**Financial Crises in Retrospect of Turkish economy:
Evidence from a probit model 1970-2018**
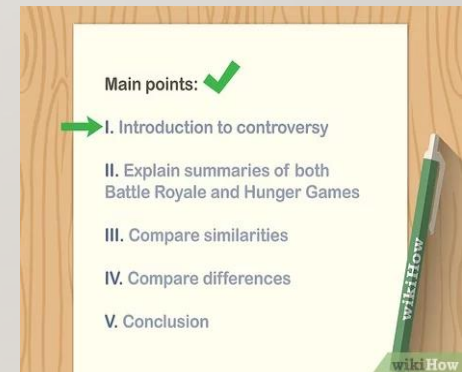
By

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OUTLINE OF THE STUDY

- The aim of the study

- A brief overview of Turkish Economy Facing Crisis

- The modelling framework and Methodology

- Data description

- Interpretation of the empirical results

- Conclusion

- Policy implication

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THE AIM OF THE STUDY

- This study empirically investigates the determinants of financial crisis which occurred in the Turkish economy in 1994, the late 1997 and 2007 respectively. A probit model is conducted by the main tool to identify the leading indicators of financial crisis using a sample of annual data covering the period 1970-2018.

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A BRIEF OVERVIEW OF TURKISH ECONOMY FACING CRISIS

- Turkey has been among those economies which have faced relatively higher frequency of crises in the period following the liberalization of capital flows since the liberalization of capital flows in 1989, there have been at least three major currency crises (i.e., 1994; 1997; 2007).

- Historically the major liberalization reform of Turkish economy started in 1980 under the surveillance of IMF whose standard stabilization package in 70's and early 80's consisted of the following policy measures (Taylor, 1983).

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A brief overview of Turkish Economy Facing Crisis

- Contractionary monetary policy

- Devaluation of domestic currency

- Abolishing totally or partially government intervention in market prices

- Internal liberalization of the financial system

- External liberalization aimed at reducing the degree of protection and barriers in foreign trade and capital flows

- Reducing the role of crawl of domestic currency over time

- To reduce the inertia in inflation, it may be advised to temporarily freeze the wages and salaries.

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A brief overview of Turkish Economy Facing Crisis

- Turkey has experienced severe financial crises and fallen into a significant recession since the 1980s.

- Turkey is a historical gateway from the ancient Silk Road to new markets. It is becoming a powerful local point as a cultural and a political intermediary as well as a trade centre of growing importance.

- Turkey is bound to become an important commercial and financial centre in the region and is one of the most industrialised nations outside of the U.S .A, Western Europe and Japan.

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A brief overview of Turkish Economy Facing Crisis

- Turkey's economy (in terms of GDP) is now the 18th largest in the world. It has a rapid growing free-market economy, and its strategic location provides an excellent base for economic activities throughout Central and Eastern Europe.

- It is very important to understand what may cause the financial crisis.

- The most common view is that the crisis reflects fundamental macroeconomic and microeconomic weaknesses in the most affected economies.

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The modelling Framework and methodology

•Probit model is used as the main tool to identify the leading indicators of currency crisis.

•The variable to be explained (y_t) which takes on the value of 1 if a currency crisis occurred during the year and 0 otherwise. The formula is used as following:
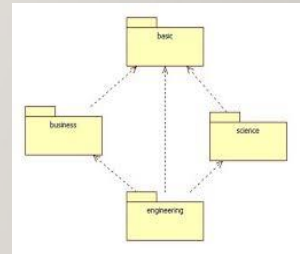
normal cumulative distribution function

$$\mathrm{Pr}ob(crisis\ t) = prob(y_t) = \Theta(\beta'X_t) = \int_{\infty}^{\beta'X_t} \frac{1}{\sqrt{2\Pi}} \exp\{-1/2t^2\}dt$$

vector of coefficients

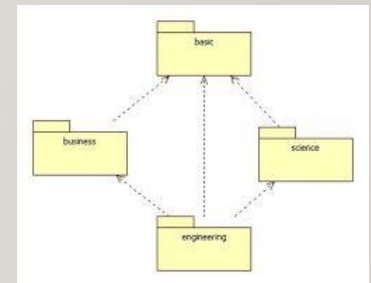vector of explanatory variables

$$Y_t^* = \beta'X_t + U_t$$

normally distributed error term with zero mean and unit variance

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DATA DESCRIPTION-DEPENDENT VARIABLE

This methodology explains that the probit model uses the discrete dependent variable (e.g., Dummy-the Turkish market pressure index/DUMMPI) and permits estimation of the probability of a speculative attack. The discrete dependent variable is constructed as follows

- **Turkish Market Pressure Index** DUM is constructed as dependent variable for the OLS as well as probit estimation.

- DUMMPI = 1 if MPI > µMPI + 1.5*σ MPI, and 0 otherwise;

$$MPI_t = \frac{\%\Delta_{e_t}}{\sigma_{\Delta_{e_t}}} + \frac{\Delta_{i_t}}{\sigma_{\Delta_{i_t}}} - \frac{\%\Delta_{r_t}}{\sigma_{\Delta_{r_t}}}$$

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DATA DESCRIPTION- THE EXPLANATORY VARIABLES

- *Seignorage (ARM)*

- the annual reserve money as a percentage of GDP (+)

- *Real Exchange Rate Misalignment (MISRER) (+)*

- negative of the percentage deviation of the RER from its average
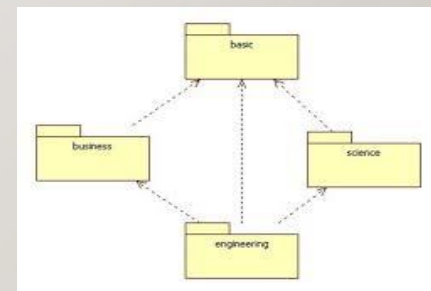
- **Current Account Balance (CABR)** (-)

-as a percentage of GDP

- **Per Capita Income Growth (CAPG) (-)**

- **Terms Of Trade Shock (TT) (-)**

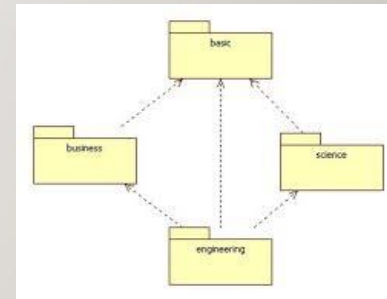**-** as the annual percentage change in the ratio of unit value of export to unit value of import

- **M2/Reserves (M2R) (+)**

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DATA DESCRIPTION-MPI

- In order to determine the dummy market pressure index in the Turkish economy, it is vital to construct a measure of exchange rate pressure, termed the Market Pressure Index (MPI), as follow:

$$MPI_t = \frac{\%\Delta_{e_t}}{\sigma_{\Delta_{e_t}}} + \frac{\Delta_{i_t}}{\sigma_{\Delta_{i_t}}} - \frac{\%\Delta_{r_t}}{\sigma_{\Delta_{r_t}}}$$


- Where e is the turkish exchange rate against the US dollar and Δ denotes the growth in the exchange rate, interest rate and non-gold international reserve respectively, i is the interest rate of Central bank of Turkey and r is the non gold international reserves of Central bank of Turkey . The changes in exchange rate, interest rate and reserves are weight by their respective σ (standard deviation). (Eichengreen, Rose, & Wyplosz, 1996)

CONSTRUCTION OF MPI

- It is worth stressing that the discrete (or dichotomous) dependent variable under this study is constructed in the following form rather than using the standard procedure in the literature giving 1 for crisis years and 0 otherwise.

$$Y_{MPI} = 1\ if\ MPI \geq \mu_{MPI} + 1.5\,\alpha_{MPI}$$

- See (Eichengreen, Rose, & Wyplosz, 1996) for more details about the construction of MPI index.

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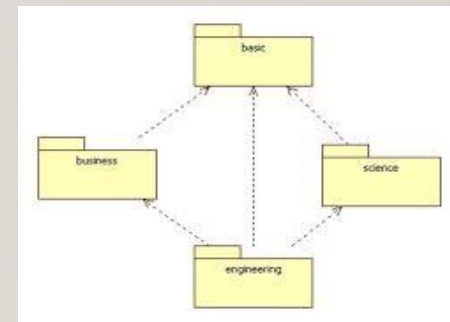
INTERPRETATİON OF THE EMPIRICAL RESULTS

- Correlation Matrix for OLS estimation

	DUM	ARM	MISRER	CAPG	CABR	TT	M2R
DUM	1.00						
ARM	0.74	1.00					
MISRER	-0.39	0.46	1.00				
CAPG	0.53	0.55	0.42	1.00			
CABR	-0.47	-0.17	-0.21	-0.16	1.00		
TT	-0.64	-0.41	-0.81	0.25	-0.37	1.00	
M2R	-0.51	0.27	0.07	-0.65	-0.09	0.22	1.00

- We can conclude that the correlations among the variables do not suffer from multicollinearity problem since our estimated results are acceptable from the statistical point of view.

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THE EMPIRICAL RESULTS-A PROBIT MODEL

Variables	Model(1)	Model(2)	Model(3)	Model(4)
ARM	1.13 (0.80)			
MISRER	0.03 (1.04)	0.23 (1.13)		
CABR	-0.15 (-1.47)	-0.14 (-1.39)	-0.11 (-1.18)	
CAPG	-0.26 (-1.62)	-0.28 (-1.93)**	-0.32 (-2.02)**	-0.31 (-2.08)*
TT	-0.11 (-2.11)*	-0.09 (-2.04)*	-0.05 (-2.15)*	-0.05 (-2.12)*
M2R	0.14 (1.98)**	0.12 (2.02)**	0.15 (1.85)**	0.09 (2.05)*
Log Likelihood	-14.7422	-15.0639	-15.6748	-16.4034
Goodness of Fit	0.76	0.73	0.66	0.59
Pseudo-R^2	0.27	0.26	0.23	0.19

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INTERPRETATION OF THE EMPIRICAL RESULTS

Source: Results are from the calculation by using software-microfit 5.5
Note: * indicates statistical significant at a 5%, ** indicate significant at a 10% and the others are not statistically significant at conventional levels.

Variables	Result (significant or not)	Reason (tcal<ttab, Insignificant; tcal>ttab, Significant)
CAPG**	*Significant*	2.08>2.045
TT**	*Significant*	2.12>2.045
M2R**	*Significant*	2.05>2.045

CONCLUSIONS

- The evidence found in this paper indicates that terms of trade shock (TT), per capita income growth (CAPG) and ratio of M2 to Reserves (M2R) are the best possible indicators of currency crisis in Turkish economy.

- Besides, real exchange misalignment (MISRER), current account balance (CABR) and the ratio of annual reserve money to GDP (ARM) are not found to be significant determinants of financial crisis.

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CONCLUSIONS

- The estimation results of our model for the sample period 1970-2018 suggested that contrary to conventional wisdom and findings of some of the previous researches, overvaluation of the real exchange rate and the increase in the respective ratios of "current account deficit" and (annual amount of) "reserve money" to GDP has not been significant determinants of financial crisis.

- Our results showed that the significant determinants of financial crisis have been "terms of trade shocks", "per capita income growth" and "the ratio of M2 (Broad measure of Money Supply) to GDP".

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POLICY IMPLICATIONS

- Recent and ongoing increses in petroleum crisis might potentially increase the likelihood of a currency crisis through its adverse effects on turkish terms of trade.

- Policies that foster long-run economic growth and therefore positively affect per income growth are likely to lower the chances of a currency crisis. (i.e., policies enhance saving investment rate, human capital accumulation, TFP growth, trade-openness, financial development, macroeconomic and political stability etc..)

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POLICY IMPLICATIONS

- It is worth to mention that negative correlation between per capita income growth and probability of currency crisis can be partly rationalized by Ballassa- Samuelson theorem: This theorem predicts that as per capita income grows TFP in tradeable sector will rise more rapidly. This in turn, will increase the relative output supply of tradeables which may lower the risk of crisis.

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Policy Implications

- One possible reason for CAB to be an insignificant determinant of currency crisis may lie in the fact that usually it is the increased availability of foreign savings (through higher rate of net inflows of foreign capital) that makes possible financing of higher current account deficits. And rationally these foreign capital inflows must be responding to improved risk-return possibilities which are likely to be associated with lower probability of currency crisis.

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Policy Implications

- Finally, the fact that ratio of M2 to total reserves of central bank is found to be a significant determinant of currency crisis suggest that the benefits of policy of the Turkish Central Bank in terms of reserve build-up in recent years might more than offset its costs in the long-run.

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