A Theoretical Overview of Currency Crises*

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Abstract

In the 1980s and 1990s, currency crises occurred frequently in various parts of the world. This paper provides an overview of the currency crises theories, which investigate the cause of these currency crises, the determinant factors of their depth, and the mechanism of their effects on actual economy. Based on the three-generation classification, this paper surveys currency crises theories with focus on the differences among them.

Keywords: currency crisis, exchange rate, speculative attack, capital flow

1. Introduction

In the modern world where international currency and international finance are fundamental factors of the economical relationship among countries, a global analysis and understanding of currency crisis and instability of international finance are indispensable. This paper gives a survey of the currency crisis theories, which analyze the currency crises in the 1980's and the 1990's.

The currency crises in the 1980's are different from that of the 1990's at several points. The Latin American currency crisis, represented by the peso crisis of Chile in 1985, is caused by external reasons such as global recession and unexpected rise of interest rate of dollar, as well as internal reasons such as overestimated exchange rate, import boom, and capital outflow due to foreign loan. In other words, neither the currency policy of the governments nor the support from IMF is successful. The Latin American crisis is characterized by the first generation currency crisis theory proposing that currency crisis happens with speculation attacks on the fundamentals such as foreign reserve.

The currency crises represented by that of Europe in 1992-1993 and that of Mexico in 1994 are result of the growth of currency speculations in both scale and speed, in an environment of capital liberalization and development of financial technology. These crises are characterized by the second generation theory proposing that currency crisis happens with the change of expectations of speculators and so is self-fulfilled.

The Asia crisis, starting in Thailand in 1997, happened in a healthy economical environment and extended globally from Thailand to East Asia and further to Russia and Brazil. It is called a twin crisis

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since currency crisis and banking crisis happened simultaneously. The reason for these crises is the inflow of a large amount of short-term foreign capital while risk management of the financial institutions is fragile. The third generation theory focuses on analyzing these currency crises connected with banking crisis.

The first, second and third generation currency crisis theories investigated the cause of currency crises, the determinant factors of their depth, and the mechanism of their effects on actual economy. This paper surveys these theories with focus on the differences among them.

The paper is organized as follows. Section 2 introduces the first generation currency crisis theory with two representative models, built by Krugman (1979) and Flood and Garber (1984). Section 3 introduces the second generation theory via three representative models, two of Obstfeld (1994, 1996) and one of Sachs-Tornell-Velasco (1996). Section 4 introduces the third generation theory with three representative models, built by Corsetti (1998), Chang & Velasco (1998), and Krugman (1999). The last section gives some conclusions.

2. First Generation Currency Crisis Theory

The first generation currency crisis theory proposes that currency crisis happens with speculative attacks on the fundamentals such as foreign reserves. It is effective for the interpretation of currency crises in developing countries in Latin America such as Mexico (1973-1982) and Argentina (1978-1981).

The feature of the first generation currency crisis models is that the models treat currency crises as unavoidable and predictable phenomena. Because of the incompatibility between domestic fiscal policy and the fixed exchange rate regime, currency crisis occur.

The first generation currency crisis theory was presented by Krugman(1979) and was later modified and developed by Flood and Garber(1984). Krugman(1979) and Flood and Garber(1984) give an equilibrium in their models, while Diamond and Dybvig(1983) gives multiple equilibriums.

2. 1 First Generation Models[1]

Two representative models in the first generation currency crisis theory are Krugman's model (1979) and Flood and Garber's model (1984).

2. 1. 1 Krugman's Model (1979)

Inspired by Salant and Henderson's model (1978), Krugman built a model of balance-of-payments crisis. Balance-of-payments crisis was defined by Krugman as the moment in which "the government is no longer able to defend a fixed parity because of the constraints on its actions" (Krugman, 1979, p.311).

There are several assumptions in this model:

[1] For the survey of first generation models, Bustelo, García, and Olivié(1999) is referenced.

① Open small economy
② Perfect foresight
③ A single composite tradable good
④ Competitive markets with no trade barriers—purchasing power parity holds, international prices are constant.
⑤ While domestic agents distribute their wealth between domestic money and foreign money, foreign agents have no access to domestic money.

Under these assumptions, if the government bears fiscal deficit in a fixed exchange rate regime, the only way of financing fiscal deficit is to issue money, so the money supply is increased. On the other hand, if there is a fixed parity, the expected devaluation equals zero, so the proportion of domestic money and foreign money that domestic agents want to keep remains constantly. Thus money demand is constant while money supply rises. To preserve the proportion of wealth in domestic and foreign money, private domestic agents exchange the money supply excess for foreign currency in the central bank. Consequently, the central bank looses reserves.

Foreign currency reserves will be depleted if deficit fiscal and expansionary monetary policies are persisted. The exhaustion of reserves would produce inflation and domestic currency devaluation. To avoid the losses, private investors launch a speculative attack. The speculative attack quickens the depletion of foreign reserves, resulting in the collapse of the fixed exchange rate regime.

Krugman (1979) pointed out the following limitation of this model. The model supposes that there are only two assets (domestic money and foreign money) available. This puts government's actions in an unrealistic constraint, because the only thing government can do is to sell foreign reserves to peg exchange rate. Otherwise, the government can peg the exchange rate through open-market sales of securities etc.

Krugman's model (1979) uses a nonlinear model, and so has the difficulty that it cannot derive clearly the time when the government gives up fixed exchange maintenance. Flood and Garber's model (1984) was constructed to derive the time of the speculative attack clearly by using a linear model.

2. 1. 2 Flood and Garber's Model (1984)

Flood and Garber calculate the exact collapse time and the tracking of reserves by their model. Assumptions in Flood and Garber's model (1984) are

① Open small economy
② Perfect foresight
③ One tradable good
④ Competitive markets with no trade barriers—purchasing power parity holds, international prices are constant.
⑤ Competitive international financial markets—uncovered interest parity holds
⑥ Domestic credit grows at a constant rate.

In a fixed exchange rate regime, the government may finance its fiscal deficit via monetary expansion. To protect the exchange rate peg, the sum of domestic credit and the foreign reserves should be kept constant. While domestic credit is expanded, the same amount of foreign reserves must be

decreased. Therefore, there will be a moment when foreign reserves are exhausted, and the fixed exchange rate peg has to be abandoned.

The fixed exchange rate regime will have to be abandoned when speculative attack happens. As in Krugman's model (1979), speculative attack advances the collapse of the exchange regime. Speculative attack happens when the shadow flexible exchange rate, i.e. the exchange rate that would prevail in the absence of the currency peg, equals the fixed exchange rate. When the shadow exchange rate is lower than the fixed rate, there will be no speculative attack because private agents win nothing by buying foreign currency. On the other side, when the shadow exchange rate is higher than the fixed rate, the speculative attack is advanced because private agents compete for the profits of buying foreign currency before the collapse (after the collapse the price of the foreign currency will increase).

The limitation of Flood and Garber's model (1984)[2] is that it cannot explain the change of domestic interest rate observed in reality when fixed exchange rate system is changed to floating exchange rate system. Considerations of such uncertainties as increase of domestic credit and/or speculator's knowledge on government's foreign reserves, may be helpful to improve their model.

2. 2 Policy Suggestion Induced from the First Generation Theory

Currency crisis can be predicted through observation on the country's economic conditions. Implementing suitable fiscal policy and monetary policy is an effective method to avoid currency crisis.

2. 3 Evaluation of the First Generation Theory

The first generation models show that a rational behavior of private agents can turn small changes in the fundamentals into severe currency crises. But while analyzing the currency crisis, the models consider economic fundamentals only and neglect the effect of self-fulfilling expectations.

The first generation theory gives an effective explanation for the currency crises of the 1980s, but cannot explain the currency crises in the 1990s and later, since these crises happened under situations when the fundamentals were not getting worse. In order to explain this phenomenon, Obstfeld (1994, 1996) and Sachs-Tornell-Velasco (1996) built the second generation currency crisis models.

3. The Second Generation Currency Crisis Theory

The second generation currency crisis theory proposes that currency crises are independent of the evolution of macroeconomic fundamentals but are consequence of coherent self-fulfilling expectations. The theory is effective in explaining the European Exchange Rate Mechanism (ERM) crisis in 1992 and the Mexican crisis in 1994-95.

The feature of the second generation currency crisis theory is that it considers currency crisis as contingent and non-predictable phenomena.

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[2] Here, 中村亨(1996) is referenced.

3．1 The Second Generation Models

The representative models in the second generation currency crisis theory are Obstfeld 's model (1994), Obstfeld's model (1996) and Sachs-Tornell-Velasco's model (1996).

3．1．1 Obstfeld 's Model (1994)[3]

Obstfeld (1994) presented two models of self-fulfilling crisis. They focus, respectively, on the role of the nominal interest rate and the role of the growth of wages.

The assumptions of the two models of Obstfeld (1994) are:

① Open small economy

② Non-linear behavior of agents

③ Rational agents

④ Foreign reserves could be freely borrowed in the world capital market

The first model of Obstfeld (1994) analyzes the influence of the nominal interest rate on the devaluation rate. Since the government uses the currency depreciation to compensate the effects of the nominal interest rate rise on the price of public debt, there is a government reaction function of the depreciation rate with respect to the interest rate. On the other hand, private agents' expectations on depreciation rise when the nominal interest rate is raised, so there is another function of the depreciation rate with respect to the interest rate. When these functions are represented graphically, the intersections of the two curves give two equilibriums. One is equilibrium with a lower interest rate and a lower depreciation; another is one with a higher interest rate and a higher depreciation. When low depreciation anticipation leads to low interest rate, if the costs of maintaining the fixed parity is lower than the fixed cost ("a cost that could reflect political embarrassment and lost credibility", Obstfeld, 1994, p.33), the government will choose to maintain the fixed parity. On the contrary, when high depreciation anticipation leads to high interest rate, the cost of maintaining the fixed parity increases. If the cost of maintaining the fixed parity is higher than the fixed cost, the government will choose to abandon the fixed parity, and self-fulfilling currency crisis occurs.

The second model focuses on the influence of the growth of wages on the devaluation rate. In this case, if domestic currency is expected to depreciate in the future, trade unions will ask for higher growth of wages and consequently incur a loss of trade competitiveness. This leads output growth to decrease and unemployment to increase, so that the cost of maintaining the fixed parity will rise. As in the first model, if the cost of maintaining the fixed parity is high, the government will choose to abandon the fixed parity. Otherwise the fixed parity will be maintained. As before, there are multiple equilibriums, one of which is the final result depending on private devaluation expectations.

Krugman (1996) pointed out two limitations of Obstfeld 's model (1994). First, it disregards the long-term trend of fundamentals aggravation. Second, when the fundamentals certainly get worse, multiple equilibriums probably do not exist.

Basing on his 1994 model and using a completely different approach, Obstfeld investigated the

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[3] For the survey of Obstfeld 's Model (1994), Bustelo, García, and Olivié(1999) is referenced.

mechanism of self-fulfilling currency crisis and gave another model in 1996. The main difference between the two models is that in Obstfeld's model (1996), the existence of multiple equilibriums depends on the fundamentals.

3. 1. 2 Obstfeld's Model (1996)[4]

Obstfeld's model (1996) uses game theory to analyze the mechanism of self-fulfilling currency crisis.

When the fundamentals are in very good condition (e.g. the foreign reserve is high), the speculators will loss if they launch a speculative attack. The currency peg is maintained.

When the fundamentals are in very bad condition, the speculators can get profits if they launch a speculative attack. So devaluation is unavoidable.

When the fundamentals are in intermediate condition, there are two equilibriums. If many speculators think, that other speculators won't launch a speculative attack, they will not launch a speculative attack too, so the fixed exchange rate system is maintained. However, if many speculators think, that other speculators will launch a speculative attack, they will do the same thing. Consequently, the fixed exchange rate system will be collapsed.[5] In this case a self-fulfilling currency crisis will be occurred as the speculators expect.

Unlike Obstfeld's models (1994, 1996), Sachs-Tornell-Velasco's model (1996) considers, in addition to foreign reserves, the soundness of a banking sector as an important element of influencing expected formation of exchange rate depreciation.

3. 1. 3 Sachs-Tornell-Velasco's Model (1996)

Sachs-Tornell-Velasco's model analyzes the generating mechanism of self-fulfilling currency crisis using indicators such as the foreign reserves, the change rate of exchange rate, and the soundness of banking sector.

Assumptions in this model are:

① Open small economy

② Simple behavior of investors and government

③ Disregarding the intertemporal aspects of both government behavior (e.g. public debt management) and individual behavior (the consumption-savings choice)

In Sachs-Tornell-Velasco's model (1996), the scale of the exchange rate devaluation is determined by two elements—nominal exchange rate and lending boom (index of judging banking sector's vulnerability). The lower the nominal exchange rate and the higher the preceding boom in bank lending are, the greater the exchange rate devaluation is.

When a country has strong fundamentals, the expected devaluation is usually lower than the difference between domestic and foreign interest rates, and so there will be no capital outflows. Hence no devaluation occurs.

When a country has weak fundamentals (e.g. a weak banking system), if the expected devaluation

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[4] Like Obstfeld (1996), Irwin and Vines (1995), Cole and Kehoe (1996) also propose that the existence of multiple equilibriums depends on the fundamentals.

[5] Here, 藤原秀夫・小川英治・地主敏樹 (2001) is referenced.

is higher than the difference between domestic and foreign interest rates, there will be a net capital outflow. In case the capital outflow is lower than the foreign reserves, the government can defend the exchange rate against a capital outflow, so no devaluation occurs. However, in case the capital outflow exceeds the foreign reserves, devaluation might occur. There are multiple equilibriums during the occurrence of self-fulfilling currency crisis.

3. 2 Policy Suggestion Induced from the Second Generation Theory

In the self-fulfilling currency crisis models, it is claimed that currency crisis cannot be prevented from breaking out by only a moderate domestic economic policy. When carrying out a fixed exchange rate system, the government needs to perform control of capital, and restriction on capital market dealings.

3. 3 Evaluation of the Second Generation Theory

Bustelo, Garc a, and Olivie(1999) gave an evaluation of the second generation theory as well as pointed out its advantage and problems.

The advantage of the second generation theory is as follows. On the origin of currency crises, "the second generation models offer an explanation that do not depend on the variables included in concrete models" (Bustelo, Garc a, and Olivie, 1999. p47). This is useful for explaining a wider range of crisis.

Problems of the second generation theory are as follows. First, the second generation models are not predictive, since, given certain fundamentals, the models can not determine which one of the multiple equilibriums will occur. Second, the theory blames only the private agents' behavior. The government is free from the responsibility of avoiding currency crises.

During the Asian currency crisis (1997-1998), financial crisis occurred together with currency crisis. If the relation between currency crisis and financial crisis, the widths of contagion, the depth of influence, the transfer problem, and the balance of payments equilibrium, etc. are taken into consideration, it is difficult for the first generation and the second generation currency crisis theory to analyze them completely. To overcome this difficulty, Corsetti (1998), Chang & Velasco (1998), and Krugman (1999) built the third generation currency crisis theory.

4. The Third Generation Currency Crisis Theory

The third generation currency crisis theory emphasizes the link between banking crisis and currency crisis (the twin crises). Especially, it analyzes the cause and the essence of the Asian currency crisis (1997-1998).

Concerning the cause of currency crisis, there are three approaches. That is to say, moral hazard based on Corsetti's model (1998), financial fragility based on Chang& Velasco's model (1998), and balance sheet based on Krugman's model (1999).

4．1 The Third Generation Models

4．1．1 Corsetti's Model (1998)

Corsetti (1998) analyzes the Asian currency crisis via moral hazard.

There are several assumptions in this model:

① Open small economy

② A single composite tradable good

③ Competitive markets with no trade barriers—purchasing power parity holds, international prices are constant.

④ The country's asset markets are incomplete and segmented, but the country's labor markets are complete and have no segmentation.

Under Corsetti's model, currency crisis happens as follows. Since the government gives implicit guarantees to domestic bank debt, moral hazard may occur in the banks' process of providing loans and consequently the number of bad loans will be increased. If domestic banks' liabilities exceed assets due to increased number of bad loans, the government devotes treasury accounts to them. The devotion of such treasury accounts leads to government budget deficit. To compensate the budget deficit, the government expands domestic credit. The growth of money supply generates expectations of exchange rate depreciation.[6] To avoid losses in case of the anticipated depreciation, economic agents will launch speculative attacks. An attack on the monetary balances will bring out a currency crisis. On the other hand, an attack on the foreign liabilities of the financial and corporate sector will cause the international creditors to withdraw the loans, so it triggers a financial crisis.

Corsetti (1998) proposes that moral hazard is the cause of banking crisis, but chang & Velasco (1998) propose that financial crisis may be due to liquidity squeeze.

4．1．2 Chang & Velasco's Model (1998)

Chang & Velasco propose that illiquid domestic banks may cause financial crisis. In this model, illiquidity is defined as "・・・ a situation in which the financial system's potential short term obligations exceed the liquidation value of its assets ・・・" (Chang & Velasco, 1998, p3).

The assumptions in this model:

① Open small economy

② A single tradable good

③ A lot of ex ante identical agents

④ Three period's model. Each agent has access to a constant returns on long term technology, in which one dollar invested at period 0 yields less than one dollar in period 1 and more than one dollar in period 2. There is also a world capital market where one dollar invested at period 0 yields one dollar in either period 1 or period 2.

Chang & Velasco's model focuses on demand deposits, which are contracts that, in period 0, commercial banks collect the residents' endowment as deposits and get their capacity to borrow from abroad. The bank invests in the long-term technology and borrows from abroad in period 0 and 1.

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[6] Here, 服部正純 (2002) is referenced.

In return, the depositors have the right to withdraw their deposits either in period 1 or in period 2. The model also assumes that the banks are committed to repay any foreign debt under all circumstances. In period 1 the depositors are assumed to arrive in random order and decide to withdraw money or not. The bank can meet the obligations by borrowing the necessary funds from abroad, and by liquidating the long-term investments into the illiquid technology. If the withdraws exceed the bank's total liquidation value in period 1, a bank run will occur. But if all depositors act in accordance to their type, bank run will not occur.

Chang & Velasco (1998) show that bank run may be caused not only by domestic depositors, but also by a panic of foreign investors. They indicate that it is the volume of short-term foreign debt that makes the country vulnerable to banking crisis. Furthermore, they prove that financial liberalization and the combination of bad policies and unfavorable shocks may exacerbate the fragility of the financial system and can indeed make crises possible.

The link between currency crisis and banking crisis is as follows. The model assumes that residents can consume only when exchanging domestic currency against foreign currency at the central bank. When the central bank tries both to fix the exchange rate and to act as a lender of last resort for the domestic banking system in case of bank run, there are two possibilities. If the central bank chooses to fix the exchange rate, a banking crisis will occur, and if the central bank chooses to save domestic banks by expanding domestic credit, a currency crisis will occur.

Corsetti (1998) and Chang & Velasco (1998) propose that it is problems in the banking sector that cause financial crises. Different from them, Krugman (1999) shows that a deep financial crisis can occur even if the banking sector has no problems.

4. 1. 3 Krugman's Model (1999)

Krugman (1999) presented a model that emphasizes the role of companies' balance sheets in determining their ability to invest and the effect of capital flows on real exchange rate. In this model, he discusses about the contagion problem, transfer problem, and balance sheet problem.

The assumptions in this model:

① An open economy

② A single good is produced each period using capital and labor

③ Capital is created through investment and capital lasts only one period

④ Workers play a passive role, but entrepreneurs play a crucial role to create and own capital

Under Krugman's model (1999), currency crisis may happen in the following situation. Suppose, companies have a large proportion of foreign debt and real exchange rate overvaluation leads to expectation for depreciation. In this case, capital outflow will decrease domestic firms' ability to invest. As a result, the real exchange rate will depreciate. This will reinforce capital outflow and so worsen domestic firms' ability to invest. In the light of real exchange rate depreciation, foreign debt will soar and output will decrease due to diminished ability to invest. When foreign debt becomes unbearable for over-exposed domestic firms, many firms will go bankrupt. So self-fulfilling expectations are realized.

According to Krugman (1999), there are three factors that can make financial collapse possible, i.

e., high leverage, low marginal propensity to import, and large foreign-currency debt relative to exports. He proposes that the countries' high exposure to foreign denominated debt was the most important factor for the Asian crisis.

Krugman (1999) made three policy suggestions.

Before the crisis, prophylactic measure may be helpful to discourage firms from taking on foreign debt of any maturity.

During the crisis, provision of emergency lines of credit and curfew on capital flight are possible ways to deal with crisis.

After the crisis, it is important to rescue the entrepreneurs, or to help create a new set of entrepreneurs, or both.

4. 2 Evaluation of the Third Generation Theory

Fourçans and Franck (2003) gave an evaluation of the third generation theory.

The advantage of the third generation theory is as follows. The third generation models give a crucial role to fundamentals while do not neglect the potential effects of speculators' self-fulfilling expectations. The models take institutional aspects into account, so widen the scope of currency crisis causes.

Problems of the third generation theory are as follows. Some third generation models restrain fundamentals to the banking sector. Others don't point out clearly the main cause of speculative attack from deteriorating fundamentals and speculator's self-fulfilling expectations.

5. Conclusion

This paper gives a survey of the currency crisis theories, which analyze the currency crises in the 1980's and the 1990's.

These theories for currency crisis are divided into three generation theories.

The first generation currency crisis theory was presented by Krugman(1979) and later developed by Flood and Garber (1984). The first generation theory is characterized by domestic fiscal policy incompatible with the fixed exchange rate regime, which leads to speculative attacks.

The second generation currency crisis theory was presented by Obstfeld (1994, 1996) and Sachs-Tornell-Velasco (1996). The second generation theory stresses that expectations of agents can lead to speculative attacks without major changes in the movements of fundamental macroeconomic variables.

The third generation currency crisis theory was presented by Corsetti (1998), Chang & Velasco (1998), and Krugman (1999). The third generation theory emphasizes on the fact that it is government guarantees, poor banking system, and contagion which cause financial crises and currency crises to occur simultaneously.

These theories explain currency crises and financial crises to some extent. However, there are still unsolved problems such as that about factors affecting agents' expectation, contagion problem, etc. These problems remain tasks for future research.

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