variable would be I_t . But if Y_t is to be modeled in first differences, the dichotomous dummy variable should also be differenced--shown as $d(I_t)$ above. After removing the trend or drift term, the coefficient on the new dummy variable would be -25. The step intervention function looks like a pulse function. Delurgio (1997) argues that most errors in intervention function modeling comes from failure to modify the dummy variable after taking differences of the original time series.

1. Temporary Intervention in Non-Stationary Series

<u>t</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Y _t	50	55	60	65	70	50	80	85	90	100
d(Y _t)		5	5	5	5	-20	30	5	5	5
d(Y _t)-		0	0	0	0	-25	25	0	0	0
I _t (Pulse)	0	0	0	0	0	1	0	0	0	0
d(I _t)		0	0	0	0	1	-1	0	0	0

In first differences, the pulse intervention assumes 1 in the event period, -1 in the following period, and 0 otherwise. Again, after removing the trend term, it is clear that the coefficient for the new dummy variable would be -25. This process describes a temporary intervention in as much as after period 7, the original series assumes the same values it would had the “event” not occurred at all.

Another method is available to detect significant events. Instead of assuming event dates a priori, the model will “choose” the dates itself. A procedure introduced by Perron (1989) uses a series of rolling regressions and rolling dummy variables to look for shifts in ARIMA processes generating a currency price. With a modification by Banerjee et al. (1992) to choose the best estimation periods around perspective significant dates, the process used to examine the rouble was first applied to the American Greenback of the Civil War. Willard, Guinnane, and Rosen (1996) identify several important dates in the Civil War--ones that had a lasting impact on the dollar price of the Greenback. This newer approach will be the one used on the Russian rouble in this paper, and will be more thoroughly explained below.

Econometric Modelling

The idea is to identify structural shifts in the rouble time series process. The process chosen might assumed to be autoregressive or moving average (ARMA). Pierre Perron (1989) suggested the following model to look at turning points:

$$\ln R_t = \beta_0 + \beta_i \ln R_{t-i} + \sum_s D_{st} + \epsilon_t$$

where the notation used designates the following variables:

s = Date of an event

D_{st} = Dummy Variable

D_{st} = 0

For any period before date of event

D_{st} = 1

For any period on or after date of event

s = Mean Change

(Price shift associated with event)

In Perron’s (1989) model, finding the day of a significant event meant finding s. The above equation is estimated over and over again, running the value of s from the first day to the last day in the chosen data

set.² On every regression a simple F-test can check the significance of β_s . The series of successive F statistics can be graphed, with the highest F value corresponding to the equation that best identifies the event date, s .

Something to consider is the choice of time periods. A problem with finding break points with this method is the possibility of two or more events occurring within a short time period. Choosing the length of the sample should avoid two obstacles:

1. **Chosen Sample Too Long: False Negative**

Testing a very long sample might include two opposing events. They might cancel each other out in significance tests, missing important events altogether.

2. **Chosen Sample Too Short: False Positive**

Testing very short samples might be misleading. Shifts that appear significant in the short run, might be mere blips in a longer run. Such blips could be liquidity trading or other market noise.

The right size sample must be taken--a balance is needed. It would be possible to choose fixed time frames that are shorter than the full sample, and then do a similar analysis on each of them. Further, it would be useful to look at the sensitivity of the results to changes in the length of these time frames.

So the idea is not to examine the full sample, but successive subsections of it. Then with diagnostic testing, we can determine which subsections are the best to use. Then with these smaller samples, the Perron (1989) method can be applied.

The Chosen Models

Two base models will be estimated for the seven year period. Each will look at the first differences of the exchange rate data, but will apply different dummy variable structures in order to capture "significant" dates. The two variants are:

$$\text{Model A:} \quad d(\ln EX_t) = \alpha + \beta_i d(\ln EX_{t-i}) + \beta_s d(D_{st}) + \epsilon_t$$

$$\text{Model B:} \quad d(\ln EX_t) = \alpha + \beta_i d(\ln EX_{t-i}) + \beta_s D_{st} + \epsilon_t$$

where the dummy variables take on the following forms:

$$D_{st} = 1 \text{ if } t = s \text{ and } 0 \text{ otherwise} \quad (\text{Equals 1 on the day of the event})$$

$$\begin{aligned} d(D_{st}) &= 1 \text{ if } t = s && (\text{Equals 1 the day of the event}) \\ &= -1 \text{ if } t = s + 1 && (\text{Equals -1 the day after the event}) \\ &= 0 \text{ otherwise} \end{aligned}$$

² Depending on the size of the sample available, room should be left both before and after the day of the event. Estimating the equation with s at either end of the sample would not allow for significance tests.

Model A is Perron's (1989) "Crash Model," but expressed in first differences. Perron's level form model would appear as the following:

$$\ln EX_t = \alpha + \beta_i \ln EX_{t-i} + \gamma_s D_{st} + \epsilon_t$$

where the dummy would represent a **one time** "crash" shock to the level of the exchange rate. Because of the lagged dependent variable structure, this "crash" will still be felt many periods after the event period. Assuming the exchange rate is non-stationary, the first differenced expression would yield Model A.

Model B is from Perron's (1989) "changing growth model", but again expressed in first differenced form. Perron's original model would appear as:

$$\ln EX_t = \alpha + \beta_i \ln EX_{t-i} + \gamma_s DU_{st} + \epsilon_t$$

where DU_{st} is a standard dichotomous dummy variable, taking a value 0 before the event period, and the value 1 after. In first differenced form, this dummy becomes the D_{st} of Model B. As opposed to a one-time shock, this model thus allows for a permanent shift in the level form drift term.

Banerjee et al. (1992) suggest a simple modification to Perron's (1989) method. Because the date of significant events are not known a priori, the dating of the dummy variables is uncertain. Essentially, Banerjee's procedure locates the most likely turning points, and Perron's models then test the significance of the top candidates. Using an algorithm of regressions, the model will search for significant turning points in the price of the rouble--caused by political events, economic news, or some other shift. With s representing the date of the event, the final regressions use a dummy variable D to test the significance of each such date. The dummy variable coefficient captures the mean shift in the log of the rouble price. Rolling regressions will find a unique s for every possible date. Dates with the most significant s will be called significant events in Russia. The new method can be broken down into 3 stages. The three stages will be repeated separately for models A, B, and C:

Stage One: Repeated Regressions

Make a 100-day frame, extending from day 1 to day 100 in the sample. An AR process should be estimated, omitting the earlier dummy variables:

$$d(\ln EX_t) = \alpha + \beta_i d(\ln EX_{t-i}) + \epsilon_t$$

An F-Test should be made, with the null hypothesis of no omitted variables. The F statistic should be saved, and stage one should be repeated for the next frame--day 2 until day 101. This process is continued until the entire sample is covered.

Stage Two: Selection of Best Windows

We are now searching for possible break points in the process. Stage one should produce a running series of F statistics, one for every 100-day window examined. We should search for peaks in the F statistic plot--signifying windows where the null hypothesis of no breaks is most strongly rejected. The windows that produced any peak in the F statistics should be set aside for stage three.

Stage Three: Identify Event Dates in Each Window

Each selected window³ should then be used as a separate sample to the Perron (1989) method. Using one of the models (A or B) will apply rolling regressions to the data.

$$\begin{aligned} \text{Model A:} \quad & \mathbf{d}(\ln EX_t) = \alpha + \beta_i \mathbf{d}(\ln EX_{t-i}) + \sum_s \mathbf{d}(D_{st}) + \epsilon_t \\ \text{Model B:} \quad & \mathbf{d}(\ln EX_t) = \alpha + \beta_i \mathbf{d}(\ln EX_{t-i}) + \sum_s D_{st} + \epsilon_t \end{aligned}$$

For whichever model is being applied, the dummy variable structure depends on s , the date of the event. Running s from the start of the window to end, the above equation will be estimated 100 times for every window chosen in Step Two. Each regression will produce an F statistic on the significance of \sum_s and/or \sum_s . The regression with the highest F statistic will identify the day of a significant event.

Stage 3 is repeated for every window chosen in stage two. And all three steps are repeated for each of the models. Additionally, the window size can be changed from 100 to check for robustness of the final list of significant dates chosen. The whole procedure is repeated for window sizes of 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, and 180.

The advantages of this procedure are in narrowing the search. The algorithms answer the following questions:

1. What is the definition of a "significant" event?
2. How long must a shift last to be called a significant event?
3. Will this capture two events that occur close to each other?
4. Can two events cancel each other out?
5. What will be type one and type two errors?

There might be surprises: both unexpected significant dates, as well as the rejection of dates that might have been commonly thought to be turning points.

One additional note is on the lag length chosen. The liberal procedure proposed by Perron (1989) is applied here as well. The original Perron (1989) model with no dummy variables,

$$\mathbf{d}(\ln EX_t) = \alpha + \beta_i \mathbf{d}(\ln EX_{t-i}) + \epsilon_t$$

was estimated with successively longer and longer lag lengths. The final lag length k was chosen as k^* when the following criteria were satisfied: the t statistic on β_k is greater than 1.60 while the t statistics on for all $k > k^*$ were below 1.60. Willard, Giunne, and Rosen (1996) found a lag length of 12 trading days for data on the American Greenback during the Civil War. The same procedure here resulted in a lag length of 18 trading days. These results are shown in table 1.

Table 1: Choosing Lag Length for Event Study

³ To allow for breaks on the borders of each window, 25 days should be added before and after each selected window. This will make windows of 150 days. The day of possible events, "s," should be run across

Lag Length k	t-statistic t(k)
1	7.150
2	1.571
3	-1.918
4	-0.532
5	4.718
6	-1.169
7	5.121
8	0.139
9	1.453
10	1.668
11	0.050
12	-0.372
13	1.389
14	0.389
15	-6.583
16	5.135
17	-2.779
18	2.008
19	0.438
20	-0.027

Empirical Results

The first stage involves rolling regressions with no dummy variables included. Starting with a 100-trading day window, the rolling regressions estimate the autoregressive model for every possible 100-consecutive-day sample within the 1330-trading day total data set. The Banerjee et al. (1992) procedure collects an Sum of squared errors (SSE) statistic for every regression. The result is a running time series of SSE statistics, one for the starting day of each 100-day sample. The same procedure was repeated 14 times with varying window sizes. The results were similar for each.

The windows are ranked by the lowest SSE--signifying those windows where an ARIMA process without

an intervention function most poorly fits the data. In other words--those windows in which some significant event would seem most likely. The exact date of the event is not yet determined--only that it is likely somewhere in the chosen windows.

The second stage of the procedure uses rolling regressions for every chosen window--estimating the ARIMA process with a dummy variable. For each successive regression, the date of a possible event is moved forward by one day, and a t-statistic is saved for the coefficient. This was done with the two separate dummy variable structures: models A and B. As the procedure suggests, those dates which correspond to dummy variables with the highest t-statistics are most likely to represent interventions--significant events in the Russian FX time series.

Using the 100-day window suggested by Willard, Guinnane, and Rosen (1996), the three models produce the following "event days"--shown in tables 2 and 3.

Table 2: Model A: $d(\ln EX_t) = \alpha + \beta_i d(\ln EX_{t-i}) + \gamma_s d(D_{st}) + \epsilon_t$

	<u>Day</u>	<u>Dummy</u>	<u>T-Stat</u>
December 18, 1992	88	-1.27123	-13.1802
September 23, 1993	211	0.154504	11.72441
October 11, 1994	472	0.274766	14.89786
June 14, 1995	638	-0.01258	-3.62446
January 4, 1996	780	0.003861	3.570856
May 17, 1996	871	0.004572	3.851031
January 8, 1997	1029	0.007007	13.29063
June 3, 1997	1129	0.003246	2.802875
October 28, 1997	1233	0.008621	5.778497
July 30, 1998	1417	-0.07387	-1.58534
September 3, 1998	1436	0.511989	11.13659
May 13, 1999	1602	0.029193	5.557411

Table 3: Model B: $d(\ln EX_t) = \alpha + \beta_i d(\ln EX_{t-i}) + \gamma_s D_{st} + \epsilon_t$

	<u>Day</u>	<u>Dummy</u>	<u>T-Stat</u>
December 18, 1992	88	-1.14923	-16.771
September 23, 1993	211	0.117956	13.32329
October 11, 1994	472	0.208515	14.61531
July 31, 1995	671	0.011459	4.246363
September 7, 1995	699	0.003042	4.069749
May 17, 1996	871	0.004032	4.805642
January 8, 1997	1029	0.005185	10.61932
June 3, 1997	1129	0.001739	2.076915
October 28, 1997	1233	0.007295	6.819062

June 17, 1998	1386	-0.0356	-1.08061
September 3, 1998	1436	0.303877	7.247904
August 9, 1999	1663	0.024863	6.977384

The chosen models were based on a 100-day window size. Willard et al (1996) argue that using too small a window will result in hunting for "blips" in the markets, while with very long windows, the danger is having more than one significant event fall inside a given window, possible events that cancel each other out and are thus undetected. So Willard suggests a 100-day window. Nonetheless, the same procedure was repeated for 15 different window sizes, from 40 days to 180 days. The results are similar, and shown in the attached appendix to this event study.

Historical Perspective

Given a set of "significant" event dates, the last step would be to look back and try to explain what happened on each of these dates. This can be done using historical records--newspapers, websites, Russian statistical handbooks, and personal interviews. The explanations might hold surprises--both for the dates that are significant, and for dates that didn't make the list despite possible expectations that they would. Below are some dates chosen by the model and possible explanations for the shift in the rouble price on these days.

A. December 18, 1992: New Prime Minister and Restructuring of Western Debt

A number of events in December led to a modest appreciation of the rouble. On December 9, Acting Prime Minister Egor Gaidar failed by a very narrow margin to obtain confirmation from the Congress of People's Deputies for his nomination by President Yeltsin to become prime minister. In a secret ballot, 467 deputies voted for him, 486 against. Hardliners scored another victory over President Yeltsin by approving overwhelmingly a constitutional amendment which would automatically strip the President of his powers if he orders a dissolution of the Congress or the Supreme Soviet.

By December 14, President Yeltsin named Viktor Chernomyrdin as his final choice for the post of Russian prime minister. Chernomyrdin, who won 621 votes during the preliminary vote earlier that day, came in second after Yurii Skokov, the head of the Russian Security Council. The final round of elections for Chernomyrdin followed: 721 deputies voted in his favor; 128 against. In his address to the Congress, Chernomyrdin said that he supported the reform policy but without "a profound pauperization of the people." The 54 year old Chernomyrdin worked in oil industry. He served as the minister of the oil and gas industry in the Gorbachev government. He was appointed deputy prime minister after the sixth session of the Congress, held in April 1992; at that time he recommended to Yeltsin that he "strengthen" the Gaidar government of "theorists" with experienced economic managers.

On December 18, the Russian press reported progress in the negotiations between Russia and her creditors. Representatives of the G-7 offered Russia a package rescheduling the \$15-billion of overdue payments on its sovereign debt to Western creditors and requiring Russia to pay only \$2.75 billion next year. However, the total owed western creditors when Russian commercial debt is added amounted to over \$5 billion. Russian Minister of Foreign Economic Relations Pyotr Aven, among others, claimed that Russia's maximum capacity to service debt to the West will be \$3-billion next year.

B. September 23, 1993: Battle at the White House

A sharp depreciation of the rouble is detected during the days of political crisis between the president and the Duma. This crisis culminated with the October 4 television pictures broadcast around the world of Russian tanks shelling the white Russian parliament building, blackening the top floors with fire and smoke.

The "October Events" as they came to be known had been brewing for months under the political and economic pains of market reforms in Russia. Starting back on January 2, 1992, Russians woke up to liberalized prices. Almost overnight, the cost of food rose by 500%. Russian reformers assured the public that this was the way to stimulate production and promote capitalism in the newly freed Russia. Under monetarist Prime Minister Yegor Gaidar, inflation was kept within limits--initially. This was done by the unpopular policy of controlling state spending. But soon this policy fell, and the central bank began printing huge sums of roubles to pay government bills. Inflation increased enormously.

By the end of 1992, Gaidar's economic policies were under tremendous political attack, and the Russian parliament demanded Gaidar's dismissal and a change in the government's economic policies. Yeltsin fired Gaidar and replaced him with technocrat Viktor Chernomyrdin. 1993 was dominated by a "War of Laws" between the government and the parliament, each pushing its own budgets and economic policies. The parliament was captivated by its Speaker, Ruslan Khasbulatov. Joining in the attack on Yeltsin and the government was Vice President Alexander Rutskoi.

In March 1993, the parliament failed to hold a promised referendum on a new constitution, so Yeltsin came on national television, claiming a special rule that allowed him to suspend the power of the parliament and call for new elections. A nationwide vote of confidence in the President was conducted, a new draft of the constitution was passed, and new electoral laws were enacted. But there was a stalemate over the early parliamentary elections. The parliament even tried impeachment of the president, but was unsuccessful.

The stalemate over early elections lasted months, until September 21, 1993. With a decree of questionable constitutional legality, Yeltsin announced that the parliament was dissolved. In defiant response about 200 members of parliament occupied the White House building, voted to strip Yeltsin of all powers, and declared Rutskoi president. Tanks surrounded the White House while a standoff stretched into two weeks. Rutskoi pleaded with the army to switch sides in the conflict, but was unsuccessful. A separate battle for control of the state television center took place on the north side of Moscow.

The military assault on the White House began at 7 AM on October 4. Yeltsin ordered the tanks to open fire and expel the defiant opposition from the White House building. With Moscow spectators perched at all vantage points, the shelling continued for 10 hours until the White House occupants were under arrest. Many civilians were killed in the crossfire, and in related shootings around the city.

The market response to this political crisis was clearly negative. The newly liberalized exchange rate fell dramatically, and the rate of depreciation increased sharply after this date.

C. October 11, 1994 "Black Tuesday"

Strong depreciation. Moscow's first fully-fledged currency crisis left Russia's leaders hunting frantically for scapegoats. The huge drop in the exchange rate produced the first political crisis triggered purely by financial markets.

The rouble lost 21.5% in one trading session--from 3,081 per dollar to 3,926, and though it clawed its way back from the dead by the end of the week, the turmoil in Russia caused intense political embarrassment to the government and undermined confidence in Boris Yeltsin and his economic reform program. To restore confidence, interest rates were sharply increased and though after some delay, the Central Bank intervened heavily at MICEX (Moscow Interbank Currency Exchange).

The political response was even more pronounced. Acting finance minister Sergei Dubinin was fired by Kremlin decree even as he stood at the podium addressing the State Duma. President Yeltsin then called on the Duma to remove Central Bank Governor Victor Gerashchenko (the constitution does not give the president the power). In a country where as recently as three years ago holding dollars could land local citizens in jail for "speculation," old suspicions about the "dark forces" of free market economics lurked just beneath the surface. Yeltsin himself made it clear that he regarded the rouble's near collapse as a deliberate act of sabotage aimed at undermining him. He named a security chief from his top counter-espionage unit, rather than a banker or an economist, to find out who was to blame for "Black Tuesday." He was quoted as saying the investigation would look into whether the rouble collapse was the result of "sabotage" or irresponsibility.

Government intervention last week was expensive. Former CBR chief Gerashchenko said the CBR has spent \$600 million so far in October to support the ailing rouble on foreign exchange markets after more than \$3 billion in August-September. Senior economists warn that the bank's foreign exchange reserves have been running at critically-low levels of \$1.5 billion and say the crisis is far from over.

D. June 14, 1995: Strong Rouble, Several Possible Reasons

Unlike most shocks to the rouble price, the summer of 1995 saw an unusually stability in the rouble/dollar exchange rate--even some appreciation. According to one St. Petersburg newspaper the next day, "The ruble leapt a stunning 70 points against the dollar Wednesday, with interpretations of the currency's continuing growth ranging from confirmation of the government's tight fiscal policy to a harbinger of a ruble crash to come that would rival Black Tuesday of October 1994."

Possible explanations for this temporary rouble strength can be found in various Russian periodicals of the day:

1. London Club Agreement

One June 13, Deputy Prime Minister Oleg Davydov announced that Russia had agreed to pay the London Club of commercial creditors \$1 billion by the end of the year to cover defaulted interest payments. This was a reassurance to foreign investors on the risks of lending to Russia. Such reassurance would seem to support the value of the rouble.

2. Confirmation Vote of Central Bank Chairwoman, Tatyana Paramonova

Some sources claimed the central bank was supporting the rouble in anticipation of the lower house of parliament confirmation vote of acting central

bank chairwoman Tatyana Paramonova. With her refusal to print new money or hand out subsidies, Paramonova had been criticized by the Duma for her policy of keeping the central bank independent from the Ministry of Finance and state Duma.

3. Prohibition of Direct Central Bank Credits to Government

On April 1 the government proposed, and April 26 the Duma passed legislation which prohibited the central bank from directly financing the government deficit by money creation. It was relatively weak legislation because it did not prohibit indirect financing via the purchase of government securities, but at least one U.S. Treasury study says this legislation caused a surge in money demand--rouble demand--and a drop in inflation. This drop in inflation expectations might also be responsible for the strength of the rouble in the summer of 1995.

4. Chabais Comment to "Drive the Dollar From Russian Markets"

Deputy Prime Minister and leading reformer Anatoliy Chubais was compared to a World War Two general after his announcement that he intends to stop the "dollarization" of the Russian economy and push the foreign currency out of the markets. Such a comment would seem significant to foreign investors who regarded Chubais as the czar of privatization and a leading force behind the transition of the Russian economy from a centrally planned one to a free market one.

The exact timing of the sudden appreciation is difficult to explain, but might just be the result of several factors working over the previous weeks and months, all under the watchful eye of currency traders. A useful article comes from a Moscow newspaper of the day, citing possible reasons why the rouble was yet undervalued, and thus ready for a market correction--an appreciation.

The article was written by Andrei Illarionov, the Director of the Institute of Economic Analysis and an advisor to the Ministry of Finance. Illarionov cited the Central Bank's policy of accumulating hard-currency reserves. In order to increase its reserves between November 1994 and April 1995, the Central Bank conducted massive ruble interventions which reduced the exchange rate. Illarionov also cited the growing trade surplus as sign that the rouble was undervalued.

E. July 31, 1995: Interbank Crisis

There was no serious crash in the rouble price, but the rate of depreciation appears to have increased, starting on this date. In the news at the time was the developing story of what has come to be called "The Interbank Crisis of 1995." At the time newspapers reported that at least 10 banks were unable to make payments as a major liquidity crisis hit Moscow's money markets. This seemed to overshadow a government announcement that it will extend the wide 600-point rouble corridor until the end of the year.

The banks' failure to make payments sparked a crisis of confidence that brought interbank currency trading and lending to a standstill. Anna Sidelnikova, a currency dealer with MOST-Bank told a Moscow newspaper that "the banks are afraid of each other. Nobody is sure if they can get payments from other banks." Interest rates on overnight loans rocketed to as high as 1,000 percent that Thursday, up from around 60

percent Monday.

As an alternative to the money markets, banks turned to the market in state treasury bills, prices of which plummeted on the secondary market by several thousand roubles as banks offloaded T-bills to raise cash. Liquidity difficulties were so serious that the Central Bank stepped in with heavy open market operations, supplying extra rubles to commercial banks through a hefty purchase of T-bills.

This liquidity crisis would most probably be explained by the gradual introduction of a tight monetary program to fight inflation. After years of measuring inflation by the week, and periods of near 3,000% annual inflation, the central bank, the government and the IMF had begun work on cutting the budget deficit, decreasing the growth of the monetary base, in bringing down the rate of inflation. This new monetary policy would tighten the supply of credits available to commercial banks, and thus contribute to such a liquidity problem.

F. September 7, 1995: Yeltsin Wants to Loosen Monetary Policy

A lasting depreciation of the ruble came after President Yeltsin signed a decree on September 7, ordering the Central Bank to allot 2 trillion rubles (\$450 million) to clear pension arrears. At a press conference the next day, Yeltsin said the economy was showing signs of stabilization and, while strict financial policies should continue, the reins must be loosened to pay pensions and salaries. At the conference, Yeltsin blamed the government for delays in paying pensions and salaries and claimed that there were resources available to remedy the problem.

This development followed the September 1 announcement of the “loan-equity swap” plan, authorizing banks and private investors to manage state shares in certain enterprises in exchange for major loans, Russian and Western agencies reported the same day. The measure allowed the state to retain ownership of the shares, but they would be transferred to the banks and investors if the state were to default on the loans. The decree said the rights to manage the shares would be allocated by tender, open to the banks and Russian and foreign investors. The amount of the loans and the conditions and guarantees attached to them were to be determined by the successful bidders.

G. January 4, 1996: Communists win Parliament; Chubais Resignation

Depreciation. After more than four years of market reforms, the communist party in Russia made a comeback by winning a majority of seats in the Russian Duma. The market response to the resulting political reshuffling was another depreciation of the ruble. The future of the reform program was under some doubt. The stock market remained steady, but the currency markets appeared to react negatively.

The environment surrounding the change in government was reason for uncertainty. Russian government officials added to the uncertainty by suggesting that the wide ruble corridor within which the Central Bank had defended its currency against the dollar for six months would no longer be necessary after June 1996. Presidential adviser Alexander Livshits and Sergei Aleksashenko, newly appointed first deputy chairman of the Central Bank, told reporters separately Tuesday and Wednesday that it was doubtful a ruble band would remain throughout 1996.

Though possibly expected by market forces, within two weeks, the reform program would suffer another blow as Anatoly Chubais, the last prominent liberal in the government, resigned as first deputy prime minister for the economy. "There have been a lot of rumors that I am leaving," Chubais, the architect of the government's privatization program, told a press conference, "That is true. Having learned of [President Boris Yeltsin's] sharply negative assessment of my work, I have made the decision to tender my resignation."

According to the state-controlled ORT television network, Yeltsin signed a decree relieving Chubais of his duties. ORT quoted Yeltsin's top economic aide, Alexander Livshits, as saying that Yeltsin had fired Chubais for "failure to obey the president's orders and to make sure that people responsible for disbursement of government funds, including those meant for salaries, did their job." Whatever the case, the resignation came on the day a top-level International Monetary Fund delegation arrived in Moscow for talks on a \$9 billion loan to Russia. The loan, called an Extended Finance Facility, would be spread over the next three years.

Chubais oversaw the talks with the IMF, and Western analysts believed his resignation could detract from Russia's credibility with foreign creditors and investors. This might explain the drop in the currency markets.

Not a single member of Yegor Gaidar's original team of reformers, which joined the Russian government in November 1991, now remained in the cabinet. A few weeks earlier, Yeltsin fired Foreign Minister Andrei Kozyrev, who had joined the government in 1990. After Kozyrev's departure and his replacement by the more conservative former spy chief Yevgeny Primakov, Chubais became the longest-serving minister in the cabinet. These cabinet reshuffles were seen as concessions to the communists and as preparations for the 1996 presidential elections.

Chubais was widely seen as the architect of the most important of Russian reforms -- privatization. Ever since he became head of the State Property Committee in late 1991, he doggedly pushed through first the voucher privatization program and then the second phase of sell-offs, in which investors could buy stock in enterprises for money rather than privatization vouchers.

Yeltsin had appeared determined to stand by Chubais. When the old State Duma refused to pass Chubais' money privatization program in 1994, Yeltsin approved it by decree. Throughout several cabinet reshuffles, Chubais not only kept his job but was promoted to first deputy prime minister and put in charge of the government's economic policy.

H. May 17, 1996 Cancellation of Exchange Rate Corridor

Depreciation. On May 16, the government of the Russian Federation and the Central Bank issued a joint statement, "On the Transition to the Establishment of the Official Exchange Rate of the Rouble on the Basis of Daily Bank of Russia Quotes." This decree canceled the official pegging of the exchange rate to the MICEX (Moscow Interbank Currency Exchange) rate, and introduced a mechanism by which the official rate would come from Central Bank quotes.

More importantly, the announcement ended the wide exchange rate corridor regime, and introduced a "crawling corridor." Still a very wide band, the corridor would now move

automatically with the rate of inflation.

From the resulting depreciation of the rouble, it would seem that market participants saw this move as an easing of the central bank's support for the rouble in the foreign exchange markets. It is interesting to note that the market reaction came with the announcement of the policy, whereas the actual policy wouldn't take effect until July 3, almost two months later.

I. January 5, 1997 President Boris Yeltsin Ill

After a year of mysterious health problems, winning the presidential elections, and then undergoing heart surgery, President Yeltsin disappears from the public eye. This was after a shaky midnight appearance on national television to wish his countrymen a happy new year. Still recovering from his heart surgery, Yeltsin and his health were a constant question in the Russian press. On January 8, it was announced that the president had entered the hospital, and was recovering from double pneumonia. Such an illness is serious for any patient, but after open heart surgery, newspapers and television emphasized the danger. On top of this, Yeltsin's history of hiding his health problems remained in readers' minds. Many still felt tricked after the summer presidential elections when Yeltsin and his advisors repeatedly assured voters that he was in perfect health--despite later admissions that this was not the case. Last July, before the second round of the presidential election, administration officials blamed a cold for Yeltsin's failure to appear in public, although later it was revealed that the president had suffered a heart attack

Meanwhile, relations with the west were strained as Russia protested the enlargement of NATO. On 6 January, Yeltsin chaired a special meeting to discuss Russia-NATO relations which was attended by Prime Minister Viktor Chernomyrdin, presidential Chief of Staff Anatolii Chubais, and other top officials, Russian and international agencies reported. Yastrzhembskii said the meeting had "unanimously confirmed" Moscow's "explicitly negative position" on NATO enlargement. He added that Yeltsin had directed Foreign Minister Yevgenii Primakov to devise a flexible "action plan" of various measures which Russia might take if the alliance accepts new Eastern European members. Western diplomatic sources told Reuters that in his 4 January meeting with German Chancellor Helmut Kohl, Yeltsin took a hard line, insisting that before NATO invites new members to join, it offer Russia a legally binding consultation agreement granting Moscow a voice in alliance decisions like enlargement. NATO officials have consistently rebuffed such suggestions in the past.

J. June 3, 1997: Speculation of Early Elections, Slow Growth Forecasted, Tax Code Debate

A depreciation of the ruble came in a week of mixed news. On June 3, President Boris Yeltsin urged the State Duma to pass the new draft Tax Code in its first reading before the Duma's summer recess begins in late June. First Deputy Prime Minister Anatolii Chubais said the same day that Russia's economy will be set back by a year and a half and the draft 1998 budget ruined if deputies fail to pass the code. Although failure to pass the either the code or the 1998 budget would not in itself have given Yeltsin grounds to disband the Duma, the comments by Yeltsin and Chubais fueled speculation that the president may have been seeking early parliamentary elections. Duma Speaker Gennadii Seleznev said the Duma would consider legislation according to its own schedule.

On June 3, the government has submitted proposals for collecting some 34 trillion rubles (\$5.9 billion) in additional revenues this year. The measures included plans to bring in 4 trillion rubles by cutting aid to enterprises that owe taxes, 3.5 trillion rubles by limiting access to export pipelines to oil companies that owe no money to the federal budget, 5 trillion rubles by selling state-owned shares in some enterprises, and 8 trillion rubles through changing customs regulations. The government proposed spending cuts of 108 trillion rubles from the 1997 budget, but the Duma postponed discussion of the proposed cuts pending government proposals on collecting more revenues.

Also on 3 June, the government submitted to the Duma a revised forecast for Russia's economic performance in 1997. The government now predicts that GDP will be between 2,550 trillion and 2,600 trillion rubles (\$450 billion) in 1997--zero growth at best and a 2% decline from 1996 levels at worst. Earlier this year, the government had predicted GDP growth of up to 2% in 1997. Meanwhile, the Financial Times on 3 June cited a new forecast by analysts of the Chase Manhattan Bank, who predict that Russia's GDP will increase by up to 5.4% this year, mostly due to the growing "shadow economy."

In events that seemingly should have supported the ruble value, On May 30, the Russian government approved an agreement with France to settle debts accrued before May 1945.

In November of 1996, Russian and French officials signed the agreement, under which Russia will pay \$400 million over three years to holders of tsarist-era bonds issued in France. Russia will also renounce claims to Russian gold transferred to Germany in 1918, which ended up in France after World War I. The deal was hoped to help Russia's bid to join the Paris Club of government creditors and allow Russia to issue new bonds in France. Economics Minister Yakov Urinson said that Germany wants Russia to repay about DM 1 billion (\$588 million) in Soviet-era debts to German businesses. He added that Russia's image in Germany has suffered because of the outstanding debt.

On June 2, officials said the World Bank had completed negotiations to extend nearly \$1.7 billion in loans to Russia by the end of the year. The bank's board was expected to approve the loans in the coming weeks. The credits are to include a \$600 million loan for structural reforms of the Russian economy and an \$800 million loan for restructuring of social benefit programs. It was unclear whether the bank's board would consider a proposed loan of \$500 million to restructure the Russian coal industry. In June 1996, the World Bank issued \$250 million in credits to the Russian coal industry, but critics have said that little of the money reached miners. A World Bank mission toured coal mining regions in May to determine how money from the 1996 loan had been spent.

K. October 28, 1997: New Budget and Tax on Foreign Exchange

Depreciation. On October 28, the government approved the draft 1998 budget parameters agreed by a trilateral commission of government, State Duma, and Federation Council. It also approved a package of 10 draft tax laws aimed at increasing revenues in line with new 1998 targets. The trilateral commission agreed to raise 1998 revenues by 27.5 billion new rubles (\$4.7 billion) to 367.5 billion rubles. The proposed tax laws would, among other things, increase the tax on foreign-currency purchases and raise the sales tax on food from 10 percent to 20 percent, the rate levied on other products. In addition, income tax exemptions currently granted to military personnel would be eliminated as of January 1, 1998.

The Duma Council decided to put the revised 1998 budget to a first Duma reading on November 12 or November 14. First Deputy Prime Minister Chubais had earlier

announced that the budget would receive its first reading on 31 October, and Prime Minister Viktor Chernomyrdin had called on Duma deputies to consider the budget before November 1. Appearing on Russian television, Aleksandr Shokhin, the leader of the pro-government faction Our Home is Russia, argued that the Duma Council delayed consideration of the budget because the Communists and their allies do not want to vote for the budget before November 7, when demonstrations are planned to mark the 80th anniversary of the Bolshevik Revolution

The Russian Trading System index rose 3.4 percent on the morning of 29 October after Russian shares lost an average of 20 percent of their value the previous day. The plunge on October 28 occurred despite a three-hour halt on the exchange, which was intended to calm the market. Russian bonds denominated in rubles and foreign currencies also suffered substantial losses. However, government officials and market analysts attributed the decline to turmoil on Wall Street and other world markets, rather than to internal economic or political conditions in Russia. For the preceding two years, the Russian stock market had posted the world's strongest gains. It was up 160 percent from the beginning of January to 6 October, 1997.

L. June 17, 1998: IMF Coming to Moscow, and Chubais to be Special Envoy

Appreciation. Martin Gilman, the IMF's representative in Moscow, confirmed on June 16 that the fund was to send a delegation to Russia for an "extensive dialogue" on possible aid and measures to stabilize the situation on Russian financial markets. The delegation was slated to arrive in Moscow on June 22. Gilman said Russian officials had not formally requested aid beyond the four-year, \$10 billion Extended Fund Facility the IMF had been disbursing to Russia in installments since 1996. However, there were rumors widely reported in the Russian media that officials had raised the issue of a bailout package on several occasions: during Chubais's visit to Washington in May, during Prime Minister Kirienko's visit to Paris earlier this month, and most recently during Yeltsin's trip to Bonn.

In addition, Prime Minister Kirienko told journalists on June 17 that Anatoliy Chubais was the "most likely candidate" for a new post to be created: special presidential envoy to international financial organizations. Kirienko said the envoy would have a rank equal to that of deputy prime minister, but he suggested that the holder of that office will not be a cabinet member. Chubais was the government's long-time main contact with organizations such as the World Bank and the IMF until Yeltsin dismissed him as first deputy prime minister in March.. Citing unnamed government sources, Interfax reported on June 16 that Chubais would retain his position as chief executive of Unified Energy System.

On June 18, President Boris Yeltsin on said his appointment of Chubais was a "temporary" measure, and cautioned journalists against drawing "unnatural conclusions" from the appointment. Chubais would keep his job at the electricity monopoly. In a speech to the second annual St. Petersburg Economic Forum on 17 June, Prime Minister Sergei Kirienko warned that the government's "anti-crisis program" will be "tough" and "unpopular," though he did not disclose details about the program, saying its implementation will require "courage and political will." Some observers believe that in his new position, Chubais would soon become a scapegoat for unpopular government policies.

M.. July 30, 1998: New IMF Loan Approved, then Tax Arrears Settlements

Among the few events found to cause an appreciation of the ruble, two announcements in July 1998 appeared to boost the value of the Russian currency. First, on July 14, Russia announced the rescheduling of billions of dollars in debt servicing costs. Deputy Finance Minister Mikhail Kasyanov said the voluntary swap of short-term treasury bills (GKO) for medium- and long-term Eurobonds would help "give the government more breathing space for four or five months." Holders of some \$4.4 billion in GKOs agreed to exchange them for some \$5.9 billion in U.S. dollar-denominated bonds (of which roughly half will mature in seven years and the other half in 20 years). The Finance Ministry also sold an additional \$500 million in Eurobonds for cash. The swap adds \$6.4 billion to Russia's foreign debt burden but reduces the amount of high-interest GKOs that need to be repaid in the coming months. Kasyanov said 60 percent of those who agreed to exchange GKOs for Eurobonds were foreign investors.

Then on July 20, the IMF's board of directors agreed to immediately disburse the first tranche of a \$11.2 billion stabilization loan for Russia. However, the first tranche will total \$4.8 billion, rather than \$5.6 billion, as had been expected. According to an IMF statement, the first tranche was reduced because of "delays in implementing" the conditions for the new loan. The rest of the loan will be disbursed later this year, provided that Russia meets its economic policy commitments. The State Duma recently rejected several key laws that the government proposed in order to increase revenues and reduce budget expenditures. The government and President Boris Yeltsin were trying to introduce some of those measures through government directives and presidential decrees. Unified Energy System head Anatolii Chubais attended the IMF board meeting in his capacity as Yeltsin's envoy to international financial institutions.

Prime Minister Sergei Kirienko claimed victory for the Russian government in securing the new \$11.2 billion stabilization loan from the IMF. Commenting on the decision by the IMF board of directors to reduce the first tranche of that loan by \$800 million, Kirienko emphasized that the overall size of the loan remains the same, Interfax reported. The premier also claimed that recent steps by the president, government, and parliament will help Russia balance its budget by bringing in 105.2 billion rubles (\$16.9 billion) in additional revenues next year. Presidential decrees and government directives were used to implement some measures rejected by the State Duma last week.

On July 28, it was reported that Fuel and Energy Minister Sergei Generalov announced that by 3 August, Gazprom and EES would sign agreements with the government on settling mutual debts. Both companies held large tax arrears but were also owed massive debts by budget-funded organizations. Prime Minister Kirienko had said the government would insist that all debts be paid in cash and would not simply cancel the companies' debts to the budget against government debts to the companies.

N. September 3, 1998: The Russian Financial Crisis of 1998

Sharp depreciation. Though it would have been difficult to predict the timing of any crisis, several signs pointed to instability in Russian economics in the summer and fall of 1998. Investors became unwilling to lend to Russia at any price, and savers lost confidence in the banking system. Well-studied in hindsight, the ominous list of problems included:

1. Deficit Spending: Large expenditures and weak tax collection
2. Debt Management Problems

3. Drop in World Oil Prices
4. A Weak Banking Sector
5. The Asian Financial Crisis
6. Problems in Structural Reforms
7. Political Turbulence

The government securities market gave signals of the trouble ahead. Interest rates were rising, maturities were falling, and the government was finding it more and more difficult to find anyone interested in buying its debt instruments. To attract investors, the Ministry of Finance raised rates and shortened maturities. At first, investors refused to buy one-year securities, only those coming due within 6 months. By May, 6-month securities couldn't be placed, and the debt rollover turned to 3-month bonds. By July, the mean-weighted yield on domestic securities had reached 126 percent. On July 8, the MOF outright canceled two bond auctions for GKO's coming due on January 6 and January 7, 1999. It was later announced that GKO holders would be allowed to convert their assets to longer term, dollar-denominated bonds. On July 11, another GKO auction was cancelled and the debt was serviced out of the budget. By July 20, the government gave up on GKO's and announced a one-year suspension on the issuance of state securities.

A government plan was announced on August 17, 1998 that would include three directives:

1. Devaluation and widening of currency "corridor"
2. 3-month moratorium on the repayment of foreign debts by Russian banks
3. Compulsory restructuring of domestic GKO-OFZ debt. (De-facto default)

The ruble was initially supported in a newly widened band (between 6 and 8 rubles/dollar) by heavy central bank intervention. But on September 2 the support was abandoned altogether, and the ruble quickly fell to over 20 rubles/dollar before settling back to 16. With increased import costs and the renewal of central bank emissions, inflation jumped to 38 percent in September (on monthly basis). Banks collapsed, the payments system froze, imports fell, and GDP dropped again.

O. May 13, 1999: Yeltsin Sacks Prime Minister Again; Duma Deadlocked on Impeachment

Depreciation. After weeks of speculation that Prime Minister Yevgenii Primakov would soon be dismissed, Russian President Boris Yeltsin announced on 12 May that he had accepted Primakov's resignation. Yeltsin explained the need for Primakov's departure by citing the fact that "the economy of Russia has not improved.... The question of economic strategy is today, nine months later, an open one." Primakov's resignation came just one day after the Kremlin dismissed reports by Ekho Moskvyy that Primakov would be fired and Railways Minister Nikolai Aksenenko would replace him. During a meeting with State Duma faction leaders on 11 May, Primakov repeated an earlier stance that he would resign if the Kremlin fired First Deputy Prime Minister Yurii Maslyukov or Deputy Prime Minister Gennadii Kulik.

Also on 12 May, Yeltsin appointed Sergei Stepashin acting prime minister. Stepashin

had recently been promoted to first deputy prime minister while maintaining his position as Minister of the Interior. Discussing the appointment, Yeltsin suggested that Stepashin would add the "necessary dynamics and energy to the work of the cabinet." In an interview with Ekho Moskvy radio on May 11, Our Home Is Russia (NDR) faction leader Vladimir Ryzhkov said that anyone other than Primakov "would meet with very great resistance" in the Duma, which must approve Stepashin's candidacy.

The resignation of Primakov was a shock to both Russian economics and politics, fueling the tension between President Yeltsin and the Duma. In an article in "Trud" on May 8, Russian political analyst Vyacheslav Nikonov predicted that "the dissolution of the [Primakov] government will inevitably be followed by the dissolution of the Duma, a ban on the Communist Party, and so forth...." According to Nikonov, Stepashin's previous promotion to first deputy premier was the first step in the implementation of this scenario. Nikonov continued that "in such a situation no one will be working on economic and social problems, everyone will be engrossed in political squabbles." And he added that "it is also clear that none of the international financial institutions will give money to a premier who has not been accepted by the Duma, especially if the lower house itself is dissolved, in which case nobody would be able to pass the legislation required by the IMF." Article 111 of the Russian Constitution grants the president the right to disband the Duma if the lower house rejects his nominee for prime minister three times. But Article 109 states that the Duma may not be dissolved once it has begun the process of seeking to remove the president from office.

In return, Duma Chairman and member of the Communist Party Gennadii Seleznev predicted that Yeltsin's decision to remove Primakov will add 100 votes to the 300 needed in the chamber for impeachment. NDR leader Ryzhkov had predicted before the dismissal that one of the five charges against Yeltsin--initiating the war in Chechnya--would garner the necessary 300 votes. Communist Party leader Gennadii Zyuganov said that the leftist opposition in the Duma will appeal directly to the Federation Council to hold an extraordinary session because Yeltsin "has deliberately staged a new government crisis."

P. August 9, 1999. Yet Again: Yeltsin sacks Prime Minister Stepashin

Russian President Boris Yeltsin signed a decree on August 9, dismissing Prime Minister Sergei Stepashin after only three months on the job. As was the case with his predecessors, three of whom had preceded him in the past 17 months, rumors of his pending dismissal started to dog him almost as soon as he was confirmed. His visit to the U.S. in July intensified such speculation both because of the visit's success and his own impromptu remarks there, such as, the U.S. has come to understand that "there are not just senile invalids in wheelchairs" in Russia. On 7 August, "Kommersant- Daily" characterized Stepashin's recent whirlwind tour through the Volga region as a last-ditch effort to convince Yeltsin not to dismiss him: during that tour, the ex-premier sought to persuade regional leaders to back the Kremlin's candidates in upcoming parliamentary elections. The newspaper had reported earlier that a Kremlin-backed effort to place Stepashin at the head of the election bloc composed of governors failed.

By 9 August, Yeltsin had decided that "the person who is able to consolidate society and, drawing support from the broadest political forces, ensure the continuation of reforms in Russia" is Vladimir Putin. Putin was director of the Federal Security Service and secretary of the Security Council until a decree that day relieved him of those posts and

named him first deputy prime minister. Yeltsin also submitted Putin's name as candidate for the premiership to the State Duma, which has three opportunities to approve Yeltsin's choice for prime minister or be dissolved. Putin, started his career with the Foreign Intelligence Service, spending many years in Germany. He also served as first deputy mayor of St. Petersburg.

In the televised announcement, Yeltsin also endorsed Putin as his own successor. After the broadcast, Putin acknowledged that he would seek the presidency in the 2000 elections. Acting First Deputy Prime Minister Viktor Khristenko announced on August 9 that the Russian government would debate the 2000 budget on 19 August, as planned, despite the cabinet's dismissal. The Economics Ministry announced the same day that the government's dismissal will not alter the value indicators projected for next year's budget, such as the ruble/dollar exchange rate, which will remain at 32 rubles per dollar. Interfax reported that economists have found that a 3 percent devaluation of the ruble following a cabinet dismissal "has become normal." The agency noted that the ruble fell by 2.8 percent when Prime Minister Yevgenii Primakov's government fell. However, few analysts are predicting a major slump in the ruble because they believe the new prime minister will follow economic policies very similar to those of his predecessor, "The Moscow Times" reported on 10 August. JAC

Also on August 9, Yeltsin signed a decree stipulating that Duma elections would be held on 19 December. With the announcement of that date, the campaign season formally began. A total of 450 deputies would be elected to the lower chamber, 225 in single-mandate districts and 225 on party lists.

The regression used window sizes for significant dates ranging from 40 days to 180 days. The above dates were determined significant at nearly all window sizes. Some other dates appeared in only a few specifications of the model. These included the following:

A. January 18, 1994 Yegor Gaidar Resigns Second Post

Monetarist reformer Yegor Gaidar removed himself from the post of Economics Minister. In this post, he had led President Boris Yeltsin's program of market reforms--including price liberalization, trade liberalization, the privatization of state property, and monopoly reforms. This resignation is on top of the resignation of Boris Fyodorov, the reform-minded Finance Minister. At the time, newspapers argued over the cause of the ruble's fall--the political crisis or possibly just a long term adjustment to changes in the balance of trade. Duma opposition economist Grigory Yavlinskiy received much press with his accusation that the government was artificially holding the price of the ruble down to support exports.

B. January 4, 1995 Chechen War

The Central Bank called for market calm as the ruble price plunged again. The Chechen crisis was for the ruble's drop to its lowest value in three months, but the bank repeated that there was no reason to panic. Alexander Potemkin, head of the central bank's international monetary department assured traders, "We have significant reserves to oppose the downward movement of the ruble, but we cannot ignore market expectations," he said. Dealers said the central bank had spent at least \$220 million in currency market intervention to prevent an even larger ruble drop.

This crisis comes days after Russian tanks rolled into Grozny, the capital city of

breakaway republic Chechnya. In newspaper stories, the head St Petersburg's currency exchange futures department, Alexei Solovey, said the Chechen conflict had cost the government dear, forcing a fall in the rouble. Inkombank spokesman Ruslan Sirov said the war in Chechnya will make inflation worse later on in the year. "Production is stagnant, and a large sum will be spent to sustain the army. Another Black Tuesday is on the way," he said. A trader from Credo Bank went further: he predicted the rouble's value could be as low as 10,000 a dollar by the end of 1995.

Russian monthly inflation was 16.4% in December, the second highest in 1994 after the 22% recorded in January.

The Chechen conflict was also thought to cast a shadow over economic reform as a whole, amid fears that it could hurt the chances of turning around the ailing economy and bringing inflation down. President Yeltsin's top economic advisor Alexander Livshits was quoted saying, "The Russian economy has started to feel the consequences of the Chechen crisis." "It is not only the direct cost of restoring the economy of Chechnya...but more importantly expectations of inflation are rising," Alexander Livshits said.

Officials quickly admitted they will need extra money to pay for the military operation and to rebuild a regional oil-based economy devastated by Russian bombing raids. "We will need endless trillions of roubles to repair what has been destroyed and to make the republic look civilized again," a parliamentary budget official announced. Fuel and energy ministry officials had already drawn up plans to repair Chechen oil wells and equipment. But economists feared extra expenditure from the fighting and the reconstruction work will widen the budget deficit and drive inflation up.

The government's 1995 budget draft originally promised to bring monthly inflation down to 1-2% by the second half of this year. But this forecast, like those for 1994, soon turned impossible. New budget drafts foresaw average monthly rates of 3% this year, but economists worried even this would be very hard to achieve unless the Chechen crisis were to come to an early end.

C. July 15, 1997 Rouble Re-denomination Announcement

The model detects a small depreciation event in July, 1995. In the news in July was the announcement on July 4 that the central bank would cut three zeros off all rouble notes. Declaring an end to the era of inflation, President Boris Yeltsin announced that the Central Bank will lop the zeros off the face value of the rouble starting January 1, 1998, introducing a new rouble note and bringing back the kopek as small change.

"Today we reliably control money circulation and inflation," Yeltsin said in a television address to the nation. "The prices of basic goods are practically stable. And we are confident that they will remain so. That is why we made the decision to conduct monetary reform."

Starting Jan. 1, 1998, the Central Bank will issue new notes and coins, including a shiny new kopek, which will be used in parallel with the old bills for one year. An old 1,000 rouble note will be equal to a new one rouble coin. By the start of 1999, the government plans to phase out use of the old notes, but it will be possible to exchange old rubles at banks for new notes until 2002.

Yeltsin hastened to assure a wary Russian public that the government had learned its lesson from previous bungled attempts to reform the currency. This time, he said, there will be no need to rush to the bank. "During the last 50 years everything connected with monetary reform has invariably hit the common people," Yeltsin said. "Nobody is going to lose anything as a result of the reform. Nobody's interests will be trampled on -- the reform will not amount to confiscation," Yeltsin said.

The new ruble will have a value of about 17 cents. The old Soviet ruble was officially worth about \$1.40. Central Bank Chairman Sergei Dubinin said the currency reform would help boost public confidence in the ruble. "We hope that the new heavy and firm ruble will further gain in strength," he said at a news conference.

Dubinin said the decision to introduce new notes would not affect Russia's monetary policy in 1998. "The gradual devaluation of the ruble will probably continue in line with inflation," he said, but added that depreciation would probably slow down next year.

Reaction to the announcement seemed mixed. Some consumers welcomed the idea of not having to count their grocery bills in the hundreds of thousands. Government officials boasted that the new ruble would be about equal to a French Franc, a notion seemingly attractive to Russians on the street. But much press centered on currency reforms of past years. Distrust of the government led many to fear the new ruble was somehow another trick the government had to make life worse for the average citizen. Some pointed out that there would have to be some rounding in the prices they saw--a bunch of bananas that sold for 4,525 old roubles would become 4.525 roubles in the new system--rounded to 4.53 or even 4.6 roubles many feared.

By announcing plans to introduce the new bills a full five months in advance, the Central Bank hoped it will have enough time to persuade Russians not to panic. It even set up a hot-line to field inquiries. (Those with questions can call 924-4409 or 921-6862 in Moscow).

As interesting as the dates that the model detected might be those that are absent from the list. If the cited dates are considered "significant events," then those omitted would by default be deemed "insignificant". A list of omitted events might include the following:

1. Yeltsin's Heart Surgery
2. End of First War in Chechnya
3. Introduction of Currency Band
4. IMF loan program announcements
5. 1996 Presidential Elections
6. Two Separate Shootings at Home of Central Bank Governor Dubinin
7. Zhironovskiy, Nationalist victory in Parliamentary Elections, 1993
8. March 1998 Cabinet Firings
9. Yeltsin Sacks Prime Minister Kirienko, Duma rejection of Chernomyrdin
10. Subsequent Debt Defaults
11. New War in Chechnya
12. IMF/Bank of New York Scandal Allegations

Appendix A: Event Study Estimation Results

Model A

Win=40

	Day Dummy	T-Stat
December 18, 1992	88	-1.33672
May 20, 1993	128	-0.03851
July 20, 1993	164	-0.00813
September 23, 1993	211	0.168517
January 20, 1994	289	-0.10029
April 27, 1994	357	-0.00653
June 30, 1994	399	-0.00459
September 13, 1994	452	-0.06715
October 11, 1994	472	0.275666
January 5, 1995	529	0.010827
May 29, 1995	627	0.007172
June 14, 1995	638	-0.01323
August 22, 1995	687	0.0063
January 4, 1996	780	0.004552
February 27, 1996	817	0.003552
May 17, 1996	871	0.003662
August 1, 1996	923	0.005386
September 19, 1996	958	0.003982
December 4, 1996	1011	-0.00058
January 8, 1997	1029	0.006869
May 29, 1997	1126	0.001823
June 3, 1997	1129	0.003099
August 15, 1997	1181	0.00255
October 28, 1997	1233	0.007824
January 22, 1998	1287	0.006173
April 30, 1998	1356	-0.0064
August 18, 1998	1430	0.049738
September 3, 1998	1436	0.510245
December 28, 1998	1513	0.07578
5/13/1999	1602	0.029582
7/6/1999	1639	0.007449
8/9/1999	1663	0.02873

Win=50

	Day Dummy	T-Stat
December 18, 1992	88	-1.32823
May 18, 1993	127	0.039007
September 23, 1993	211	0.168655
January 20, 1994	289	-0.09986
April 27, 1994	357	-0.00635
September 13, 1994	452	-0.06344
October 11, 1994	472	0.275705
January 5, 1995	529	0.01022
May 30, 1995	628	-0.00744
June 14, 1995	638	-0.01313

September 7, 1995	699	0.004872	2.312154
January 4, 1996	780	0.004492	4.708578
May 17, 1996	871	0.004229	4.014474
July 18, 1996	913	0.005111	3.334248
September 19, 1996	958	0.003632	4.41078
January 8, 1997	1029	0.006873	23.77098
May 29, 1997	1126	0.00182	2.662288
June 3, 1997	1129	0.003124	3.592347
October 28, 1997	1233	0.008218	6.573962
January 22, 1998	1287	0.006174	3.905638
April 30, 1998	1356	-0.00636	-3.02948
August 18, 1998	1430	0.05508	0.853309
September 3, 1998	1436	0.509458	8.917791
December 28, 1998	1513	0.070616	3.963553
5/13/1999	1602	0.029589	7.04887
8/9/1999	1663	0.028586	6.047129

Win=60

		Day Dummy	T-Stat
December 18, 1992	88	-1.29739	-11.4637
May 18, 1993	127	0.086268	0.61255
September 23, 1993	211	0.168706	19.492
January 20, 1994	289	-0.09949	-9.54592
April 27, 1994	357	-0.00666	-1.81056
October 11, 1994	472	0.27534	12.40495
January 5, 1995	529	0.00961	4.56804
May 29, 1995	627	0.005868	1.851193
June 14, 1995	638	-0.01323	-3.33138
September 7, 1995	699	0.003627	3.34189
January 4, 1996	780	0.004458	4.727816
May 17, 1996	871	0.00454	3.359323
January 8, 1997	1029	0.006937	17.0356
May 29, 1997	1126	0.00181	2.787078
June 3, 1997	1129	0.003099	3.712544
October 28, 1997	1233	0.008632	5.121845
April 30, 1998	1356	-0.00653	-3.5326
June 17, 1998	1386	-0.02846	-0.45944
September 3, 1998	1436	0.510007	9.512557
December 28, 1998	1513	0.074803	4.545779
5/13/1999	1602	0.029705	7.17212
8/9/1999	1663	0.02882	6.458281

Win=70

		Day Dummy	T-Stat
December 18, 1992	88	-1.27352	-11.2827
September 23, 1993	211	0.167941	18.57471
January 20, 1994	289	-0.09976	-10.1983
April 27, 1994	357	-0.00663	-1.88393
October 11, 1994	472	0.275075	13.0529

January 5, 1995	529	0.009745	4.718317
June 14, 1995	638	-0.0128	-3.33648
September 7, 1995	699	0.003672	3.303404
January 4, 1996	780	0.00448	5.140688
July 18, 1996	913	0.005001	3.58024
January 8, 1997	1029	0.006925	17.55911
April 3, 1997	1089	0.001504	2.701775
June 3, 1997	1129	0.003114	3.730185
October 28, 1997	1233	0.008725	5.380051
July 14, 1998	1405	-0.01178	-1.47503
September 3, 1998	1436	0.51167	9.896595
December 28, 1998	1513	0.073878	4.782998
5/13/1999 1602		0.029541	7.657852
8/9/1999 1663		0.028857	6.632749

Win=80

		Day Dummy	T-Stat
December 18, 1992	88	-1.27103	-11.8163
May 18, 1993	127	0.032836	1.675695
September 23, 1993	211	0.155224	11.01924
January 24, 1994	291	-0.09829	-5.23622
October 11, 1994	472	0.274858	13.67413
January 5, 1995	529	0.009786	4.721801
June 14, 1995	638	-0.01284	-3.44332
September 7, 1995	699	0.004333	2.200957
January 4, 1996	780	0.00434	4.939271
July 18, 1996	913	0.004863	3.57886
January 8, 1997	1029	0.007021	12.63656
May 8, 1997	1112	-0.00148	-1.63679
June 3, 1997	1129	0.003132	3.596645
October 28, 1997	1233	0.008668	5.546446
August 18, 1998	1430	0.052074	0.957316
September 3, 1998	1436	0.510933	10.20141
January 6, 1999	1516	0.07518	4.435992
8/9/1999 1663		0.029003	6.252737

Win=90

		Day Dummy	T-Stat
December 18, 1992	88	-1.26087	-12.0423
September 23, 1993	211	0.154374	11.27251
February 23, 1994	313	0.018931	2.050814
October 11, 1994	472	0.27485	14.30094
January 5, 1995	529	0.009845	4.860958
June 14, 1995	638	-0.01273	-3.53994
January 4, 1996	780	0.004391	3.411244
May 17, 1996	871	0.004586	3.761948
January 8, 1997	1029	0.007039	12.98474
June 5, 1997	1131	-0.00337	-2.76643
October 28, 1997	1233	0.00859	5.494779

May 14, 1998	1363	-0.031	-0.60364
September 3, 1998	1436	0.511437	10.68232
January 19, 1999	1524	0.050045	2.774085
8/9/1999 1663		0.028732	5.931876

Win=100

		Day Dummy	T-Stat
December 18, 1992	88	-1.27123	-13.1802
September 23, 1993	211	0.154504	11.72441
October 11, 1994	472	0.274766	14.89786
June 14, 1995	638	-0.01258	-3.62446
January 4, 1996	780	0.003861	3.570856
May 17, 1996	871	0.004572	3.851031
January 8, 1997	1029	0.007007	13.29063
June 3, 1997	1129	0.003246	2.802875
October 28, 1997	1233	0.008621	5.778497
July 30, 1998	1417	-0.07387	-1.58534
September 3, 1998	1436	0.511989	11.13659
5/13/1999 1602		0.029193	5.557411

Win=110

		Day Dummy	T-Stat
December 18, 1992	88	-1.25174	-12.7826
September 23, 1993	211	0.154414	12.21236
October 11, 1994	472	0.274833	15.48312
June 14, 1995	638	-0.01253	-3.73068
January 4, 1996	780	0.004202	4.156596
July 18, 1996	913	0.004869	3.991213
January 8, 1997	1029	0.00704	11.4988
October 28, 1997	1233	0.008592	5.935462
May 14, 1998	1363	-0.02923	-0.61727
September 3, 1998	1436	0.512295	11.58326
5/13/1999 1602		0.028498	5.472919

Win=120

		Day Dummy	T-Stat
December 18, 1992	88	-1.24926	-13.188
September 23, 1993	211	0.154504	12.62091
October 11, 1994	472	0.274792	16.03275
June 14, 1995	638	-0.01256	-3.86734
January 4, 1996	780	0.004306	4.437744
July 18, 1996	913	0.004989	4.273618
January 8, 1997	1029	0.007016	10.9411
October 28, 1997	1233	0.008644	6.295972
May 14, 1998	1363	-0.02893	-0.63321
September 3, 1998	1436	0.512371	12.01015
5/13/1999 1602		0.028747	5.675091

Win=130

		Day Dummy	T-Stat
December 18, 1992	88	-1.24731	-13.5906

September 23, 1993	211	0.154452	12.92105
October 11, 1994	472	0.27052	16.02907
June 14, 1995	638	-0.01222	-3.57033
January 4, 1996	780	0.004677	3.205959
July 18, 1996	913	0.004937	4.203166
January 8, 1997	1029	0.007021	10.5968
October 28, 1997	1233	0.008676	6.291227
May 14, 1998	1363	-0.02858	-0.64693
September 3, 1998	1436	0.512463	12.42394
5/13/1999 1602		0.028606	5.639891

Win=140

		Day Dummy	T-Stat
December 18, 1992	88	-1.24567	-13.9846
September 23, 1993	211	0.154258	13.20394
October 11, 1994	472	0.270308	16.49648
June 14, 1995	638	-0.01188	-3.48841
July 18, 1996	913	0.004974	4.262126
January 8, 1997	1029	0.00702	13.76149
October 28, 1997	1233	0.008597	6.81894
July 14, 1998	1405	-0.01127	-1.99032
September 3, 1998	1436	0.512719	12.82198
5/13/1999 1602		0.028549	5.645449

Win=150

		Day Dummy	T-Stat
December 18, 1992	88	-1.245	-14.3774
September 23, 1993	211	0.154647	13.79562
October 11, 1994	472	0.270177	16.94425
June 14, 1995	638	-0.01185	-3.57679
July 18, 1996	913	0.004949	4.347396
January 8, 1997	1029	0.006997	10.44297
October 28, 1997	1233	0.008731	4.817759
September 3, 1998	1436	0.513032	13.21065
5/13/1999 1602		0.028418	5.674261

Win=160

		Day Dummy	T-Stat
December 18, 1992	88	-1.24513	-14.4071
September 23, 1993	211	0.154695	14.21623
October 11, 1994	472	0.270167	17.41402
June 14, 1995	638	-0.01177	-3.62829
January 4, 1996	780	0.004037	3.750859
January 8, 1997	1029	0.007005	6.742642
June 5, 1997	1131	-0.0035	-3.32372
October 28, 1997	1233	0.008817	4.654808
September 3, 1998	1436	0.513231	13.58388
5/13/1999 1602		0.028487	5.728296

Win=170

Day Dummy T-Stat

December 18, 1992	88	-1.24088	-14.7103
September 28, 1993	214	-0.10965	-4.48986
October 11, 1994	472	0.259091	15.82886
June 14, 1995	638	-0.01303	-4.69409
January 8, 1997	1029	0.006984	6.798488
October 28, 1997	1233	0.008614	8.391163
July 30, 1998	1417	-0.05172	-1.37602
September 3, 1998	1436	0.513246	13.91602

Win=180

		Day Dummy	T-Stat
December 18, 1992	88	-1.23962	-15.0136
February 2, 1994	298	0.14872	5.313517
October 11, 1994	472	0.258878	16.19944
July 27, 1995	669	-0.01172	-4.32405
January 8, 1997	1029	0.00698	6.960158
June 5, 1997	1131	-0.00348	-3.43976
July 14, 1998	1405	-0.01019	-1.97493
September 3, 1998	1436	0.513405	14.26959

Model B

Win=40

		Day Dummy	T-Stat
December 18, 1992	88	-1.12294	-12.1088
May 18, 1993	127	0.033451	5.162576
September 13, 1993	203	0.005235	0.337061
September 23, 1993	211	0.125238	20.35946
January 20, 1994	289	-0.06914	-7.99231
April 11, 1994	345	0.004802	1.708579
June 29, 1994	398	0.00414	2.485207
September 13, 1994	452	-0.05206	-4.29061
October 11, 1994	472	0.208113	10.45416
January 4, 1995	528	-0.00525	-2.77539
May 29, 1995	627	0.006632	2.969257
July 31, 1995	671	0.011844	3.425423
August 10, 1995	679	0.005535	1.874572
January 4, 1996	780	0.00301	4.080309
February 27, 1996	817	0.002731	5.846244
May 17, 1996	871	0.00322	3.608207
July 31, 1996	922	-0.00364	-3.18802
September 18, 1996	957	-0.00225	-3.68232
November 15, 1996	998	-0.00044	-0.68605
January 8, 1997	1029	0.00632	23.0624
April 3, 1997	1089	0.001262	2.65476
June 3, 1997	1129	0.002469	3.921422
August 14, 1997	1180	-0.00211	-2.10614
October 28, 1997	1233	0.006974	6.937729

January 21, 1998	1286	-0.00314	-2.67363
April 29, 1998	1355	0.003954	2.555425
August 18, 1998	1430	0.04245	0.885133
September 3, 1998	1436	0.30983	5.497599
December 28, 1998	1513	0.065336	4.967091
5/13/1999	1602	0.018132	4.816248
7/6/1999	1639	0.005027	1.134328
8/9/1999	1663	0.024941	7.955373

Win=50

		Day Dummy	T-Stat
December 18, 1992	88	-1.12635	-12.8853
May 18, 1993	127	0.026593	3.26703
September 23, 1993	211	0.125421	21.9403
January 20, 1994	289	-0.06871	-8.46893
April 26, 1994	356	0.004544	1.709005
September 13, 1994	452	-0.04864	-4.19823
October 11, 1994	472	0.208278	11.26884
January 4, 1995	528	-0.00475	-2.70352
May 29, 1995	627	0.005916	2.682595
July 31, 1995	671	0.011661	3.550285
September 7, 1995	699	0.002952	2.003904
February 27, 1996	817	0.002518	3.730078
May 17, 1996	871	0.003879	5.221407
July 17, 1996	912	-0.00281	-2.63234
August 28, 1996	942	0.002123	3.603227
January 8, 1997	1029	0.006008	16.55256
April 3, 1997	1089	0.001251	2.816937
June 3, 1997	1129	0.002483	4.020873
October 28, 1997	1233	0.007108	7.515429
January 21, 1998	1286	-0.0031	-2.75279
April 29, 1998	1355	0.003914	2.658835
August 18, 1998	1430	0.044246	0.988569
September 3, 1998	1436	0.309364	5.890837
December 28, 1998	1513	0.060399	4.775053
5/13/1999	1602	0.018024	4.96022
8/9/1999	1663	0.024087	7.423833

Win=60

		Day Dummy	T-Stat
December 18, 1992	88	-1.14372	-13.7926
May 13, 1993	126	-0.01757	-0.17746
September 23, 1993	211	0.126068	23.4687
January 20, 1994	289	-0.06892	-9.03439
June 9, 1994	385	0.005061	2.014745
October 11, 1994	472	0.20841	12.01704
December 21, 1994	521	-0.00464	-2.8567
May 29, 1995	627	0.005925	2.779697
July 31, 1995	671	0.011374	3.64576

September 7, 1995	699	0.003078	4.234739
February 27, 1996	817	0.002581	3.886887
May 17, 1996	871	0.004038	4.248867
January 8, 1997	1029	0.00541	11.3584
April 3, 1997	1089	0.001256	2.979467
June 3, 1997	1129	0.002518	4.269554
October 28, 1997	1233	0.007194	5.900921
April 30, 1998	1356	-0.00443	-3.19979
June 16, 1998	1385	0.025035	0.577467
September 3, 1998	1436	0.309726	6.287022
December 28, 1998	1513	0.064611	5.569194
5/13/1999	1602	0.017494	4.926851
8/9/1999	1663	0.024309	7.969325

Win=70

		Day Dummy	T-Stat
December 18, 1992	88	-1.15241	-14.3591
September 23, 1993	211	0.124197	20.56442
January 20, 1994	289	-0.06927	-9.5903
June 9, 1994	385	0.005018	2.081986
October 11, 1994	472	0.208556	12.73504
December 21, 1994	521	-0.00472	-2.98874
July 31, 1995	671	0.011548	3.865888
September 7, 1995	699	0.003048	4.051643
February 27, 1996	817	0.002499	4.053302
May 17, 1996	871	0.004093	4.464438
January 8, 1997	1029	0.005353	11.65853
April 3, 1997	1089	0.001234	3.123365
June 3, 1997	1129	0.002529	4.291794
October 28, 1997	1233	0.007234	6.171222
July 3, 1998	1398	-0.00974	-1.74977
September 3, 1998	1436	0.307188	6.484399
December 28, 1998	1513	0.064305	5.908307
5/13/1999	1602	0.017526	5.270394
8/9/1999	1663	0.024641	8.346993

Win=80

		Day Dummy	T-Stat
December 18, 1992	88	-1.15295	-15.1131
May 18, 1993	127	0.024247	1.77139
September 23, 1993	211	0.118062	12.44269
January 21, 1994	290	0.072471	6.501806
October 11, 1994	472	0.208585	13.38976
December 21, 1994	521	-0.00464	-2.94074
July 31, 1995	671	0.011559	3.986912
September 7, 1995	699	0.003033	2.210634
February 27, 1996	817	0.00248	4.025619
May 17, 1996	871	0.003993	4.442735
January 8, 1997	1029	0.004892	8.849769

April 3, 1997	1089	0.001111	1.789506
June 3, 1997	1129	0.002387	3.847174
October 28, 1997	1233	0.007139	6.304843
August 18, 1998	1430	0.042245	1.121522
September 3, 1998	1436	0.30342	6.635154
January 19, 1999	1524	0.048235	3.328756
8/9/1999 1663		0.025087	8.01534

Win=90

		Day Dummy	T-Stat
December 18, 1992	88	-1.15706	-15.8781
September 23, 1993	211	0.117748	12.77035
March 3, 1994	319	0.007961	1.190132
October 11, 1994	472	0.208559	14.01374
December 21, 1994	521	-0.00489	-3.22437
July 31, 1995	671	0.011466	4.103372
September 7, 1995	699	0.002715	2.944619
May 17, 1996	871	0.00401	4.648428
January 8, 1997	1029	0.005252	10.49751
June 3, 1997	1129	0.001734	1.993267
October 28, 1997	1233	0.007309	6.537139
June 16, 1998	1385	0.024539	0.662137
September 3, 1998	1436	0.3038	6.955067
January 19, 1999	1524	0.050408	3.797288
8/9/1999 1663		0.024142	7.205248

Win=100

		Day Dummy	T-Stat
December 18, 1992	88	-1.14923	-16.771
September 23, 1993	211	0.117956	13.32329
October 11, 1994	472	0.208515	14.61531
July 31, 1995	671	0.011459	4.246363
September 7, 1995	699	0.003042	4.069749
May 17, 1996	871	0.004032	4.805642
January 8, 1997	1029	0.005185	10.61932
June 3, 1997	1129	0.001739	2.076915
October 28, 1997	1233	0.007295	6.819062
June 17, 1998	1386	-0.0356	-1.08061
September 3, 1998	1436	0.303877	7.247904
8/9/1999 1663		0.024863	6.977384

Win=110

		Day Dummy	T-Stat
December 18, 1992	88	-1.16029	-17.27
September 23, 1993	211	0.117615	13.77845
October 11, 1994	472	0.208558	15.19531
July 31, 1995	671	0.011475	4.410053
February 27, 1996	817	0.002577	3.627913
May 17, 1996	871	0.004034	4.982467
January 8, 1997	1029	0.005013	9.34507

October 28, 1997	1233	0.007263	7.006206
June 16, 1998	1385	0.023138	0.678529
September 3, 1998	1436	0.304139	7.542856
8/9/1999 1663		0.025714	7.383386

Win=120

		Day Dummy	T-Stat
December 18, 1992	88	-1.16097	-17.9218
September 23, 1993	211	0.117804	14.28598
October 11, 1994	472	0.208494	15.73582
July 31, 1995	671	0.011456	4.557801
February 27, 1996	817	0.002586	3.816516
May 17, 1996	871	0.004029	5.121928
January 8, 1997	1029	0.00477	8.549123
October 28, 1997	1233	0.007104	7.126099
June 16, 1998	1385	0.022262	0.677871
September 3, 1998	1436	0.304139	7.819039
8/9/1999 1663		0.025026	7.286186

Win=130

		Day Dummy	T-Stat
December 18, 1992	88	-1.16145	-18.5487
September 23, 1993	211	0.118182	14.77361
October 11, 1994	472	0.208746	16.27277
July 27, 1995	669	-0.01066	-4.32947
January 3, 1996	779	-0.00268	-2.59378
May 17, 1996	871	0.004056	5.135158
January 8, 1997	1029	0.004682	8.264106
October 28, 1997	1233	0.00719	7.205042
June 16, 1998	1385	0.022232	0.70039
September 3, 1998	1436	0.304176	8.087686
8/9/1999 1663		0.024899	7.221932

Win=140

		Day Dummy	T-Stat
December 18, 1992	88	-1.16183	-19.1552
September 23, 1993	211	0.118386	15.20828
October 11, 1994	472	0.208702	16.7778
July 27, 1995	669	-0.01055	-4.30003
May 17, 1996	871	0.004081	5.170059
January 8, 1997	1029	0.005133	11.21632
October 28, 1997	1233	0.007226	7.875693
June 29, 1998	1394	-0.0082	-2.04325
September 3, 1998	1436	0.304386	8.35146
8/9/1999 1663		0.024654	7.145392

Win=150

		Day Dummy	T-Stat
December 18, 1992	88	-1.16191	-19.7028
September 23, 1993	211	0.117724	15.54819
October 11, 1994	472	0.208811	17.28762

July 27, 1995	669	-0.01054	-4.41338
May 17, 1996	871	0.004097	5.319257
January 8, 1997	1029	0.004493	7.927217
October 28, 1997	1233	0.006476	4.923363
September 3, 1998	1436	0.304655	8.610153
8/9/1999	1663	0.024457	7.134285

Win=160

		Day Dummy	T-Stat
December 18, 1992	88	-1.1651	-19.943
September 23, 1993	211	0.117634	15.97428
October 11, 1994	472	0.208773	17.76915
July 27, 1995	669	-0.01049	-4.49248
January 3, 1996	779	-0.00227	-3.01522
May 17, 1996	871	0.004038	5.0816
June 3, 1997	1129	0.001681	2.227629
October 28, 1997	1233	0.006528	4.779236
September 3, 1998	1436	0.304773	8.8558
8/9/1999	1663	0.024237	7.086973

Win=170

		Day Dummy	T-Stat
December 18, 1992	88	-1.166	-20.5662
September 27, 1993	213	0.086209	4.73378
October 11, 1994	472	0.211694	18.37688
July 31, 1995	671	0.011436	5.337681
May 17, 1996	871	0.004061	5.184611
October 28, 1997	1233	0.007333	9.655812
June 17, 1998	1386	-0.02623	-0.99081
September 3, 1998	1436	0.305021	9.093419

Win=180

		Day Dummy	T-Stat
December 18, 1992	88	-1.16638	-21.0359
February 1, 1994	297	-0.08594	-5.14474
October 11, 1994	472	0.211627	18.82959
July 31, 1995	671	0.011656	5.667651
May 17, 1996	871	0.004061	5.310113
October 27, 1997	1232	-0.00468	-6.95105
October 28, 1997	1233	0.008872	2.527943
September 3, 1998	1436	0.305152	9.32823