

CURRENCY CRISES THEORY: THIRD GENERATION MODELS

A Master's Thesis

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August 2009

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ABSTRACT

CURRENCY CRISES THEORY: THIRD GENERATION MODELS

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This thesis investigates third generation currency crisis literature and concludes that the 2001 Turkish currency crisis can be labeled as a third generation type crisis, despite having unique characteristics. According to the model of Eijffinger and Goderis (2007) which derives risk premium of the economy from the balance sheet structure of the corporate sector, higher domestic debt increases the probability of currency crisis, whereas higher foreign debt can either increase or decrease the probability of a currency crisis depending on the parameter values. This model has little explanatory power for the 2001 crisis, since the crisis predominantly arise from the maturity mismatch problem in the balance sheet of the financial sector, coupled with moral hazard problem driven by implicit government guarantees. In addition to these two issues which are examined by different strands of third generation currency crisis literature, Turkish crisis display distinctive characteristics such as the role of fragile fiscal deficit financing mechanism.

Keywords: Third Generation Currency Crisis Models, Implicit Government Guaranties, Moral Hazard, Balance Sheet Vulnerabilities

ÖZET

PARA KRİZİ TEORİSİ: ÜÇÜNCÜ NESİL MODELLER

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Yüksek Lisans, İktisat Bölümü

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Bu tezde üçüncü nesil para krizi literatür incelenmiş, kendine özgü özellikleri bulunmasına rağmen 2001 Türkiye krizinin üçüncü nesil tipi kriz olarak nitelendirilebileceği sonucuna varılmıştır. İktisadi riskin firma bilanço yapısından türetildiği Eijffinger ve Goderis (2007) modelinde, yüksek iç borcun para krizi olasılığını artırırken, yüksek dış borcun parametre değerlerine göre para krizini olasılığını artırması da azaltması da mümkündür. Kriz ağırlıklı olarak, finansal sektörün bilançolarındaki vade uyumsuzluğu ile beraber dolaylı hükümet güvencesinden doğan ahlaki tehlikeden kaynaklandığından, bu modelin 2001 krizini açıklama gücü düşüktür. Üçüncü nesil para krizi modellerinin değişik kolları tarafından incelenen bu iki konunun yanısıra, Türkiye krizi, kırılmalı mali açık finansman mekanizmasının rolü gibi kendine özgü özellikler sergilemektedir.

Anahtar Kelimeler: Üçüncü Nesil Para Krizi Modelleri, Dolaylı Hükümet Güvenceleri, Ahlaki Tehlike, Bilanço Kırılmalılığı

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TABLE OF CONTENTS

ABSTRACT.....	iii
ÖZET.....	iv
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	viii
CHAPTER I: INTRODUCTION.....	1
CHAPTER II: RELATED STUDIES IN THE LITERATURE.....	3
2.1 The Need for Third Generation Model	3
2.2 Early Third Generation Models.....	4
2.3 Balance Sheet Crisis Literature.....	10
2.3.1 Currency Crisis, Monetary Policy and Corporate Balance Sheet Vulnerabilities.....	10
2.3.1.1 Solving the Model.....	14
2.3.1.2 Determination Currency Crisis.....	17
2.3.1.2.1 Domestic and Foreign Debt Levels.....	17
2.3.1.2.2 Conservativeness Degree of Monetary Authority.....	19
2.4 Other Studies.....	20
CHAPTER III: 2001 CURRENCY CRISIS IN TURKEY	22
3.1 Characterization of the Crisis	22
3.2 Comparing Turkish Crisis and East Asian Crisis	26

3.3 Financial Crisis	30
3.4 Eijffinger and Goderis (2007) Model and the Turkish Crisis.....	34
CHAPTER IV: CONCLUSION.....	36
BIBLIOGRAPHY.....	38
APPENDICES.....	40
APPENDIX A: INSTANCES OF FRAUD IN EAST ASIA.....	40
APPENDIX B: OTHER VARIABLES.....	41
APPENDIX C: SAVING DEPOSIT INSUARANCE FUND (TRANSFERRED BANKS).....	44

LIST OF TABLES

1.	Table 1: Financing of Consolidated Budget Deficits (% GNP).....	22
2.	Table 2: Central Bank of Republic of Turkey Balance Sheet.....	23
3.	Table 3: Consumer Inflation.....	24
4.	Table 4: Growth and Unemployment.....	24
5.	Table 5: Inflation and Nominal Interest Rate.....	25
6.	Table 6: Bank of Thailand Balance Sheet.....	27
7.	Table 7: Financing of Budget Deficits in Thailand (% GDP).....	27
8.	Table 8: Inflation and Nominal Interest Rate in Thailand.....	28
9.	Table 9: Growth and Unemployment in Thailand.....	29
10.	Table 10: Liquidity, Credit Growth, Non-Performing Loans.....	31
11.	Table 11: Duty Losses of the State Banks.....	31
12.	Table 12: Relative Risk Scheme of Demirbank.....	32

CHAPTER I

INTRODUCTION

A currency crisis can be defined through quantitative measures of depreciation such as: “a nominal depreciation of the currency of at least 25 per cent that is also at least a 10 per cent increase in the rate of depreciation”. (Frankel and Rose, 1996) Other papers describe the term in a broader sense, as a specified amount of change in Market Pressure Index: (Saxena and Wong, 1999)

$$MPI_{i,t} = \frac{(\% \Delta e_{i,t})}{\sigma_{\Delta e_{i,t}}} + \frac{(\Delta i_{i,t})}{\sigma_{\Delta i_{i,t}}} - \frac{(\% \Delta r_{i,t})}{\sigma_{\Delta r_{i,t}}}$$

where e denotes the bilateral exchange rate of country “ i ” with Germany or US, i is the nominal interest rate in country i , r refers to non-gold international reserves that the central bank has and the changes in exchange rate, interest rate and reserves are scaled by their respective standard deviations. A high value of the index indicates high level of pressure on the domestic currency. The logic is that, if there is an attack on currency, either exchange rate will depreciate, interest rates will be increased as a defensive measure or the monetary authority will sell foreign currency to preserve the value of domestic currency. The index

is primarily used to capture currency crisis risk or identify episodes of currency crisis in flexible exchange rate regimes. More relevant to our discussion is the currency crisis definition of Eijffinger and Goderis (2007) which is “*the situations in which the cost of maintaining a fixed exchange rate exceed the cost of abandonment*” Over the last 30 years, numerous countries have come under pressure or experienced currency crisis at different points in time.¹ Doing a catch-up work, economists have been trying to address symptoms and remedies after the occurrences of currency crisis. The models can be grouped into three generations each of which intends to clarify different notions that pave the path to currency crisis.

The thesis is organized in three parts. In part I, the conditions which gave rise to emergence of third generation literature are briefly examined. Part II summarizes early third generation studies, focusing primarily on Corsetti (1999) and Krugman (1998a). The paper titled “Currency Crisis, Monetary Policy and Corporate Balance Sheet Vulnerabilities” by Eijffinger and Goderis (2007) constitutes the core of this study and is examined in Part III. Part IV relates the third generation currency crises literature to the 2001 currency crisis in Turkey. Finally, Part IV concludes the thesis.

¹ Mexico in 1976, Argentina, Brazil, Peru and Mexico in the early and mid-80s, Chile and Argentina in 1980s, European Monetary System in 1992, Mexico in 1995, major part of Asia in 1997 and 1998, Turkey in 2001, Argentina in 2001 and 2002.

CHAPTER II

RELATED STUDIES IN THE LITERATURE

2.1. The Need for Third Generation Model

Earlier studies of Salant and Henderson (1976), Krugman (1979), and Flood and Garber (1984), which are called the first-generation models, thoroughly identify the relationship between persistent government deficits on capital outflows and currency crisis. Later, the crisis in Chile and Argentina in the 1980s and European Monetary System in 1992 led to the development of next generation of models, which stresses the existence of multiple equilibrium in foreign exchange markets and possibility of self fulfilling crisis. Although, first and second generation currency crisis models have been successful in explaining former episodes of currency crisis, they could not assist researchers in predicting the East Asia crisis (1997-1998) Before the crisis, some pessimists have expressed their worries regarding East Asian miracle, as these economies were running substantial current account deficits.

However, the actual downturn was more complex and drastic than the most negative-minded prediction, involving collapses in domestic asset markets, bank failures and widespread bankruptcies in the real economy. (Krugman 1998a)

The East Asian crisis exhibits some characteristics which were either not present or observable in previous episodes of crisis. First, the crisis countries had responsible fiscal policies, low budget deficits or surpluses and sound economic fundamentals which make first generation models inapplicable. Furthermore, these economies were not facing any exchange rate stability – unemployment trade off and had been growing at impressive rates for a long period of time. Before the crisis, they were widely regarded as the ideal model of growth for the developing world. (Saxena and Wong 1999)²

2.2. Early Third Generation Models

The earliest models to address shortcomings of the previous generations include Krugman (1998 a,b) and Corsetti, et al (1998,1999) which proposed moral hazard as a possible explanation for the ongoing Asian crisis. The two authors analyzed financial and currency crises as interrelated phenomena and defined moral hazard as the common factor underlying the twin crisis. At the core of their analysis the authors assume that, counting on future bailout interventions,

² Despite their sound macroeconomic outlook, it is worth noting that East Asian economies has experienced institutional weaknesses prior to the crisis. These weaknesses can be regarded as potential triggers of the crisis 1997. Appendix A displays the significant increase in fraud cases in 1998 for Thailand and Republic of Korea. This jump is followed by a relatively steady pattern in these two crisis countries. However, in Hong Kong and Malaysia the total number of fraudulent activities does not appear to be linked to the economic crisis.

the weakly regulated financial institutions engage in risky investment. By definition, a bailout intervention is of fiscal nature, altering distribution of income between taxpayers and financial intermediaries. Within this context the government's burden of financial insurance take an implicit form, which is not observable until the crisis arises. Although the liabilities remain manageable in the presence of the mild sector-specific shocks, the financial fragility becomes observable in periods of sizable macroeconomic shocks. Within this framework, the currency side of the financial crisis stems from the anticipated fiscal cost of recapitalization which also generates expectations of deficit monetization of future fiscal deficit and consecutive slowdown of the economy due to structural adjustment. (Corsetti 1999) Corsetti's line of argument implies that expectations of a future bailout need not be linked to any explicit guarantee or policy of the government. Even in the absence of a public insurance scheme, rational domestic and foreign agents anticipate intervention, which was the case in the East Asian crisis. That is to say, no ex-ante announcement by policy makers is capable of convincing the agents that, ex-post government will remain committed to laissez-faire arguments and let financial system to advance towards its debacle.

Corsetti explains transition from the moral hazard problem to continuous overinvestment by the process of evergreening. Corsetti characterizes an economy where the technology parameter of the aggregate production function is stochastic.

$$Y_t = \tilde{A}_t K_t^\alpha L^{1-\alpha} \quad \text{where } \tilde{A}_t = A + \sigma \quad \text{with probability } \frac{1}{2}$$

$$\tilde{A}_t = A - \sigma \quad \text{with probability } \frac{1}{2}, \quad A > \sigma > 0$$

Y denotes output, K is physical capital, L is labor, \tilde{A} is a technology parameter, and σ is the stochastic component of technology. Being insured against adverse contingencies, the producers have no incentive to incur a loss at times of a negative shock. Instead the producers choose to re-finance the decrease in earning through external borrowing which leads to a higher level of capital as compared to the efficient level. In Krugman's terminology the condition corresponds to "overinvestment, driven by Pangloss values" which is described later on. As a negative shock to profitability ($\tilde{A}_t = A - \sigma$) is not offset by contemporaneous government transfer, the agents resort to further foreign borrowing and this process is called evergreening. Theoretically, even when the government budget is balanced, through evergreening an economy can experience persistent current account deficits. Evidently, evergreening has natural limitations. If the process leads to persistent current account deficits, the stock of external liabilities would grow faster than the cost of debt, eventually the solvency constraint will be violated and international lenders will not be lending at market rate r.

As Krugman suggests, the aforementioned implicit government guarantee gives rise to risky investment of financial intermediaries, which in turn pose inflationary pressures exclusively in the asset markets. Overpricing of the assets was partly sustained through a circular process where the increased

asset prices induced by risky lending provided a sounder outlook on behalf of financial intermediaries. After the crisis, the mechanism of crisis follows the same circular pattern in reverse. Revealing insolvency of the financial intermediaries, the falling prices forces the financial intermediaries to cease operations which consecutively leads to further cutback in prices. Krugman asserts that the cyclical-counter cyclical mechanism helps us in explaining the state of vulnerable Eastern Asian financial markets and the radical level of contagion between economies with few economic links. (Krugman 1998a) As a matter of fact, Burnside et al. (2001) provide several examples of publicly known bank failures and reorganizations that took place before the crisis, validating the existence of counter cyclical mechanisms.³

Using a simplified 3-period framework, where assets are completely inelastic, that is, financial intermediaries can influence prices, not quantities; Krugman demonstrates the relationship between falling asset prices and failure of financial intermediaries. It is assumed that financial intermediaries are perceived to be fully insured and any expected economic profit is competed away.⁴ The land can be purchased by the intermediaries, yielding rents of 25 or 100 dollars with probabilities $2/3$ and $1/3$ at periods 2 and 3 respectively. Note that the expected return of the investment amounts to 100 at each period.

³ Analyzing the stock markets of respective countries, the authors conclude that in Korea, Thailand and to a lesser extent, the Philippines and Malaysia, the value of the banking sectors had been declining well before the currency crises. It follows that private agents had sufficient information regarding the fragile nature of their banking systems.

⁴ Krugman (1998a) additionally assumes that the owners of intermediaries do not put any of their own capital at risk

Period 1	Period 2	Period 3
	25 or 100	25 or 100

It follows that, being fully insured at period 1, financial intermediaries will pay 200 dollars (Panglos value) whereas the expected return amounts to a total of 100 dollars in period 1. Next, he argues that, even if possibility of an exogenous regime change in period 2 is incorporated to the model, in other words if government may abandon the bailout regime with probability p in the second period, the financial intermediaries will still be willing to pay the Panglos value at period 1.

Period 1	Period 2	Period 3
	25 or 100	25 or 100

$$P(\text{regime change in Period 3}) = p$$

Needless to say, expected return is even lower in this scenario, even though the motives of financial intermediaries remain unchanged. Indeed, in a setting like this one, a regime change is inevitable as the financial intermediaries will constantly run losses, which in turn lower their credibility. Hence, regarding regime change as an endogenous phenomenon, Krugman constructs the final scenario as follows: creditors of financial intermediaries are bailed out precisely once. If the outcome turns out to be 25, not 100, in the second period, the first period expected rent will be 75. (50 in the third period + 25 in the second period) Consequently the total loss will be 125 rather than merely 75. The

magnification effect is caused by circular nature of disintermediation. Alternatively, even if the outcome in the second period is 100, creditors can be convinced that there will be no bailout in the third period. In other words, the creditors will provide funds which amounts to the expected return of 50, although the financial intermediaries still pay 100 (Panglos value) for the third period. This means that, the negative perceptions will be justified and a bailout will be required in the last period. On the basis of this moral hazard framework, Krugman aimed to explain the devastating effects of falling asset prices on the financial sector and self-fulfilling nature of negative expectations. (Krugman 1998 a)

Chang and Velasco (1998) claim that Krugman's (1998 a) argument is incomplete as it neglects the fact that, at the aftermath of the currency crisis asset values drop below their "true" value. If illiquid banks and firms are forced to abandon and liquidate their investment projects before maturity, the value of the respective assets will be lower than it would have been in the absence of a crisis. In the paper, they define presence of illiquid banks as a necessary and sufficient condition for financial crisis to occur. Their model suggest that, under fixed exchange rate regime a bank run turns into a currency run if the central bank acts as a lender of last resort. Jeanne and Zetelmeyer (2002) argue that within this context, a large international lender (i.e. International Monetary Fund) can help overcome the self-fulfilling crisis by lending to the government and conditioning the cash flow on net worth of the government which will be the real worth of the government under non-crisis conditions. The international institution can also guarantee foreign exchange deposits of "conditionally

solvent banks” (i.e. banks whose net worth is positive under non-crisis conditions). Through these mechanisms the international institution will loosen credit constraints of the domestic agents without acting like a lender of last resort.

2.3. Balance Sheet Crisis Literature

Balance sheet vulnerabilities of financial intermediaries, real sector and the government have become a central phenomenon of the later third generation literature. First class of models which focus on balance sheets of the banks involve currency mismatch accompanied with maturity mismatch. Namely, the crisis is characterized by runs on short term currency debts. The second class of models solely involve currency mismatch in corporate balance sheets where crisis involves credit crunch and fall in investment. In both cases, depreciation of the exchange rate is confirmed by the resulting real disruption, stemming either from bank or corporate balance sheets (Jeanne and Zettelmeyer, 2002)

2.3.1. Currency Crisis, Monetary Policy and Corporate Balance Sheet Vulnerabilities

Throughout the remainder of the thesis, I will focus on the model of Eijffinger and Goderis (2007) in order to visualize the effect of corporate balance sheet position on probability of currency crisis through interest rate and exchange rate channels.

The three-period model is characterized as follows. The monetary authority is committed to the fixed exchange rate regime in period $t-1$. At this

period the economy is assumed to be at long-run equilibrium. At period t , monetary authority can either maintain or abandon the fixed exchange rate regime. Throughout this period prices are sticky and the economy can deviate from its long-run equilibrium. At period $t+1$, monetary authority preserves the exchange-rate policy stance of the previous period. Market participants have perfect foresight of period $t+1$ price level and hence exchange rate (Purchasing power parity). That is to say, at period $t+1$ prices adjust and eventually the economy returns to long run equilibrium.⁵

$$M_t - \bar{p}_t = \gamma - \beta(i_t - RP_t) \quad \text{Money market equilibrium} \quad (1)$$

$$y_t = y_n - \lambda(r_t - r_n) + \theta(S_t - \bar{p}_t) \quad \text{Goods market equilibrium} \quad (2)$$

$$r_n = r^* = i^* = c \quad \text{Natural level of real interest rate} \quad (3)$$

$$i_t = i^* + (S_{t+1} - S_t) + RP_t \quad \text{Uncovered interest rate parity} \quad (4)$$

$$S_{t+1} = p_{t+1} \quad \text{Purchasing Power Parity in period } t+1 \quad (5)$$

$$i_{t+1} = r_{t+1} + \dot{p}_{t+1} \quad \text{Period } t+1 \text{ Nominal interest rate} = \text{Real interest rate} + \text{Inflation} \quad (6)$$

r^* is foreign real exchange rate, i^* is foreign nominal exchange rate, y_t is real domestic output, y_n is natural level of real domestic output, r_t is real domestic interest rate, r_n is natural level of real domestic interest rate, i_t is nominal domestic interest rate, M_t is nominal domestic money supply, \bar{p}_t is fixed domestic price level, RP_t is default risk premium (domestic – foreign), β is real

⁵ All variables are in the form of natural logarithms. (*) is used for foreign country's variables. See Appendix for a complete list of variables.

interest rate elasticity of money demand, λ is real interest rate elasticity of output, θ is real exchange rate elasticity of output, S_t is nominal exchange rate (home/foreign currency) at time t, \hat{S}^{fix} is level of fixed exchange rate at period t-1, \dot{p}_{t+1} is inflation at t+1 ($\dot{p}_{t+1} = p_{t+1} - p_t$), δ is interest rate elasticity of investment.

Risk premium is the indicator of financial fragility and derived from the corporate balance sheet.

$$\ln \text{Risk Premium} = \ln \left(\frac{\text{Investment}_t}{\text{NetWorth}_t} \right)$$

Subtracting foreign risk premium from domestic risk premium leads to the definition of risk premium:

$$RP_t = -\delta(r_t - r_n) + (1 + r_t) \frac{\hat{d}_t^d}{\hat{\Phi}_t} + (1 + S_t - S^{fix}) \frac{\hat{d}_t^f}{\hat{\Phi}_t} \quad (7)$$

$\hat{\Phi}_t$ is the level of consolidated total assets at the beginning of period t (debt + net worth), \hat{d}_t^d is the level of consolidated domestic debt at the beginning of period t, \hat{d}_t^f is the level of consolidated foreign debt at the beginning of period t. It follows that a depreciated currency inflates the burden of foreign corporate debt, an increased real interest rate inflates the burden of domestic corporate debt and both of them contribute to a higher risk premium. Equation 1 suggests that demand for real money is dependent on return from domestic assets ($i_t - RP_t$). As the goods market condition (equation 2) suggests, output is negatively affected from an increase in real interest rate as it reduce investment and hence aggregate demand. The latter term indicates the positive effect of real

depreciation on aggregate demand through the current account channel. Equation 3 depicts natural real interest rate which is equal to real foreign interest rate and nominal foreign interest rate as inflation in the foreign country is assumed to be zero. Equation 4 displays a revised version of uncovered interest rate parity where domestic and foreign assets are assumed to be imperfect substitutes due to different levels of corporate default risks.

Under fixed exchange rate regime, monetary policy cannot be used to stimulate output since it has to maintain fixed exchange rate value. To illustrate this fact, let us assume that foreign interest rate rises which creates incentives for domestic agents to sell domestic assets, exchange receipts for foreign exchange and buy foreign assets. Under fixed exchange rate regime, the transaction will create depreciation pressures which should be countered by the monetary authority. Buying excess supply of domestic currency in exchange for foreign currency, the monetary authority reduces its foreign exchange reserves and money supply falls. Higher domestic interest rate re-establishes the equilibrium in equation 4 and fixed exchange rate is maintained.

Finally the loss function of the monetary authority is as follows:

$$L_t^{CB} = \frac{\chi}{\eta} \dot{p}_{t+1}^2 + (y_t - y_n - k)^2$$

where χ is the level of conservativeness of the monetary authority (the weight given to price stabilization) and η is the rate of time preference. One important assumption of the model is the wedge between desired and natural level of output. This difference, k , can be explained by political business cycles or an

imperfectly functioning labor market. In period t-1 and t+1 the output is at long run equilibrium level and the monetary authority can increase the output level above the natural level y_n only in period t. In this setting, inflation can arise only when prices adjust, in period t+1.

2.3.1.1. Solving the Model

Under floating exchange rate, in long run equilibrium, it is assumed that market participants perfectly anticipate monetary policy. Having perfect foresight, they set the prices in such a way that output do not deviate from its natural level. Since the desired output level ($y_n + k$) is higher than the natural level of output, monetary authority has the incentive to use monetary policy in raising the output to the desired level. The market agents will anticipate this and increase their prices accordingly. The result is no output gain and a positive inflation. The inflationary bias which can be regarded as the natural level of inflation is computed using a 3-period discretionary framework. Under these conditions:

$$\text{Since market participants have perfect foresight: } M_t = M_{t-1} + \frac{X}{\frac{\chi}{\eta}} k \quad (8)$$

$$\text{Inflationary bias: } \pi^n = \frac{X}{\left(\frac{\chi}{\eta}\right)} \cdot k \quad \text{where} \quad X = (\lambda + \theta) \left(\frac{1 + \beta}{\beta}\right) \quad (9)$$

Therefore the increase in money supply between period t-1 and t is translated into a price increase between period t+1 and t. Efficacy of monetary policy is established through both interest rate channel and exchange rate channel. Hence,

increases in the measures of λ and θ (equation 2), respectively responsiveness of output to real interest deviations and divergence from Purchasing Power Parity, amplify the inflationary bias π^n , whereas higher levels of β reduces efficacy of monetary policy, causing lower impact of monetary policy on interest rates. Inflationary bias is negatively related with χ , which measures conservativeness value of the monetary authority. Higher conservativeness, by definition, means higher cost of inflation. A higher value of time preference (η) gives rise to higher inflationary bias, as present cost of inflation decreases. The root cause of inflationary bias is k , which creates incentive for the monetary authority to increase output. It follows that a higher level of wedge between desired and natural output levels increases inflationary bias.

Next, the authors examine the cases of (i) maintaining fixed exchange rate regime at period t and (ii) abandonment of fixed exchange rate regime at period t . At period t , the domestic and foreign debt levels are allowed to change. For case (i):

$$L_t^{CB} = \left(\lambda \left(\frac{\frac{\hat{d}_t^d}{\hat{\Phi}_t} \cdot c + \left(\frac{\hat{d}_t^d + \hat{d}_t^f}{\hat{\Phi}_t} \right)}{1 + \delta - \frac{\hat{d}_t^d}{\hat{\Phi}_t}} \right) + k \right)^2 \quad (10)$$

For a given level of money supply, any type of debt results with increased risk premiums and a higher level of interest rate. (equation 4) Accordingly the output drops below its natural level and output cost of maintaining a fixed exchange rate increases. Since monetary policy cannot be used autonomously and fixed

exchange rate should be maintained, there will be no inflation, therefore no inflation cost. In case of abandonment (ii), loss function takes the following form:

$$L_t^{CB} = \frac{\frac{\chi}{\eta}}{\frac{\chi}{\eta} + A^2} \left(A \cdot \pi^n + \left(\lambda \frac{\left(\frac{\hat{d}_t^d}{\hat{\Phi}_t} \cdot c + \left(\frac{\hat{d}_t^d + \hat{d}_t^f}{\hat{\Phi}_t} \right) \right)}{1 + \delta - \frac{\hat{d}_t^d}{\hat{\Phi}_t}} + k \right) \right)^2 \quad (11)$$

$$\text{where } A = \frac{(1 + \beta)}{\beta} \left(\frac{\lambda \left(1 - \frac{\hat{d}_t^f}{\hat{\Phi}_t} \right)}{1 + \delta - \frac{\hat{d}_t^d}{\hat{\Phi}_t}} + \theta \right) \quad (12)$$

The output cost part is quite similar to the previous case (i) where there is no inflation cost. If natural level of inflation is assumed to be zero, the inflation cost will disappear and loss functions of the two cases will be easily comparable. Since $(\chi/\eta)/((\chi/\eta) + A^2)$ is less than 1, in case of zero natural level inflation, output cost of abandonment will be less than that of maintenance. Due to expansionary monetary policy, in the case of abandonment, a portion of the output loss will be compensated.

Now that costs of abandonment and maintenance are derived, in line with the initial definition of currency crisis, one can compute the conditions under which abandonment of fixed exchange rate yield more benefits than maintenance.

$$L_t^{CB} (\text{maintenance}) > L_t^{CB} (\text{abandonment})$$

Rearranging the terms:

$$\Omega = \left(\sqrt{\frac{1}{A^2} + \frac{1}{\frac{\chi}{\eta}} - \frac{1}{A}} \right) \left(\lambda \left(\frac{\hat{d}_t^d \cdot c + \left(\frac{\hat{d}_t^d + \hat{d}_t^f}{\hat{\Phi}_t} \right)}{1 + \delta - \frac{\hat{d}_t^d}{\hat{\Phi}_t}} \right) + k \right) - \pi^n > 0$$

2.3.1.2. Determination of Currency Crisis

2.3.1.2.1. Domestic and Foreign Debt Levels

Taking first order derivatives of Ω with respect to $\frac{\hat{d}_t^d}{\hat{\Phi}_t}$ and $\frac{\hat{d}_t^f}{\hat{\Phi}_t}$ the authors

capture effects of domestic and foreign debt on occurrence of currency crisis.

$\frac{\partial \Omega}{\partial \left(\frac{\hat{d}_t^d}{\hat{\Phi}_t} \right)} > 0$ condition indicates that regardless of other parameters the level of

domestic debt increases the probability of a currency crisis. The reason is that a higher level of domestic debt increases risk premium which necessitates an increase in real money supply. In order to compensate for the increase in output cost, the monetary authority has the incentive to abandon the fixed exchange rate regime and pursue expansionary monetary policy. The other channel which reinforces monetary authority's incentive to abandon the fixed exchange rate regime, stems from the corporate sector's sensitivity to changes in interest rate. That is to say, due to a higher level of domestic debt, a decrease in interest rate has a high negative impact on risk premium. As both forces operate in the same

direction, their combined effect exceeds the cost of inflation in case of abandonment.

Taking first order derivative of Ω with respect to $\frac{\hat{d}_t^f}{\hat{\Phi}_t}$ yields

$$\frac{\partial \Omega}{\partial \left(\frac{\hat{d}_t^f}{\hat{\Phi}_t} \right)} > 0 \text{ or } \frac{\partial \Omega}{\partial \left(\frac{\hat{d}_t^f}{\hat{\Phi}_t} \right)} < 0$$

depending on the parameter values. Similar to the case of domestic debt, a higher level of foreign currency denominated debt results with a higher level of risk premium, creating incentives for the monetary authority to abandon fixed exchange rate regime. However, in the case of foreign debt, loosening of monetary policy decreases effectiveness of monetary policy in stimulating output as this action leads to depreciation of the currency. Since foreign currency denominated debt is at a relatively high level, currency depreciation will have adverse effects in terms of net worth of the corporation. Taking these two effects in consideration, the overall impact of monetary policy depends on the parameter values. To put it differently, higher level of foreign debt increases the need for output loss compensation, however, lowers the efficacy of monetary policy.

Next the authors examine the impact of other model variables on the probability of currency crisis. Similar to the previous analysis, the effect of these variables arise from two channels: inflation and output costs. Although realizations of respective costs are dependent on the type of the exchange rate regime, they still influence the exchange rate decision of the monetary authority

at time t . The parameters that are examined are χ (conservativeness degree of the monetary authority), η (time preference rate of the monetary authority), k (positive wedge between output level targeted by the monetary authority and natural level of output), θ (real exchange rate elasticity of output), λ (real interest rate elasticity of output), β (nominal interest rate elasticity of money demand) and r_n (natural domestic interest rate)

2.3.1.2.2. Conservativeness Degree of the Monetary Authority (χ)

An increase in the conservativeness degree of the monetary authority can either increase or decrease the probability of currency crisis. Since Ω is obtained by subtracting the loss function of the maintenance case from the loss function of the abandonment case, one can examine the two channels separately. In the case of maintenance, conservativeness degree of the monetary authority plays no roles, since the economy incurs no inflation costs in that setting. However, abandonment gives rise to both output cost and inflation cost. For the output cost, an increase in the conservativeness degree of the monetary authority poses a negative effect. Since inflation which arises from the loosening monetary policy is given more weight in the loss function, the monetary authority has less incentive to induce output and therefore in the case of abandonment, output cost increases.

As the weight of inflation in the loss function increases, monetary authority seeks to create less inflation. Furthermore, given that the monetary authority follows a more strict monetary policy the decrease in output drives down the inflation as well. Consequently, these two effects more than offset the

initial increase in conservativeness degree of the monetary authority and the overall impact on inflation cost is negative. In brief, with a positive impact on output cost and a negative effect on inflation cost, conservativeness degree of the monetary authority can either increase or decrease the probability of currency crisis.

The effect of the changes in the remaining model parameters on the probability of a currency crisis can be examined in a similar fashion, through investigating inflation and output cost channels separately. The analysis is depicted in Appendix B.

2.4. Other Studies

From a conventional perspective, a higher interest rate can be regarded as a handy defensive tool against speculative attacks, as it obstructs taking short positions on domestic currency and signals monetary authority's commitment to the fixed exchange rate regime. Nonetheless, the theoretical connection between corporate balance sheet structure and occurrence of currency crisis instigated several empirical studies over the last years. Kraay (2002) reports lack systematic association between interest rates and outcome of speculative attacks both in developed and developing countries. Modifying Kraay's framework, Goderis and Ioannidou (2008) incorporate other country specific fundamentals, namely short-term and long-term corporate debt, in order to investigate the theoretical linkages. The authors find out that the interest rate defense is not a credible policy if the level of short-term corporate debt is high. In a different study, Eijffinger and Goderis (2007) additionally suggest that raising interest

rates is more credible and hence effective in countries with high-quality institutions.

CHAPTER III

2001 CURRENCY CRISIS IN TURKEY

3.1. Characterization of the Crisis

Unlike the case of East Asian crisis (1997), the Turkish crisis (2001) cannot be instantly regarded as being of a third-generation nature as some factors, such as the high government deficits (Table 1) seem to point out the possibility of a first and second generation crisis. Nonetheless, in order to establish such a connection between the occurrence of the currency crisis and government deficits, monetization of deficits by the central bank is a necessary condition.

Table 1: Financing of Consolidated Budget Deficits (% GNP)

	1995	1996	1997	1998	1999	2000	2001
Public Sector Borrowing Requirement	5	8.6	7.7	9.4	15.6	12.5	15.9
Consolidated Budget Borrowing Requirement	3.7	8.5	7.6	7.1	11.6	10.2	17.9
Net Domestic Borrowing	3.6	7.1	8.5	8.6	12.4	7.4	12.9
Net Foreign Borrowing	-1	-0.9	-1.5	-1.9	0.6	2.1	-2.5
Central Bank Advances	1.2	1.5	0	0	0	0	0
Deferred Payments	0	0.7	0.6	0.5	-1.4	0.6	7.4

Source: Republic of Turkey Prime Ministry Undersecretariat of Treasury

Apparently the Turkish economy has already undergone reforms to prohibit financing of the fiscal deficits by the Central Bank by the time the crisis surfaced in 2001. Note that in the years following the adoption of pre-announced crawling peg exchange rate policy (December 1999) which is supported by the IMF, the central bank reserve levels remain high except for the aftermath of the crisis. Although pre-announcement of the timing and magnitude of exchange rate band decisions were deemed to be the strength of the program, the policy arguably influenced the timing of the attack. According to the program it was publicly announced that the transition period would be over and Turkish Lira would be allowed to float in June 2001, that is 4 months after occurrence of the crisis.

Table 2: Central Bank of Republic of Turkey Balance Sheet

Time	Net Domestic Assets *	Net Foreign Assets *	Base money *	Reserves**
1995	323	-6	317	12,391
1996	335	275	610	16,273
1997	142	988	1,13	18,419
Jun-98	-1,778	3,331	1,553	26,377
1998	625	1,486	2,111	19,721
Jun-99	-899	3,526	2,627	21,521
1999	-938	4,818	3,88	23,177
Jun-00	-1,741	6,372	4,631	24,547
2000	2,485	3,303	5,788	22,172
2001	20,475	-12,672	7,803	18,787

* Trillions of TL

** Millions of USD

Source: Central Bank of Republic of Turkey. Electronic data delivery system

The two observations overrule the possibility of a first-generation-like currency crisis. Despite the persistently declining inflation levels Yilmazkuday (2008)

claims that extensions of first generation models have some limited explanatory power in clarifying the causes of the crisis. The author asserts that in accordance with Calvo's (1996) claims if the government finances the fiscal deficit not by seigniorage but by borrowing, the economy will experience the same level of inflation yet at an earlier date.

Table 3: Consumer Inflation

	1995	1996	1997	1998	1999	2000	2001
Avarage	89	80.2	85.7	84.6	64.9	54.9	54.4
End-year	76	79.8	99.1	69.7	68.8	39	68.5

Source: Central Bank of Republic of Turkey. Electronic data delivery system

Due to the ongoing disinflationary IMF program substantial success was achieved at the inflation front by the end of year 2000, which contradicts with the previous claim. There exists more evidence to support the explanatory power of the second-generation models as compared to the case of first-generation frameworks.

Table 4: Growth and Unemployment

	1996	1997	1998	1999	2000	2001	2002	2003
Unemployment, total (% of total labor force)	7	7	7	8	6	8	10	10
GDP growth (annual %)	7	8	2	-3	7	-6	6	5

Source: World Bank Development Indicators

Prior to the crisis in 2001 unemployment rate was not an important concern for the policy makers as the fairly stable trend suggests. In other words, prior to the crisis the economy did not encounter a second-generation type policy trade off problem. However, Ozatay (2003) claims that the high levels of short-term

public debt might trigger a self-fulfilling attack if the speculators anticipate the weakness of the financial sector and believe that the government will not consider increasing the interest rate under such fragile circumstances. I believe that the weakness of the financial sector should be examined within the context of third generation models, since it brings about problems such as maturity mismatches which will be examined later. Another important point which can be drawn from Table 4 is the high growth rates following the crisis year. Ozatay (2003) defines the subsequent high growth rates as an implication of second-generation type crisis since the third-generation type crisis typically causes low growth rates due to the difficult recovery of corporate or financial sectors. However, the sound post-crisis growth performance can easily be attributed to the “baseline effect” and does not imply the type of the crisis per se.

Table 5: Inflation and Nominal Interest Rate

	Inflation *	Nominal Interest Rate **
Jun-99	64.3	77.13
Jul-99	65	76.9
Aug-99	65.4	77.18
Sep-99	64.3	71.94
Oct-99	64.7	71.03
Nov-99	64.6	70.45
Dec-99	68.8	72.11
Jan-00	68.9	41.85
Feb-00	69.7	41.54
Mar-00	67.9	38.47
Apr-00	63.8	38.85
May-00	62.7	38.82
Jun-00	58.6	43.51
Jul-00	56.2	36.08
Aug-00	53.2	30.71
Sep-00	49	42.53

Oct-00	44.4	41.49
Nov-00	43.8	48.91
Dec-00	39	81.2
Jan-01	35.9	51.54
Feb-01	33.4	344.1
Mar-01	37.5	124.44
Apr-01	48.3	90.23
May-01	52.4	69.91

* Price change as compared to the same month of the previous year

** 1 month deposit rate

Source: Central Bank of Republic of Turkey. Electronic data delivery system

Considering that the wedge between nominal interest rate and inflation has been, on the whole, decreasing over the past year, it might be difficult to explain the occurrence of the crisis through the upsetting effects of real interest rates on corporate and financial balance sheets in the short run. However the crisis and the associated interest rate hike in December 2000 hits the state banks hard in particular.

3.2. Comparing Turkish Crisis and East Asian Crisis

Since Thailand economy was the first and arguably most affected East Asian economy, it is chosen as a benchmark for the comparison between Turkish and East Asian currency crisis. Similar to the Turkish case, there is no apparent decline in reserves or foreign assets prior to the crisis, whereas the data of the crisis years clearly indicate sizable interventions in the foreign exchange market.

Table 6: Bank of Thailand Balance Sheet

Time	Net Domestic Assets*	Net Foreign Assets*	Base Money *	Reserves**
1994	111984	758797	24544	30279
1995	140928	931644	25369	37027
1996	222325	990654	24917	38725
1997	1337002	935904	56500	26968
1998	1728162	672313	40426	29536
1999	1689475	822851	36568	34781
2000	1730274	875580	31504	32661
2001	1482093	1039637	30907	33048

* Millions of Baht

** Millions of USD

Source: Bank of Thailand Statistics and Own Calculations

Table 7: Financing of Budget Deficits in Thailand (% GDP)

	1994	1995	1996	1997	1998	1999	2000	2001
Loans to Central Government	0.3	0.3	0.3	0.2	0.3	0.6	0.1	0.2
Net Domestic Borrowing	0.25	0.16	0.52	-0.01	-0.08	-0.13	-0.16	-0.14
Net Foreign Borrowing	-0.03	0.06	0.28	-0.01	-0.01	0.00	0.00	0.00

Source: Bank of Thailand Statistics

Contrary to Turkey's case central bank can lend to central government which indicates the possibility of first and second generation type crisis. Nonetheless, the ratio of loans to Gross Domestic Product is relatively insignificant as compared to Turkey's ratios before the crisis. In general, a first and second generation type crisis seems to be highly improbable in Thailand, because of additional macroeconomic reasons.

Table 8: Inflation and Nominal Interest Rate in Thailand

	Inflation *	Nominal Interest Rate **
Jan-96	7.2	12.0
Feb-96	7.4	11.0
Mar-96	7.3	11.0
Apr-96	7.1	11.0
May-96	6.1	10.0
Jun-96	5.5	10.0
Jul-96	5.4	10.0
Aug-96	5.7	10.0
Sep-96	4.6	10.0
Oct-96	4.3	10.0
Nov-96	4.7	10.0
Dec-96	4.7	9.0
Jan-97	4.4	9.8
Feb-97	4.4	9.8
Mar-97	4.7	9.8
Apr-97	4.2	9.5
May-97	4.2	9.3
Jun-97	4.5	9.3
Jul-97	4.9	11.5
Aug-97	6.6	11.5
Sep-97	6.9	11.5
Oct-97	7.3	11.5
Nov-97	7.7	11.5
Dec-97	7.7	11.5
Jan-98	8.6	11.5
Feb-98	8.8	12.3
Mar-98	9.3	12.3
Apr-98	10.0	12.3
May-98	10.3	12.3
Jun-98	10.6	12.0
Jul-98	10.0	14.0
Aug-98	7.5	12.0
Sep-98	6.8	8.8
Oct-98	5.8	7.8
Nov-98	4.6	6.8
Dec-98	4.3	6.0

* Price change as compared to the same month of the previous year

** Deposit rate

Source: International Financial Statistics

Contrary to the case of Turkey, the constantly rising inflation level before 1997 might be an indicator of substantial government borrowing in line with Calvo's (1996) arguments. More importantly the increasing real interest rates might have adverse implications for corporate balance sheets which increases the possibility of a third generation type crisis. Although the increasing trend of the real interest rate was less apparent in Turkey, it had similar undesirable implications prior to both crisis episodes.

Table 9: Growth and Unemployment in Thailand

	1994	1995	1996	1997	1998	1999	2000	2001
Unemployment, total (% of total labor force)	1.3	1.1	1.1	0.9	3.4	3	2.4	2.6
GDP growth (annual %)	9	9.2	5.9	-1.4	-10.5	4.5	4.8	2.2

Source: United Nations Statistics Division

As it is discussed before, relatively low levels of unemployment and impressive growth rates overrule the possibility that of a first or second generation type crisis. However in the case of Turkey it is difficult to eliminate the possibility of a first or second generation type crisis, by simply checking the macroeconomic conditions.

In general, there appears to be a consensus over the fact that the problem largely stems from the balance sheets of the financial sector and financial weaknesses specific to the Turkish economy, rather than the corporate balance sheet structure. On the other hand, Allen et al. (2002) argues that currency mismatch problem was apparent both in the financial and real sectors. As for the maturity mismatch, the authors point out that the corporate balance sheet data do

not enable a reliable analysis, while maturity mismatch in the financial sector is one of the prime causes of the crisis.

3.3. Financial Crisis

To begin with, the financial crisis cannot be attributed to a liquidity problem or a rapid credit expansion since the situation in non-crisis times does not vary significantly as compared to the time of the crisis. That is to say the increasing risk of the banks cannot be captured through these measures. However the level of non-performing loans has been increasing the possibility of a crisis ever since 1997. This trend is primarily due to the actions of Saving Deposit Insurance Fund who took increasing numbers of banks under its control and could not convince the market that the trend in the loan performance is of a temporary nature. Over the active engagement period of Saving Deposit Insurance Fund the perceived financial risks climbed at each subsequent year, deteriorating the borrowing capabilities of the institutions. Note that, the effect of miscommunication was devastating as the economy was just recovering from a long history of high inflation after 1999, which already affected the long-run borrowing capabilities of the financial sector negatively. The maturity mismatch problem reached to an extent that, as reported by Ozatay (2003), “for one unit of three-month liability, there was a 0.5 unit of three-month asset at the end of 1999”.

Table 10: Liquidity, Credit Growth, Non-Performing Loans

	1995	1996	1997	1998	1999	2000	2001
M1YRS / Central Bank Reserves	1.85	1.76	1.81	1.75	1.49	2.22	1.78
M2YR/ Central Bank Reserves	3.57	3.48	3.39	3.64	3.53	4.16	3.98
Real Credit Growth	18.6	24.6	7.7	-14.7	-13.6	17.4	-28.2
Non-Performing / Total Loans	2.8	2.2	2.4	7.2	10.7	11.6	18.6

Source: Central Bank of Republic of Turkey. Electronic data delivery system

Public and private banks played different roles in realization of the crisis due to their different portfolio structures. After 1992 state banks have been used to finance growing expansionary needs of the Treasury and the state banks incurred substantial duty losses as these loans are characterized as “performing loans”. The problem naturally arises because of the fact that in addition to its supervisory role in the financial market the Treasury was controlling the financial state enterprises. The losses needed to be financed by short term domestic liabilities which are sensitive to the increases in the interest rates.

Table 11: Duty Losses of the State Banks

(% GNP)	1995	1996	1997	1998	1999	2000	2001
Duty Losses of the State Banks	1.85	1.76	1.81	1.75	1.49	2.22	1.78

Source: Republic of Turkey Prime Ministry Undersecretariat of Treasury

Due to the comparatively higher portion of domestic liabilities of the state banks, the interest rate hike in December 2000 hit the state banks more severely while at the aftermath of the 2001 crisis it was the private financial institutions who suffered the most. By the time the 1999 IMF stabilization program was in place, the government debt instruments constituted a larger portion of the private bank balance sheets compared to government debt instruments portfolio. Therefore the burden of government debt sustainability created additional

problems in terms of increased risk in the financial sector. Note that the relationship between the government and the financial institutions takes a rather different and direct form as compared to the East Asia crisis. In the case of East Asian crisis, it was perceptions of implicit government guarantees which led to over lending, while in the case of Turkey it is the observable remnants of an era where the state had direct control over the financial sector in terms of direct control and supervision.

The substantial financial risk which is accumulated through short-term financing of government bonds finally came to a halt when the primary dealer of government bonds, Demirbank could not sustain the debt rollover scheme in December 2001. Being a primary dealer, in exchange for the privilege of having a priority in government bond auctions, Demirbank had to purchase 15% of the transaction volume from the government. The primary dealer role gave rise to a higher level of government bonds, hence higher level of domestic assets, in the balance sheet, compared to other private financial institution.

Table 12: Relative Risk Scheme of Demirbank

		1997	1998	1999	2000	2001
Government Instruments / Total Assets	Sector	31.72	29.5	34.64	31.45	21.52
	Demirbank	58.54	57.09	65.12	58.33	67.63
Interest Earning Assets / Total Assets	Sector	67.8	63.66	63.22	60.79	52.73
	Demirbank	77.44	72.86	79.57	73.57	84.6
Long term / Total Government Instruments	Sector	9.95	8.37	18.43	20.3	69.26
	Demirbank	23.49	27.15	27.15	28.83	27.43

Source: Central Bank of Republic of Turkey.

Demirbank's short-term dependency on the other banks in terms of overnight borrowing caused the crisis to crystallize and propagate easily. Reluctance of the sector in lending to Demirbank, forced Demirbank to borrow from abroad through structured loan agreements by offering government instruments as collateral. The payment failure resulted with automatic sale of government instruments, consequently a huge decline in government bond prices to which the banking system is dependent and finally an increased demand for foreign currency. Hence the failure of the riskiest bank quickly propagated to the whole sector and triggered a currency crisis.

Önder and Özyıldırım (2008) point out additional systemic weaknesses in the financial sector prior to 2001. Evidently moral hazard undermined the banking system and contrary to the widely accepted perceptions (Demirgüç-Kunt, A., and Huizinga, H. (2004)), depositor activity increased in the presence of implicit government guarantees. More importantly, controlling for bank characteristics, macroeconomic conditions, and yearly effects, both depositors and borrowers reacted negatively to risky banks and punished risky institutions during the periods of generous government guarantees. However this corrective behavioral pattern failed to alleviate risky activities of financial institutions. The authors demonstrate that the activities that involve moral hazard intensified even after introduction of 100% deposit insurance. In a nutshell, third generation type moral hazard problem was apparent in 2001, together with the structural weaknesses that are described above. Furthermore, the actions of the market participants did not influence the activities of the banking system in a corrective fashion.

Even though the crisis is widely regarded as being a financial one, the root cause turns out to be the ever increasing government deficits and the mechanism of fiscal financing. Nonetheless, as the other alternatives are proven to be inadequate in explaining the phenomenon, it can safely be labeled as a third-generation type crisis which is to a great extent triggered by special local weaknesses in the fiscal deficit financing mechanism. Note that due to the nature of this mechanism, by the means of declining government instrument prices, the financial crisis feed the government debt sustainability problem and consequently the extent of the initial crisis is magnified. The root cause of the crisis can also be traced back to the ambiguous selection criterion and executive decisions of the Saving Deposit Insurance Fund. Among other conclusions, the Turkish crisis highlights the importance of transparency and accountability in every level of financial intermediation.

3.4. EIJJFINGER AND GODERIS (2007) MODEL AND THE TURKISH CRISIS

According to Eijffinger and Goderis's (2007) specification a currency crisis materializes if the cost of maintaining a fixed exchange regime exceeds the cost of abandonment. Although, technically Central Bank of Republic of Turkey was not committed to a fixed exchange rate regime, its exchange rate policy decisions were determined by the publicly known, pre-announced IMF program which necessitates central bank's intervention in the exchange rate regime market whenever nominal exchange rate moves out of the pre-announced policy

band. Therefore the policy setting of the pre-crisis period satisfies the first assumption of the Eijfinger and Goderis (2007) model.

The most notable feature of the Eijfinger and Goderis (2007) model is the risk premium term that is used in the money market equilibrium and uncovered interest parity condition equations. The relative risk premium term is derived from the corporate risk premiums of domestic and foreign economies, which is basically the ratio of investment to net worth. In the case of Turkish crisis, the increased risk premium stems from the maturity mismatch in the financial sector's balance sheets rather. This particular characteristic is not captured by the Eijfinger and Goderis (2007) model, since the model investigates corporate sector balance sheets and does not address maturity mismatch issues. Other studies such as Corsetti (1999) focuses on moral hazard and implicit government guarantees appears to be more relevant to the institutional characteristics of Turkey, throughout the crisis epoch. However, although third generation features such as implicit government guarantees, resulting moral hazard and overinvestment in the financial sector are present in the Turkish crisis, other unique weaknesses played important roles which are described in the previous sections.

CHAPTER IV

CONCLUSION

The aim of this thesis is to exhibit the evolution of “third-generation” responses to the previous episodes of currency crisis. Although third generation literature exhibit some recurrent features, each model brings about a fresh perspective and different assumptions. At the aftermath of the East Asian crisis, the early theories were centered on a possible moral-hazard and overinvestment channel, whereas balance sheet crisis literature has focused on feedback mechanisms between the real economy and corporate and banking sector balance sheets. While establishing this link, the later strand of third generation models operate under different assumptions and do not identify the overinvestment channel as a root cause of currency crisis.⁶ In fact, all of these distinct approaches contribute to our understanding of currency crisis, particularly the East Asian (1997) episode.

⁶ For instance in Eijffinger and Goderis (2007) investment is defined in a conventional sense ($\ln(\text{Investment } t) = \psi - \delta(r_t - r_n)$) where it is a function of differences between domestic real interest rate and natural level of real interest rate.

The balance sheet crisis literature is still evolving and instigating wide range of new ideas some of which have already been proven to be reliable, thanks to the empirical analysis. Goderis and Ioannidou (2008) point out to an important endogeneity problem concerning the ratio of short term debt to total assets. According to this critical approach, it may not be the case that short term debt affects the outcome of an attack. Rather the probability of a successful attack can determine the short-term debt of the corporation. This alternative channel can form the basis of future research both in empirical and theoretical front.

Finally, the examination of the 2001 Turkish crisis clarifies the possible connections between fiscal debt sustainability, financial health and probability of a currency crisis. Although the crisis exhibit distinct characteristics which was not present in the East Asian crisis, the underlying reasons for the 2001 Turkish crisis are largely in line with the arguments of the third-generation currency crisis literature.

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APPENDICES

APPENDIX A

INSTANCES OF FRAUD IN EAST ASIA

	1995	1996	1997	1998	1999	2000
Thailand	1920	2335	2233	6468	6461	6831
Republic of Korea	140365	199684	171412	209009	221828	174767
Hong Kong	2270	1982	1631	1829	2042	2040
Malaysia	270	430	568	34	48	78

Source: The Sixth and Seventh United Nations Survey on Crime Trends and the Operations of Criminal Justice Systems

APPENDIX B

OTHER VARIABLES

Time preference rate of the monetary authority (η)

A higher time preference rate of the monetary authority is equivalent to a decrease in the conservativeness degree. Namely, as the parameter value increases inflation in period t is valued less. Therefore, in case of abandonment, output cost increases, inflation cost decreases and the overall effect is yet again parameter dependent.

The wedge between output level targeted by the monetary authority and natural level of output (k)

For any actual output level, an increase in the targeted level increases the output cost, creating incentives for abandonment of fixed exchange rate regime. As in the other cases, inflation cost is realized only in the case of abandonment, offsetting a fraction of the increased output cost. Since the monetary authority is more inclined to abandon fixed exchange rate regime in order to reach higher levels of output, inflation cost raise accordingly. The inflation cost raises the

probability of maintenance and the overall effect will be either an increase or decrease in the currency crisis probability

Real exchange rate elasticity of output (θ)

In case of abandonment, an increase in the parameter will create an incentive for loosening monetary policy since the resulting depreciation effect will stimulate output through current account channel more effectively. Once again, in case of abandonment the accompanying inflation cost creates incentive for maintenance. Having reduced output cost on one hand and positive inflation cost on the other, an increase in real exchange rate elasticity of output can either increase or decrease the probability of a currency crisis.

Real interest rate elasticity of output (λ)

Higher values of real interest rate elasticity of output imply higher depression of investment and output, necessitating higher output loss compensation. Another factor which influences abandonment is the possibility of more effective output stimulation through the exchange rate channel. On the other hand, as monetary authority becomes more inclined to loosen monetary stance, an inflationary bias emerges and creates incentive for maintenance. Therefore, the net effect of an increase in real interest rate elasticity of output is either a decreased or increased probability of currency crisis.

Nominal interest rate elasticity of money demand (β)

If nominal interest rate elasticity of money demand increases, for a given level of monetary expansion, nominal interest rate falls by a slighter amount. In that

case, the resulting output gain is more limited which points out to lower efficacy of monetary policy in stimulating output. Hence output cost is higher and monetary authority has more incentives to maintain fixed exchange rate regime. Another effect of lower monetary policy efficacy is a lower inflationary bias, that is, lower inflation cost and increased tendency to abandon fixed exchange rate regime. With lower inflation cost and higher output cost, probability of currency crisis either decreases or increases.

Natural domestic interest rate (r_n)

Finally, an increase in the level of r_n , which is equivalent to foreign real interest rate, increases the probability of currency crisis. As inflation rate in the foreign country is assumed to be zero at all times, an increase in r_n is also equivalent to an increase in nominal interest rates of the foreign country. The increase is translated to an increase in the risk premium and lower output which necessitates monetary compensation. Since the only way to balance the reduced output is raising the real money supply, an increase in r_n leads to higher probability of abandonment and currency crisis. Through an increase in r_n the economy incurs both inflation and output costs as it is already mentioned.

APPENDIX C

SAVING DEPOSIT INSURANCE FUND

(TRANSFERRED BANKS)

Banks	Date of Transfer to Current Status	Saving Deposit Insurance Fund
Egebank	Dec 21,1999	It was merged with Sümerbank on January 26, 2001.
Yurtbank	Dec 21,1999	It was merged with Sümerbank on January 26, 2001.
Yaşarbank	Dec 21,1999	It was merged with Sümerbank on January 26, 2001.
Bank Kapital	27-Oct-00	It was merged with Sümerbank on January 26, 2001.
Ulusalbank	28-Feb-01	It was merged with Sümerbank on April 17, 2001.
Interbank	7-Jan-99	It was merged with Etibank on June 15, 2001.
Esbank	21-Dec-99	It was merged with Etibank on June 15, 2001.

Iktisat Bankası	15-Mar-01	Its banking license was revoked as of December 7, 2001 and the liquidation process was initiated. Upon the resolution adopted in the General Assembly Meeting on April 4, 2002 the liquidation decision was revoked and the Bank was merged under Bayindirbank.
Kentbank	9-Jul-01	Its banking license was revoked as of December 28, 2001 and the liquidation process was initiated. Upon the resolution adopted in the General Assembly Meeting on April 4, 2002 the liquidation decision was revoked and the Bank was merged under Bayindirbank
Etibank	27-Oct-00	Its banking license was revoked as of December 28, 2001 and the liquidation process was initiated. Upon the resolution adopted in the General Assembly Meeting on April 4, 2002 the liquidation decision was revoked and the Bank was merged under Bayindirbank
EGSBank	9-Jul-01	Its banking license was revoked as of January 18, 2002 and merged with Bayindirbank as of the same date.
Toprakbank	30-Nov-01	Its banking license was revoked as of September 30, 2002 and merged with Bayindirbank on the same date.
Source: Saving Deposit Insurance Fund		