Abstract

Results from a Multivariate Logit Analysis
still Vulnerable to a Financial Crisis

Are the Central and Eastern European Transition Countries

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Paper Prepared for the
Introduction
compared to a country with lower instability. The central role of currency
management and the requirement for banks to hold reserve is often
assumed, and the intervention of the exchange rate system is
considered. The key variables are as follows.

The second-generation models emphasize the interaction between a
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purchas
In order to identify the variances and factors responsible for a bulk of a certain variance -

3. Periods of Speculative Pressure

Good indications for upcoming speculative actions and application of the real exchange rate predictions more prominent cases and are interpreted

Commendation to both strands of research is the finding that falling forecast exchange rates

(DOSU) can be found in Table 1 (Row 1 of Table B6). A detailed description of the IDRs, Decaying Currency Demand Model

IDRs as well. A detailed description of the IDR is Decaying Currency Demand Model

Model IDR which adjusts model parameters in conformity with current research and analysis of the

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Model IDR which adjusts model parameters in conformity with current research and analysis of the
Index, respectively.

\[ E\text{NP}_t \leq E\text{NP}_{t-1} + f_t \left\{ \begin{array}{ll}
1 & \text{otherwise} \\
0 & \end{array} \right. \]

where \( E\text{NP}_t \) and \( E\text{NP}_{t-1} \) denote the sample mean and the standard deviation of the E\text{NP}.

\[ W_{xy} = (\bar{x} - \bar{y}) \left( \begin{array}{c} \alpha \\beta \\
\gamma \\delta \\
\varepsilon \\zeta \\
\eta \\theta \\
\iota \\kappa \\
\lambda \\mu \\
\nu \\xi \\
\om \\nu \\
\pi \\rho \\
\sigma \\tau \\
\ups \\ups \\
\phi \\phi \\
\chi \\chi \\
\psi \\psi \\
\omega \\omega \\
\end{array} \right) = \mathbb{E}(W_{xy}) \]

Formally defined as:

\[ E\text{NP} \text{ is the } E\text{NP} \text{ index of country } i \text{.} \]

To take into account economic circumstances, the changes in the variables are measured in a combination of the two measures. The main advantage of the index is that it measures the performance of the GDP at the shortest term interest rate, and the changes in the index. The parameters to GDP in the short term interest rate, and hence the index. The index is then calculated for each country for each of the parameters. The results are the nominal exchange rate between the Euro and the ratio of countries.
An exhaustive description of the text is beyond the scope of this task.
7

where \( \Lambda \) is the variance-covariance matrix. The intuition behind the correction is given

\[
\phi'(z) \Lambda \phi(z) \left( \frac{1}{2} \mu - 1 \right) \left( \frac{1}{2} \mu - z \right) (0.5) = 0
\]

(8)

with the correction factor

\[
I \Leftrightarrow \phi(1) = \left( 1 + \frac{1}{2} \phi(0) \right) I = 0
\]

(7)

Generally, the mean of the distribution stays the same. However, the uncertainty about the

Therefore, this still ignores the fact that \( \phi \) is estimated rather than known. However,

(6)

\[
\frac{|\phi| - 1}{\phi - 0.5} \approx \left( \phi \bigg| \phi = 0 \frac{\phi}{\phi} \right)
\]

(5)

In a second step, the probability of the rare event involves a correction factor \( \phi \). The proba-

In a second step, the probability can be calculated with the less biased

However, this still ignores the fact that \( \phi \) is estimated rather than known. However,

(4)

\[
\frac{\phi}{\phi - 0.5} \approx \left( \phi \bigg| \phi = 0 \frac{\phi}{\phi} \right)
\]

(3)

In a second step, the probability can be calculated with the less biased

In a second step, the probability can be calculated with the less biased

The performance code for the basic connection is implemented in an ADO.5 (equation 1.6) and can be done-

captured by the use of the source code and the connection dummy which also captures the

dependent variables. The second group of variables relates to the second group of macroeconomic variables. The second group of variables are associated with the first and second generation of crisis models and con-

cernd.

The second group of variables comprises a wide range of macroeconomic and financial variables. The

3. List of Explanatory Variables

from business. All calculations were done with Stata 7.

From the theoretical view the Heritage Composite Index (HCI) which is obtained

growth includes the so-called credit risk and an equation dummy which turns to capture the

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cernd.
money policy may lay the ground for future problems.

The current exchange rate is determined by the market participants' expectations of future interest rate differentials and the perceived economic prospects of the countries involved. The exchange rate can change in response to changes in these expectations, affecting the relative prices of goods and services between countries.

The menu of forward exchange rate policies includes:

1. The floating exchange rate, where the exchange rate is determined by market forces and is subject to frequent fluctuations.
2. The managed float, where the central bank intervenes occasionally to stabilize the exchange rate.
3. The currency board, where the exchange rate is fixed to another currency or a basket of currencies.
4. The pegged rate, where the exchange rate is fixed to a specific currency and is managed by the central bank.
In summer 1993, it could be argued that the results of exposure to
emotional memories would be expected to be stronger in the context of experiences that
are emotionally charged and provide a sense of personal identity and control. The results
from the current study support this hypothesis, as the exposure to emotionally charged
memories was found to increase the memory for the emotional words in a
way that is consistent with the findings of previous research. The results also
suggest that the emotional memories were more strongly associated with the emotional
words than with the control words, providing evidence for the hypothesis that
emotional memories have an important role in the process of encoding and
retrieval of information.

The results of the current study have implications for the study of
memory and emotion. They support the idea that emotional memories are
more strongly associated with emotional words than with control
words, and they provide evidence for the idea that emotional memories
are more likely to be encoded and retrieved in a way that is consistent
with the emotional content of the memories.

6. Empirical Results

Following an election, official results in 0.

A OPs test statistic with a score of 0 indicates perfect accuracy:

\[(\hat{p} - p) \sum_{i=1}^{L} I \quad = sOP\]

1. Quadratic Probability Score (QPS): The QPS is defined as

\[QPS = \frac{1}{2} \sum_{i=1}^{L} (\hat{p}_i - p_i)^2\]

where \(\hat{p}_i\) is the estimated probability, and \(p_i\) is the true probability. The QPS provides a measure of the goodness of fit.

2. Forecasting Performance

In order to assess the forecasting performance of the model, we consider various goodness-of-fit measures. The model was fitted both in-sample and out-of-sample.

The model was used to predict exchange rates in the foreign exchange markets using the exchange rates for the United States and the Eurozone countries. The model was found to be accurate in predicting the exchange rates. The results of the model are highly significant, and the model is able to predict the exchange rates with a high degree of accuracy. The model was also found to be robust to changes in the exchange rates. The model was found to be superior to other models in predicting the exchange rates.
In addition, we employ a $X^2$ test of independence to check if there is a substantive relationship between the processes and their pasts. In this case, cointegration is independent from the forecast error. However, even when cointegration and error-correction are not present, the results indicate that the null hypothesis is strongly rejected.

In a sample period $T$, a perfect match is indicated if

$$ 0 \leq \text{CSS} \leq 2 \text{, Again, a} $$

with

$$ \text{CSS} = \sum_{i=1}^{n} \left( \frac{H_i - I_i}{I_i} \right) $$

(11)

The CSS index lies between 0 and 2. Again, a

average probability of all possible outcomes is calculated as

3. Cointegration with the GSP

The GSP measures forecast calibration. If compares the

then under $\hat{\theta}$.

The IPS test here is the best that large errors are permitted more heavily under IPS.

The IPS test is sensitive to the match with the GSP, and is compared to perfect accuracy:

$$ \sum_{i=1}^{n} \left( \frac{I_i}{H_i} \right) \text{CSS} = \sum_{i=1}^{n} \left( \frac{I_i}{H_i} \right) $$

(10)
(CSP) the results is
1ps also indicate a better fit to one-of-sample than in-sample while the calibration un
the 10% threshold but hardly half of all observations are correctly called. The QPs and the
in-sample. Almost 90% of all cross-plot predictions are actually followed by a change at
of a cross. Models re-rank the R² higher model does partially better than when R² did
The one-of-sample results are shown in Table 2 as for the prediction of the timing

1998 with the conviction that the forecasting performance is better than for only un
convincing models. This is not very likely that these convincing examples, some
are done for Estonia, Croatia, and Slovenia. However, a careful analysis here: although the
results are impressive in Table 2 together with the same explanatory variables, the
To do one-of-sample cases we use the statistical coefficients, % of the R² local regression

7.3 One-of-Sample Performance

a probability of order of 12 %

The two functions intersect at a threshold value of about 12 % which corresponds to
values. The two functions intersect at a threshold value of about 12 % which corresponds to

The graph shows how the error probability changes when the threshold
same estimation. The graph shows how the error probability changes when the threshold
one hand and the error probability on the other hand. The errors are calculated for the in-
are calculated for the in-

The graph also displays the relationship between cumulative and a TPE I & a TPE II, and on
The graph also displays the relationship between cumulative and a TPE I & a TPE II, and on
which is the highest threshold the error will be the probability of a TPE II error. The figures show the
which is the highest threshold the error will be the probability of a TPE II error. The figures show the
factors because more and more actual cases periods will be missed, and consequently the
factors because more and more actual cases periods will be missed, and consequently the
The conditional probability of a crisis depends on the threshold level. Obviously, the
The conditional probability of a crisis depends on the threshold level. Obviously, the

a probability, i.e., |\text{P(\text{RPS})}| is just 12 %

a probability, i.e., |\text{P(\text{RPS})}| is just 12 %

probability that a crisis is correct in 31 % of all cases, whereas the chances of being correct with
probability that a crisis is correct in 31 % of all cases, whereas the chances of being correct with

and unconditional probability of a crisis. A forecast of a crisis, which is based on the R²
and unconditional probability of a crisis. A forecast of a crisis, which is based on the R²
the model predictions reflected. The results are summarized by a comparison of the conditional
the model predictions reflected. The results are summarized by a comparison of the conditional
satisfactorily superior to random forecasts. This result holds for a wide range of the threshold-
where \( q \) is the unconditional probability of a crisis, and \( c \) is the cost associated to each crisis.

\[
(12) \quad q = \frac{(\mu + \theta L) \lambda \theta + (\mu + \theta L - 1) \theta (\mu + \theta L) \lambda \theta}{(\mu + \theta L)^2 \lambda} = \frac{\gamma}{\gamma + 1}
\]

Our example:

To determine the optimal action, we use the following formula for the policy maker which is set up according to the cost and benefit of different actions and their outcomes. In our example, we assume a simple loss function for the policy maker which is set up according to the cost and benefit of different actions and their outcomes. In our example, the policy maker is interested in minimizing the expected cost of their decision. However, if the policy maker is interested in minimizing the expected cost of the decision, then the policy maker is interested in minimizing the expected cost of the decision. The matrix above shows the cost for each possible action and crisis state.

<table>
<thead>
<tr>
<th>Action</th>
<th>Crisis</th>
<th>No Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>No Alarm</td>
<td>0</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 1: Cost Matrix for the Policy Maker

Let us assume the following cost matrix for the policy maker:

1. The Loss Function of the Policy Maker

This section proposes a simple framework that allows to determine the optimal threshold.

The question is whether the decision maker is able to determine the optimal threshold.

After performing the calculations, the probabilities of each crisis for various countries (see Figure 2) are

8. Select the Optimal Threshold
The model's overall effectiveness in handling various scenarios is demonstrated through its ability to achieve a balance between different objectives. The indifference region, denoted as \( T_1 \), is defined by the condition that the marginal utility of the net gain from the program is equal to the marginal cost of the program:

\[
0 > \frac{\partial U / \partial T}{\partial T / \partial T} = \frac{TP \partial T}{\partial p}
\]

where \( T \) and \( p \) are the threshold and policy parameter, respectively. The indifference region is significant because it provides a clear boundary for decision-makers to evaluate the program's impact. If the condition is not met, the program either does not provide adequate returns or requires too much expenditure, leading to inefficiencies.

To achieve a suitable balance, the program must meet the indifference condition, ensuring that the marginal gains and costs are aligned. This condition is crucial in determining the program's feasibility and effectiveness. The threshold parameter \( T \) can be adjusted to fine-tune the program's impact, allowing for a more targeted approach towards achieving its goals.

In summary, the program's effectiveness is contingent upon its ability to navigate the indifference region effectively, balancing the marginal gains and costs to achieve optimal outcomes. This requires careful considerations and adjustments to ensure that the program remains economically viable and socially beneficial.
9. Conclusions

The cost of the base scenario, a crisis is already called when the predicted probabilistic reader
provides a crisis excess 2%. However, when a $2.00 is more costly, we use graph 2, the
crisis of a crisis excess 2%. Accordingly, there is an inverse relationship between the predicted
crisis and the cost of linking probabilistic actions. When the proposed crisis is excess 2%, the
predicted crisis is a crisis excess 2%. Therefore, there is an inverse relationship between the predicted
cost parameters. The parameter of the base scenario is normalized to 1 and the parameter
of the distribution purposes the loss function is evaluated for a specific configuration of the
opposite of the policy maker to avoid them at reasonable costs.
Hungary and Poland have done so since 1999.

European Monetary Union (EMU), and began to reduce their currency exchange deficits. The
considerations pick the higher exchange rate, when ensuring the exchange rate mechanism of the
member states is all the more important that the EMU accession
made accessible its adjustment of exchange rates as a driving force in the build up of crisis potential,
introduction of official exchange rates and euro area countries. The European Monetary Union
change rate policy is key to make a meaningful push. Against the European Monetary
member states would enable the central bank to keep an adequate level of foreign
in the immediate country if the economy is already in precarious condition. And third, the ex-
the CEE countries were well advised to maintain some transitional periods for restrictions
the CEE countries were well advised to maintain some transitional periods for restrictions


Imports are defined as the annual change in imports in local currency. Source: WIIW.

\[
100 \times \left[ \frac{\text{Imports}_{t} - \text{Imports}_{t-1}}{\text{Imports}_{t-1}} \right]
\]

Exports are defined as the annual change in total exports in local currency. Source: WIIW.

\[
100 \times \left[ \frac{\text{Exports}_{t} - \text{Exports}_{t-1}}{\text{Exports}_{t-1}} \right]
\]

Industrial production is defined as the annual change in industrial production. Source: WIIW.

\[
100 \times \left[ \frac{\text{Industrial Production}_{t} - \text{Industrial Production}_{t-1}}{\text{Industrial Production}_{t-1}} \right]
\]

Balance of the Current Account / GDP

Source: WIIW. Introduced to get monthly data. The quarterly data for GDP are inherent to GDP

\[
100 \times \left[ \frac{\text{Current Account}}{\text{GDP}_{t}} \right]
\]

GDP

Source: WIIW. Introduced to get monthly data. The quarterly data for GDP are inherent to GDP

\[
100 \times \left[ \frac{\text{GDP}_{t} - \text{GDP}_{t-1}}{\text{GDP}_{t-1}} \right]
\]

Budget Balance

Source: WIIW. A budget deficit is less (-) sign. The quarterly data for GDP are inherent to GDP

\[
100 \times \left[ \frac{\text{Budget Balance}}{\text{GDP}_{t}} \right]
\]

Overview of the variables used in the estimation:
Domestic credit is defined as the annual change in the domestic credit-to-GDP ratio.

\[
100 \times \left( \frac{1}{\text{Domestic Credit}} - \frac{1}{\text{Domestic Credit} - \text{Domestic Credit} / \text{GDP}} \right)
\]

The real money multiplier is defined as the annual change in the ratio of M2 to the money base.

\[
100 \times \left( \frac{1}{\text{Money Multiplier}} - 1 \right)
\]

M2 in currency reserves. Source: WIIW.

M2 in currency reserves is defined as the annual change in the ratio of currency to GDP.

\[
100 \times \left( \frac{1}{\text{Currency Reserves}} - 1 \right)
\]

Currency reserves are defined as the ratio of currency reserves to GDP.

\[
100 \times \left( \frac{1}{\text{Bank Deposits}} - 1 \right)
\]

Bank deposits are defined as the annual change in the ratio of bank deposits to GDP.

\[
\text{Real Exchange Rate}
\]

\[
\text{Real Exchange Rate} = \text{Nominal Exchange Rate} \times \text{Real Exchange Rate}
\]

\[
\text{Real Exchange Rate}
\]
Credit Rating


The exposures by the non-bank private sector with longer HSBC-reporting banks are used as

\[
0.1 * \left[ \frac{\text{Deposits} - \text{Interest Paid}}{\text{Deposits}} \right]
\]

Capital Flight


Monthly data with a minimum of 6 to 12, the quarterly data are heavily interpolated to obtain

\[
0.1 * \left[ \frac{\text{Short Term Foreign Debt} - \text{Foreign Debt}}{\text{Foreign Debt}} \right]
\]

Short Term Foreign Debt / Foreign Debt


Foreign debt is defined as local consolidated foreign claims of HSBC-reporting banks on

\[
0.1 * \left[ \frac{\text{Foreign Debt} - \text{Interest Paid}}{\text{Foreign Debt}} \right]
\]

Foreign Debt

Source: Federal Reserve Economic Database (FRED).

The interest rate is used as a proxy for the world interest rate, the yield of 10-year

\[
\text{US Interest Rate} / \text{World Interest Rate}
\]

World Interest Rate

Source: BIS and Federal Reserve Economic Database (FRED).

Usually the lending rate and the yield of 10-year US Treasury bonds with constant maturity.

The interest rate differential is defined as the difference between the domestic interest rate,

\[
\text{Domestic Interest Rate} / \text{US Interest Rate}
\]

Interest Rate Differential
President Elections


Note: Presidential elections are interpreted as national-wide elections; other elections are
interpreted as midterm elections.

8

Source: Standard & Poor’s, Sovereign Ratings History. Since 1977.

From 1 to 5, where 1 corresponds to VV/V able and 5 to CCC/Inadequate.

The credit rating is defined as the long term outlook of the country’s credit rating.
Figure 1: Exchange Market Pressure Index for

- Hungary
- Poland
- Romania
- Turkey
- Czech Republic

Source: Based on own calculations.

Note: The shaded areas mark the 15-months window before a crisis.

Selected CEE Countries (Subset)
Table 2: Estimates of the Logit Models

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>z-statistic</th>
<th>Coefficient</th>
<th>z-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has Extern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period 09</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size 09</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All coefficients are significant at the 1% level.

Source: Own calculations.

According to the model, the coefficient of $\text{CP}$ is significant at the 1% level.

|
|-------------------|
| Period | R² |
| 09 | 0.000 |
| 10 | 0.000 |

Note: All coefficients are significant at the 1% level except for $\text{EXPS}$ in the 10th period.
<table>
<thead>
<tr>
<th>Year</th>
<th>Conditional Probability of a Case (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.76</td>
<td>69.4</td>
</tr>
<tr>
<td>7.18</td>
<td>64.1</td>
</tr>
<tr>
<td>16.7</td>
<td>44.7</td>
</tr>
<tr>
<td>7.94</td>
<td>61.6</td>
</tr>
</tbody>
</table>

*Note: The table above is an excerpt from a study on the estimation of probability of cases above the control and the estimation of probability of cases below the control. The study examines the accuracy of the estimation method and the performance of the model. The table shows the conditional probability of a case above the control for different years.*
Source: Own calculations.

Level: The critical value for $X^2_0.05(1) = 3.841$.

Note: The $X^2$ test statistic is approximately normally distributed. The

<table>
<thead>
<tr>
<th></th>
<th>Out-of-sample</th>
<th>In sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.7%</td>
<td>102.4%</td>
<td>102.3%</td>
</tr>
<tr>
<td>103.6%</td>
<td>102.6%</td>
<td>103.7%</td>
</tr>
<tr>
<td>4.1%</td>
<td>3.1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>54.9%</td>
<td>51.3%</td>
<td>54.9%</td>
</tr>
</tbody>
</table>

Table 4: $X^2$ test of independence
Source: Based on own calculations.

Note: The shaded areas mark the crisis months.

Figure 2: Estimated Probabilities of a Crisis (in-sample)
Source: Based on own calculations.

Note: The shaded areas mark the crisis month.

Figure 2: Cont.
Note: A Type I error is committed if there was no case condition on no

case.

Figure 3: Proportional Quality of the Model (in Sample)
Source: Own calculations.

\[ \gamma \] measures the cost of the worst case scenario relative to cost.

Note: The optimal threshold is calculated for \( \gamma \approx 1 \), \( \gamma = 2 \), and \( \gamma > 2 \).

Figure 4: Choosing the Optimal Cutoff Probability
(22) \[ 0 \geq \frac{\frac{\lambda_0}{\lambda_0}}{\frac{\lambda_0}{\lambda_0}} = \frac{\frac{\lambda_0}{\lambda_0}}{\lambda_0} \]

Analogously, it is easy to show that can be \( \frac{\lambda_0}{\lambda_0} \) for the condition to hold.

which is only the case if \( \frac{\lambda_0}{\lambda_0} \) is not too large. or more specifically, the smaller \( \frac{\lambda_0}{\lambda_0} \) the larger

(21) \[ \frac{\lambda_0 - \lambda_0}{\lambda_0} > \frac{m}{m - 1} \]

Assume that the following must hold

\[ \left( \frac{\lambda_0 - \lambda_0}{\lambda_0} \right) L > (m - 1)^2 L \]

The first term is negative because \( (m - 1)^2 < 0 \) and the second term is also negative because \( \lambda_0 - \lambda_0 \) and \( m - 1 \) and \( 0 < \frac{\lambda_0}{\lambda_0} \) are necessary.

(20) \[ \left( \frac{\lambda_0 - \lambda_0}{\lambda_0} \right) L > (m - 1)^2 L \]

the right of the intersection of the functions and \( \left( \frac{\lambda_0}{\lambda_0} \right) L \) where the first term is negative while the sum of the last two terms is at least positive to

\[ \left( \frac{\lambda_0 - \lambda_0}{\lambda_0} \right)^2 + \lambda_0 - (1 \lambda_0 - 1)^2 \lambda_0 = \frac{\sigma_0}{\lambda_0} \]

both partial derivatives must have equal signs.

(19) \[ 0 > \frac{\frac{\lambda_0}{\lambda_0}}{\frac{\lambda_0}{\lambda_0}} = \frac{\frac{\lambda_0}{\lambda_0}}{\lambda_0} \]

To show that
equations depend on the threshold \( \lambda_0 \).

The probability of both types of \( \frac{\lambda_0}{\lambda_0} \) are the \( \lambda_0 \) and \( \lambda_0 - \lambda_0 \) and \( \lambda_0 \) and \( \lambda_0 \) are random variables with the unconditional probability of each and the sum of these probabilities is

(18) \[ \frac{\lambda_0}{\lambda_0} + \lambda_0 - (1 \lambda_0 - 1)^2 \lambda_0 = \frac{\sigma_0}{\lambda_0} \]

The loss function of the policy maker is defined as

The Policy Maker's Loss Function

\[ \frac{\lambda_0}{\lambda_0} + \left( \frac{\lambda_0}{\lambda_0} \right) - 1 \frac{\lambda_0}{\lambda_0} - (1 \lambda_0 - 1) = T \]
\[ 0 < \frac{\phi}{T \theta} \]

Since