Three Essays on Macroeconomy under Financial Instability and Female Labor Participation

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· Chapter 1 is based on 'Equity Market and Foreign Capital' by Yoko Furukawa.

· Chapter 2 is based on 'Excessive Liquidity and Capital Reversals in Emerging Market.' by Yoko Furukawa.

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Contents

Overview

Financial instability exacerbates a macroeconomy. It may lead to recessions or even destroy the macroeconomy. A stable financial system is necessary for economic growth. In order to eliminate financial instability, its cause and mechanism must be understood. Therefore, many macroeconomists are engaged in work on what triggers financial instability.

Capital swings induces financial instability by causing disorder in financial markets. More specifically, financial disorder transforms into currency crises when capital swings destroy macroeconomies internationally.

We have observed a number of currency crises in the 1990s. The crisis of the European monetary system crisis occurred in 1992 followed by The Mexican crisis in 1994, and the Asian crisis in 1997-1998. These crises were fuelled by swings of international capital. Prior to 1990, currency crises were triggered by immature economies. An effective prescription for which was financial re-depression. After 1990, currency crises have emerged in economies with well-developed financial markets. Financial re-depression cannot mitigate such crises. We have to deal with these crises through other channels.

Financial re-depression is considered to be effective against all types of currency crises. This is because the price mechanism eliminates the possibility of speculative attacks, according to conventional wisdom. To the

extent that there is a well-functioning equity market, prices converge to their equilibrium level as they are uniquely determined by arbitrage transactions across other financial markets, such as bonds and securities. The currency crises of the 1990s, however, occurred in the economies with well-developed financial markets. Chapters 1 and 2 of this dissertation attempt to present mechanisms of currency crises in a well-developed domestic financial markets.

Chapter 1 shows that the fixed exchange rate regime distorts a well-developed equity market. Many currency crises have occurred in the fixed exchange rate regime. During the Asian crisis, equity market crashes coincided with the collapses of exchange rate regimes in emerging markets. Although considerable empirical evidence suggests this linkage, few theoretical studies have considered this issue.

Owing to foreign capital inflows and the fixed exchange rate regime, the price mechanism cannot always effectively stabilize an equity market. This is in contrast to conventional wisdom. This is because of the sustainability of the fixed exchange rate regime. Under the fixed exchange rate regime, foreign currency is offered on a first come, first served basis. This creates a strategic complementarity among foreign investors who invest in domestic equity markets through foreign exchange markets, which can result in multiple equilibria. The multiplicity of equity market equilibria generates the possibility of simultaneous equity and currency market crashes.

Foreign investors participate in the equity market through the currency market. The currency market may distort the weights of the current and future value of assets in a country, thereby infecting the equity market. This creates multiple equilibria—one, with optimality, and the other, with sub-optimality. Multiple equilibria produce the possibility of speculative attacks in the equity market as well as the currency market. Therefore, conventional

wisdom that the self-stabilizing mechanism of the equity market eliminates the possibility of speculative attacks is not consistently supported in chapter 1.

Chapter 2 focuses on foreign capital reversals as a result of a unique equilibrium in a well-developed domestic equity market. Normally, a unique equilibrium represents optimality, and optimality is not considered to be a consequence of financial instability. Chapter 2 shows that foreign capital reversals are driven by internal and external factors in an economy.

Excessive liquidity in an economy constitutes the internal factor. Risk-averse domestic agents require excessive liquidity. Since domestic risk-averse agents overreact to unexpected liquidity shocks, they demand excessive liquidity in the domestic financial market. This excessive liquidity expands domestic consumption at the expense of investment, which is accompanied by rise in stock prices in the early stages. Thus, countries that import capital become less profitable for foreign investors who withdraw their assets. Chapter 2 shows that excessive liquidity engenders a unique equilibrium with the risk of capital reversals even in markets that are based on solid economic fundamentals.

In the early stages, excessive liquidity raises stock prices to levels higher than what would otherwise be in terms of current economic fundamentals. Prices of stocks are determined by the discount on the potential for future growth at the interest rate, which can be higher than current economic fundamentals. Liquidity circulates more than what their economic fundamentals need in the early stages of the economy. However, with the change in the the external environment, the economy tends toward insolvency, and capital reversals occur as a result of a unique equilibrium. Excessive liquidity enables easy outflow of foreign capital.

The external factor is the world interest rate. Obviously, an unexpected jump in the world interest rate triggers capital reversals in emerging markets. I show that untimely capital reversals can occur when the world interest rate is relatively low with regard to the potentials for economic growth. Nevertheless, unexpected jumps in the world interest rate trigger untimely capital reversals explicitly, while excessive liquidity has the same effect implicitly. Domestic weakness spreads to foreign investors during untimely capital reversals.

Unexpected capital reversals can occur when an emerging economy follows a unique equilibrium model, notwithstanding the potential for economic growth. This is different from the model described in chapter 1 wherein multiple equilibria induce capital reversals. There are external factors (the world interest rate) and internal factors (the risk-averse tendency of domestic stockholders) that determine the direction of foreign capital movements. Consequently, capital swings occur in a unique equilibrium.

Chapter 3 examines one of the economic phenomena caused by business cycles. It considers the change in the female labor participation rate produced because of business cycles. I prove that the female labor participation rate is determinedby not only by business cycles but also by another significant factor—household income inequality. Chapter 3 presents a general equilibrium model to analyze the relationship between the female labor participation rate and income inequality. I show that income inequality flattens the change in the female labor participation rate.

We usually assume a representative agent while attempting to obtain simple implications about the macroeconomy. The female labor participation behavior, however, varies with the household income levels. Income inequality can influence the female labor participation behavior in accordance with

business cycles. I introduce a distribution of agents' income instead of a representative one in a general equilibrium model, and provided a stochastic behavior of agents who confront the decision between housework and labor participation.

The main objective of chapter 3 is to show that income inequality determines the magnitude of the change in the female labor participation rate in business cycles. I focus on the income/housework preference ratio of each household. A representative agent has a unique income/housework preference ratio. Thus, the entry into and exit from a labor market of female labor of the representative household is uniquely determined. I assume heterogeneity of households' earning ability in the model described in chapter 3 and analyze the relationship between the distribution of income and the female labor participation rate. Heterogeneity of household income leads to heterogeneity of the decision of female labor participation. I discover that wider income distribution makes the female labor participation less dependent on fluctuations in business cycles.

Threshold households decide new entry/exit of a female labor market. A wage cut does not have an adequately strong impact on the participation of female labor if the income distribution is wide. Middle class households are strongly influenced by economic fluctuations. In the case of wide income distribution, a small number of households reconsider female labor participation depending on the business fluctuations. In contrast, when the income distribution is narrow, a large number of households may alter female labor involvement in leisure and the labor market.

The results obtained in chapter 3 provide a microscopic view of the macroeconomy. Each agent's behavior is independently of the representative agent's behavior. On aggregating agent behavior, we obtaine only the

average, representative agent. However, this will not consider the fact that each agent is different. The model in chapter 3 enables us to have a microeconomic view in a macroeconomy. In regard with the female labor participation rate is an appropriate parameter for analyzing microscopic behavior in a macroeconomy.

Overall, this dissertation provides a view of financial instability and macroeconomy. The rest of this dissertation is organized as follows. Chapter 1 is entitled 'Equity Market and Foreign Capital.' Chapter 2 is 'Excessive Liquidity and Capital Reversals in Emerging Markets.' Chapter 3 provides 'Female Labor Participation Rate and Income Inequality.'

Chapter 1

Equity Market anf Foreign Capital

abstract

This chapter analyzes how the fixed exchange rate regime that is not complete market distorts a well-developed equity market. Recent research suggests that there is a strong linkage between equity market recessions and currency crises. It presents a model that demonstrates that the market mechanism is not always effective in stabilizing an open equity market. Foreign capital inflows create multiple equilibria in the equity market, which may simultaneously trigger a currency crisis as well as an equity market crash even if the equity market is well developed.

1.1 Introduction

Recent research suggests that there is a strong linkage between equity market recessions and currency crises.[1] The synchronization of equity market crashes and the collapses of exchange rate regimes is often observed during crises in emerging markets[2] and is referred to as *twin crises*—financial market crises both in domestic and international levels. The co-movement of equity prices and exchange rates receives considerable attention because it exacerbates macroeconomic instability.

Although much empirical evidence suggests this linkage, few theoretical studies have considered this issue. According to conventional wisdom, the price mechanism eliminates the possibility of speculative attacks. To the extent that there is a well-functioning market for equity, prices converge to their equilibrium level as they are uniquely determined by arbitrage transactions across other financial markets, such as bonds and securities. There is no theoretical possibility of a sub-optimal equilibrium induced by speculative attacks. Allen et al. (2002) claim that equity financing prevents financial distress. Claessens (2004), Hakansson (1999), and Ishii and Habermeier (2002) insist that well-developed financial markets help reduce the risk of financial crises.

I demonstrate that, due to foreign capital inflows, the price mechanism is not always effective in stabilizing an equity market. This is because the currency market may distort the weight of the current and future value of assets in the country, infecting the equity market. Foreign agents invest

[1] Kaminsky and Reinhart (1999, 2002) mention that recessions and asset price bubble bursts precede financial crises.

[2] Hashimoto and Ito (2004) have found a high degree of co-movements between the exchange rate and the stock prices during the Asian crisis.

in equity markets through currency markets. Under a fixed exchange rate regime, foreign currency is offered on a first come, first served basis. This creates a strategic complementarity among foreign investors who invest in domestic equity markets through foreign exchange markets, which can result in multiple equilibria. The multiplicity of equity market equilibria produces the possibility of simultaneous equity and currency market crashes. Contrary to conventional wisdom, the price mechanism does not always ensure a unique equilibrium in an open equity market.

I examine these issues using a variant of the Diamond and Dybvig (1983) model. They show that the creation of a banking system enhances social welfare; yet the same banking system simultaneously creates the possibility of bank runs that destroy welfare. The Diamond-Dybvig model is a seminal contribution to the understanding of why financial panics may occur despite sound economic fundamentals.

In a series of works, Chang and Velasco (2000a, 2000b, 2001) adapted Diamond and Dybvig's framework to an open economy. They clarified the relationship between exchange rates, currency regimes, and banking crises by showing how banking crises triggers foreign creditor panic. Their results, however, relied heavily on the assumption of an incomplete domestic financial market: namely, maturity mismatches. In order to critically examine conventional wisdom that the price mechanism stabilizes such markets in an emerging economy, I embed a well-developed financial market into Chang and Velasco's framework. This modification rules out maturity mismatches in a domestic financial market.

Jacklin (1987) has modified the framework that results in these maturity mismatches. He has introduced the equity market mechanism into the Diamond and Dybvig model. He shows that an equity market arrangement

can achieve the same allocations as those achieved by the Diamond-Dybvig's banking system without producing the possibility of a run. This indicates that an equity market is self-stabilizing, as is suggested by conventional wisdom. To begin with, I examine the performance of an equity market in the manner proposed by Jacklin (1987) and confirm his conclusion by investigating whether or not the self-stabilizing mechanism of an open equity market indeed performs well during speculative attacks.

An open-economy extension of Jacklin's model yields two distinct analytical advantages. First, by introducing the equity market mechanism into an analysis of twin crises, I can relax the implicit assumption of the Diamond-Dybvig theory—the limited access of agents to financial markets. This provides a further analysis of financial crises without maturity mismatches in a domestic market.

Second, in contrast to Jacklin's model, I prove that the equity market mechanism is not always effective in stabilizing an economy. Although the self-stabilizing mechanism in an equity market is still adequate for eliminating speculative attacks in a closed economy, it is inadequate in an open one. This is because a sell off by foreign investors in the domestic equity market places too much liquidated capital in the hands of foreign investors, who then try to repatriate these assets to their own country. Notably, coordination failure is inevitable in a fixed exchange rate regime. Under certain circumstances, foreign currency reserves are insufficient to defend the fixed exchange rate regime even though the value of the foreign owned assets depreciates due to a sell off. This results in a run on the foreign currency in conjunction with a depression in the equity market. I show that even a mere suspicion of a currency crisis is sufficient to trigger a crisis in the foreign exchange market as well as speculative attacks in the equity market.

The remainder of this paper is organized as follows. Section 2 studies the basic model with optimal and suboptimal equilibrium that causes simultaneous currency and equity markets crashes. Section 3 offers some concluding remarks.

1.2 The Model

Consider a country that lasts over three periods indexed by 0, 1, and 2. There is a single consumption good named *dollar*. This good is freely traded and consumed at all times. There is a continuum of ex ante identical investors. Each investor is endowed with 1 dollar.

The available technology allows a dollar to be stored from one period to another. Furthermore, there is a productive but illiquid technology available only for one *firm*, which is owned by the country. The firm requires an input of dollars in period 0, which yields $0 < L < 1$ units of dollars in period 1. Reinvesting L in the production process as an additional input, it returns $R > 1$ dollars in period 2. Hence, without the influx of dollars, this technology is not available.

Following Diamond and Dybvig (1983), let x denote the typical investor's consumption if she is *impatient*, and let y denote the quantity of consumption if she is *patient*. All investors have probability λ, $0 < \lambda < 1$, of being impatient, in which case they care only about period 1 consumption. Otherwise, they are patient and are indifferent to the timing of consumption. I assume that investors derive their utility from consuming dollars. Hence, x and y are denominated by dollars. Then, the investor's expected utility is:

$$\lambda u(x) + (1 - \lambda)u(y). \tag{1.1}$$

The utility function, $u(.)$, is smooth, strictly increasing, strictly concave,

and satisfies Inada conditions.

There is a fixed cost of investing in the firm, $\bar{u}$, which can be interpreted as a risk premium. If an investor can expect a gain of U, she will enter as long as $U - \bar{u} > 0$, but will stop in equilibrium when $U = \bar{u}$. Obviously, for an equilibrium with entry to exist, the fixed cost should not be exorbitantly high. Otherwise, capital will not flow to production due to a high risk premium.

There is a local currency named *peso*. Pesos are created and/or destroyed by the central bank of the country without cost. Moreover, pesos can be stored from one period to the next without cost. The central bank is owned by the country.

All transactions in the country are denominated in pesos. I assume that investors who wish to consume in period 2 must hold pesos in some amount during periods 1 and 2. Otherwise, investors cannot consume in period 2. Let α $(0 < \alpha < 1)$ be the ratio of the minimum peso holding against consumption during periods 1 and 2. Denote m_1 the amount of each investor's peso holdings from period 1 to 2. Then, $m_1 \geq \alpha y$. This minimum peso holding can be motivated by 'cash in advance'. This assumption ensures the simplicity of peso demand. An implicit assumption is that α is not too high.

Since the central bank is the sole supplier of pesos, it determines the value of the peso to the dollar, which is interpreted as the exchange rate, denoted as e_t in period t. I assume that the central bank taxes all dollars in the country. This implies that each investor must visit the central bank when she consumes dollars. The firm, too, must visit the central bank in order to obtain dollars when it commences production in period 0, after which it re-invests an additional input in period 1. To begin with, I assume that the exchange rate of peso to dollar is one. The central bank guarantees the exchange rate fixed to the promised rate on a first come, first served basis.

At the initial period, the firm decides its dollar basis investment strategy. The objective of the firm is to extract the surplus of investors. It stores a certain amount δ $(0 \leq \delta \leq 1)$ of the initial investment and possibly some portion of liquidation, ζ $(0 \leq \zeta \leq 1-\delta)$, of the production process in order to distribute profits to investors in period 1. Then, the firm invests the rest in the illiquid production technology, and thereafter, pays some portion of the initial amount to investors. The extraction is determined by how much the firm harvests from production and the amount it has to pay the investors:

$$\max_{\delta,\zeta,x,y} \delta + L\zeta + R(1-\delta-\zeta) - [\lambda x + (1-\lambda)y]. \tag{1.2}$$

The country should set the parameter such that the allocation in terms of dollars is feasible:

$$\lambda x \leq \delta + L\zeta, \tag{1.3}$$

$$(1-\lambda)y \leq R(1-\delta-\zeta), \tag{1.4}$$

$$x,\ y,\ \delta,\ \zeta \geq 0, \quad \delta + \zeta \leq 1. \tag{1.5}$$

The resource constraints in period 1 and 2 are represented in (1.3) and (1.4) accordingly. Furthermore:

$$\lambda R x + (1-\lambda)y \leq R, \tag{1.6}$$

$$\lambda u(x) + (1-\lambda)u(y) \geq \bar{u}, \tag{1.7}$$

$$m_1 < x < y, \quad m_1 \geq \alpha y. \tag{1.8}$$

Inequality (1.6) indicates that the country never accepts investors unless it stands to gain from it. Investors, as well, never invest in the firm unless they stand to profit from it. Hence, there is a participation constraint, (1.7). If (1.8), investors act according to their types. Unless (1.8), there is an incentive for patient/impatient investors to pretend to be impatient/patient investors.

Since $L < 1$, it is evident that the country gains more when $\zeta = 0$. It can easily be noted that the resource constraint (1.3) must be necessarily

binding. Hence, $\lambda x = \delta$.

Substituting $\zeta = 0$, $\delta = \lambda x$, into (1.2), the optimal allocation for the country is represented as follows:

$$\min_{x,y} \lambda Rx + (1-\lambda)y,$$

subject to (1.6), (1.7), (1.8) as well as $\lambda x \leq 1$, where the last constraint stands for $\delta \leq 1$.

If $\bar{u}$ is too high, the constraint set is empty. This can be interpreted as being no possibility for the country to commence production if the country risk is too high. Similarly, if α is too high, the constraint set is empty. Assuming $\bar{u}$ and α are not too high, then the optimal allocation in terms of dollars satisfies the following:

$$u'(x^*) = Ru'(y^*), \tag{1.9}$$

$$\bar{u} = \lambda u(x^*) + (1-\lambda)u(y^*), \tag{1.10}$$

$$\delta = \lambda x^*. \tag{1.11}$$

Given this economic regime, the question that arises is whether or not—and in what manner—the optimal allocation described in (1.9)-(1.11) will be implemented in this economy. In order to analyze this issue, I will assume that all investors enter this country initially.[3]

Next, this allocation is implemented in an economy with an equity market where pesos is the currency for transaction. Under this framework, a share is the sole channel by which to connect the firm and the investors. Define a share as the right to that part of the firm's process in period 0. In the initial period, the firm sets the price of the share to one peso per dollar investment. Let d_1 and d_2 be the dividend per share in period 1 and 2, accordingly. I assume that a share market is open in period 1 where investors can freely

[3]The same argument can be found in Diamond and Dybvig (1983).

trade ex-dividend shares. Let q be the share price. As in Jacklin (1987), if optimal allocation is feasible, the firm should set the dividend distribution policy and the investment strategy in order to attains the objective of the surplus extraction from investors. From the assumption that all transactions including dividend distribution in the country are made in pesos, the firm pays dividends in pesos.

Suppose that the central bank offers to lend pesos to the firm in period 1, to be repaid in period 2 without interest. When the firm sets the dividend to be $d_1 = \lambda x^* + (1-\lambda)\alpha y^*$ and $d_2 = (1-\lambda)(y^* - \alpha y^*)$, the optimal allocation is implemented.

Proposition 1 *The allocation* (x^*, y^*) *can be decentralized.*

Proof. Market clearing in the optimal allocation requires that impatient investors sell off their shares in period 1 and patient investors purchase them using their received dividends minus their peso holdings (m_1) during periods 1 and 2. Since investors expect $e_1 = e_2 = 1$, there is no net return in terms of dollars from holding pesos. Then, patient investors hold exactly $m_1^* = \alpha y*$ units of pesos. The market clearing price of the share yields,

$$\begin{aligned} \lambda q &= (1-\lambda)(d_1 - m_1^*), \\ q &= \frac{1-\lambda}{\lambda}(d_1 - m_1^*). \end{aligned}$$

From assumption (1.8), the price of the share is positive. In any event, impatient investors will sell off their shares in period 1. Since $d_2 - q = d_2 - \frac{1-\lambda}{\lambda}(d_1 - m_1^*) = (1-\lambda)(y^* - x^*)$ and $y^* > x^*$ from (1.8), the return per share from periods 1 to 2 is positive. Patient investors have an incentive to purchase as many shares as possible. The amount of consumption in each period then yields $x = d_1 + q = x^*$ and $y = \frac{d_2}{q}(x - m_1^*) + m_1^* = y^*$.

The optimality requires that the expected utility from investing in the

firm equals the risk premium $\bar{u}$ ((1.10)). If a patient investor deviates from optimality, then the share price falls and the profitability of holding shares from periods 1 to 2 rises. This indicates that deviating from the optimality does not arise as an equilibrium. Thus, the optimal allocation is incentive compatible. *Q.E.D.*

Proposition 1 states that the equity-finance economy can achieve optimal allocations. As Jacklin (1987) observed, an equity market system eliminates the possibility of a financial panic, but nevertheless achieves optimality. This implies that the equity market has a self-stabilizing mechanism. This proposition is consistent with conventional wisdom that the price mechanism eliminates the possibility of speculative attacks. However, an emerging economy with foreign capital inflows has to be concerned about international liquidity as well as domestic liquidity.

I define a share market crash as a situation where some or all patient investors deviate from optimality and sell off their shares in period 1. Consider the case in which investors do not expect that the fixed exchange rate regime will sustain itself until the final period. Hence, investors convert all of their assets into dollars. This happens when the central bank fails to defend the fixed exchange rate regime during period 1. This means

$$d_1 = \lambda x^* + (1-\lambda)\alpha y^* \geq \delta + L(1-\delta). \tag{1.12}$$

Proposition 2 *If (1.12), then there exists an equilibrium where a share market crash and a collapse of the fixed exchange rate regime occur simultaneously.*

Proof. Suppose all investors expect the fixed exchange rate regime to collapse during period 1 and $e_2 = \infty$. Since investors anticipate that $d_2/e_2 -$

$q/e_1 \leq 0$, patient and impatient investors sell off their shares in period 1. If (1.12), then clearly the central bank fails to meet all requests on currency exchanges. In this case, no dollar is supplied in period 2; that is, $e_2 = \infty$. The dividend distributed in period 2 is worthless in terms of dollars, which makes holding shares until period 2 worthless as well. Since both patient and impatient investors wish to sell off all their shares in period 1, the price of the share falls to $q = 0$. Consequently, a share market crash as well as a collapse in the fixed exchange rate regime occurs simultaneously. *Q.E.D.*

There is no supply of dollars in period 2 when the central bank fails to defend the fixed exchange rate regime. Regardless of how much the firm pays peso-denominated dividends in period 2, the share price declines to zero because the return per share is not positive ($d_2/e_2 - q/e_1 \leq 0$).

Proposition 2 claims that although the share price falls during a twin crisis, all investors, regardless of their type, decide to sell off their shares in order to retrieve their capital at the early stage. This is because the impact of an exchange rate depreciation outpaces that of the share price devaluation. The expectation of a currency crisis causes a crash in the share market and an actual crisis for the currency market. As a result, the optimal allocation described in (1.9) - (1.11) cannot be implemented when the exchange rate collapses.

The problem is that once investors expect a currency run, anything that causes them to anticipate a sudden capital outflow will actually trigger it. Even worse, a depression in the share market caused by a sudden capital outflow will simultaneously destroy the economy of the country due to the excess demand for the dollar in period 1.

Remarkably, there is no maturity mismatch in terms of domestic liquid-

ity. Even if the dividend distribution in the final period does not change by, for example, the central bank's action as a lender of last resort, a sudden capital outflow occurs. In this case, the self-stabilizing mechanism in the share market is inadequate to rule out the sub-optimal equilibrium that causes a share market crash. In other words, even if there is a well developed financial market, and domestic liquidity is not binding, a suspicion of an exchange rate depreciation makes international liquidity binding. This presents a different view of twin crises from Chang and Velasco's works where maturity mismatches in a domestic financial market cause a domestic financial and/or currency crisis. A suspicion of an exchange rate depreciation causes a crash in the share market, a sudden capital outflow, and a consequent and simultaneous collapse of the fixed exchange rate regime.

A coordination failure in currency exchanges infects the share market with a crisis. A sell off of the firm's shares by patient investors places an excessive amount of pesos in the hands of patient investors, who then attempt to redeem these pesos for dollars. Hence, a currency run occurs in conjunction with a run in the share market.[4]

Indeed, even in this chapter, there is no coordination failure in the share market. The currency market, however, distorts the weight of the current and future values of the shares even though the share market mechanism functions adequately. This results in a twin crisis: a share market crisis and a currency crises.[5]

[4]In the case of some emerging market crises, twin crises are first undertaken domestically and are then spread to foreign investors, contrary to the result in Proposition 2. Refer to Furukawa (2005) for the theoretical analysis of this type of twin crises.

[5]A flexible exchange rate regime or capital outflow controls can alleviate twin crises, but that the focus of this chapter is on environments which are subject to these crises. Further discussion will be provided in future researches.

1.3 Conclusion

I have provided a formal analysis on the performance of foreign capitals in the share market in a country with foreign capital inflows under a fixed exchange rate regime. Furthermore, I have shown the linkage between share market crashes and untimely capital outflows. It is interesting that a currency crisis produces a crash in the share market even in an economy in which financial markets are well developed.

The intuition behind the results can be summarized as follows. Foreign investors participate in the equity market through the currency market. The currency market may distort the weights of the current and future value of assets in the country, infecting the equity market. This creates multiple equilibria—one, with optimality, and the other, with sub-optimality. Multiple equilibria produce the possibility of speculative attacks in the equity market together with the currency market. Therefore, conventional wisdom that the self-stabilizing mechanism in the equity market eliminates the possibility of speculative attacks is not consistently supported in this chapter.

The most important element of this chapter is in demonstrating that conventional wisdom—that the price mechanism ensures a unique equilibrium—is not consistently supported in an open economy. Financial globalization increases the likelihood of a twin crisis. In an economy with multiple equilibria, any event that causes investors to anticipate a sudden capital outflow will lead to a currency crisis. A suspicion of exchange rate depreciation results in multiple equilibria, which offsets the self-stabilizing mechanism of the share market.

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Chapter 2

Eccessive Liquidity and Capital Reversals in Emerging Markets

abstract

This chapter provides that restrictive access to the world financial market distorts domestic financial markets when domestic agents demand excessive liquidity. In such a case, untimely foreign capital outflows from emerging markets occurs. I study a model of an open and emerging market with stock market arrangement. Excessive liquidity expands domestic consumption accompanied by rising stock prices. Capital reversals may shake an economy where risk-averse domestic agents demand excessive liquidity. Meanwhile, an unexpected jump of the world interest rate triggers an untimely capital reversal, which is exacerbated by the excessive liquidity supply. Thus, excessive liquidity creates a risk of untimely capital reversals even in an emerging market that has solid economic fundamentals and potential.

2.1 Introduction

The 1990s were a decade of currency crises. A crisis shook the European Monetary System (EMS) in 1992 because a policy of unemployment reduction accidentally increased money supply. A currency crisis also hit Mexico in 1994, which is a traditional type of currency crises resulting from crucial fiscal imbalances. The Asian crisis in 1997-8 prevailed a new type of crisis that witnessed rapid economic growth shortly before a financial meltdown. Currency crises also struck Russia and Brazil in the 1990s.

Such currency crises can be classified into three representative models: the first generation model pioneered by Krugman (1979), the second generation model proposed by Obstfeld (1994, 1996), and the third generation model provided by Chang and Velasco (2000, 2001). The first generation view sees crises as the inevitable outcome of ongoing fiscal imbalances coupled with fixed exchange rates. This view explains accurately the currency crises that struck Latin America mostly in the 1970s. The second generation view proposes that the credibility of an exchange rate peg is determined by the expectations that the foreign exchange market has about the central bank's incentives to defend it. This perspective implies that crises are driven by self-fulfilling speculative attacks motivated by "animal spirits," which is an accurate explanation of the EMS crisis. The third generation view emphasizes maturity mismatches as the primary cause of currency crises. This new view best explains the Asian crisis that has two features: sudden reversals of short-term international capital flows and local financial institutions under financial distress.

Fiscal reform and capital controls can eliminate such currency crises. Fiscal reform is valid and necessary for first generation crises. In second and third generation crises, good and bad equilibria coexist in an economy where

investors' speculation determines which equilibrium arises. In this case, capital controls can be effective in eliminating bad equilibria as well as enhancing social welfare.[1]

What kind of prescription, however, is needed when capital reversals are not driven by either fiscal deficits or multiple equilibria? The purpose of this chapter is to show that capital reversals are driven by risk-averse domestic agents who require excessive liquidity. Since domestic agents who are risk-averse overreact to unexpected liquidity shocks, they demand excessive liquidity in the domestic financial market. This excessive liquidity expands domestic consumption at the expense of investment, which is accompanied by increases in stock prices in the early stages.[2] Thus, countries that import capital become less profitable for foreign investors who withdraw their assets. This chapter shows that excessive liquidity creates the risk of capital reversals as the result of a unique market equilibrium even in markets that have solid economic fundamentals.

Considering the solvency for foreign liabilities, the view of capital reversals proposed in this chapter is valid for emerging market crises. An emerging economy that has the potential for economic growth attracts foreign capital, but it does not achieve economic growth in the early stages. Once an untimely capital reversal strikes, such an economy is confronted with an economic meltdown when the market value of foreigners' assets exceeds the liquidation value of them.[3] Excessive liquidity pushes the market value of

[1]For example, Eichengreen et al. (1995) proposed the introduction of a "Tobin tax" on foreign exchange transactions in order to rebuild a new, more stable, EMS. Furukawa(2004) also showed that capital controls eliminates the possibility of capital reversals motivated by self-fulfilling speculations.

[2]Calvo, Leiderman, and Reinhart (1996) pointed out that stock and real estate prices rise in emerging countries with large capital inflows.

[3]Allen, et al. (2002) claimed that solvency risk, which occurs when represents a situa-

assets in financial market, which exceeds the liquidation value. Even though an emerging economy may have solid economic fundamentals and potentials for growth, it cannot eliminate the risk of untimely capital reversals in the early stages.

In order to analyze the dynamics of market and liquidation values of stocks, the framework presented in this chapter borrows heavily from von Thadden (1998). The model formulated by von Thadden re-examined Diamond and Dybvig (1983) in the framework of a continuous time scheme. The framework provided by von Thadden is successful in describing differences between the liquidation value and market value of assets accurately. This chapter introduces foreign investors into von Thadden (1997, 1998), which plays an important role in untimely capital reversals.

This chapter shows that the internal factor –excessive liquidity– plays the key role in understanding capital reversals. It is obvious to see that an unexpected jump in the world interest rate triggers capital reversals in emerging markets as an external factor. Data observes a rise in the country risk premiumfor emerging economies in international financial markets during the East Asian crisis, which emerged exogenously (Cook and Devereux (2006)). Yet, it is debatable that the world interest rate including the country risk premium rises enough to provoke capital reversals in such markets despite their potentials for economic growth. I show that untimely capital reversals can occur while the world interest rate is relatively low compared to the potentials for economic growth. Nevertheless, the unexpected jump in the world interest rate triggers untimely capital reversals explicitly, while excessive liquidity causes the problem implicitly. The domestic weakness spreads

tion where an entity's assets no longer covers its liabilities, is one of the causes of currency crises.

to foreign investors in the phase of untimely capital reversals.

The outline of this chapter is as follows. Section 2-2 shows a basic framework that examines the risk of capital reversals and explores the internal and external factors that determine the risk. Section 2-3 presents a conclusion of the analysis.

2.2 Basic Framework

Consider a small open economy where time is measured continuously, with $t \in [0, 1]$. There exists a single consumption good named *dollar*. Dollars are freely traded in the world market and can be consumed and invested worldwide. Dollars can be interchangeably referred to as the units of currency or consumption.

The country is populated by a continuum of ex ante identical agents of total measure one. Each agent is endowed with one unit of dollar at time t = 0 and lives until time t = 1. Those agents labeled *locals* are given access to two investments opportunities. They can store their endowment without interest nor cost. Alternatively, they can invest them in a production technology.

The available production technology in the country has the following features. It has a constant return to scale and increasing return to time. Initial investment of dollars is required. The technology has the return function $\pi(t)$ per unit of investment, which lie in the interval $[0, 1]$. The return function $\pi(t)$ is assumed to have the following properties: $\pi(0) = 1$, $\pi'(t) > 0$ for $t \in [0, 1]$, and $\pi'(t)/\pi(t)$ is non-decreasing in $[0, 1]$. Investment and liquidation are costless. The first and the second assumptions are self-explanatory, while the third assumption suggests that the growth of the return should be non-decreasing in time. Based on the third assumption, such an economy

can forfeit an incentive to interrupt a production process in order to reinvest in the same technology.

There exists a world market where one dollar invested at any time t grows with the rate β at the marginal time point. The parameter β can be interpreted as the discount rate of *foreign investors*. The population of foreign investors is measured by $\bar{\lambda}$. Each of foreign investor is risk-neutral, and is endowed with 1 unit of dollar at the initial date. Locals can borrow dollars from the world market but cannot invest in it. This asymmetry in market access is reinforced by the scarcity of capital in the country or the "home bias" of the investment.

There is an exogenous shock regarding the world interest rate. At the itinial date, the world interest rate is given to be $\beta = \beta_L$. At each marginal time point, β can take one of two possible values, β_H and β_L $(0 < \beta_L < \beta_H)$, with probabilities given by ρ and $1 - \rho$ $(0 < \rho < 1)$, respectively. For the simplicity, once the realization of β_H has occurred, it will remain at that level until the final date. Thus, the gross return rate in the world market during $t = 0$ to $t = 1$ can be written as follows,

$$e^{\beta} = \rho \int_0^1 e^{\beta_L \tau + \beta_H (1-\tau)} d\tau + (1-\rho) e^{\beta_L}.$$

Furthermore, I assume that ρ is very small and close to zero. Therefore, the world interest rate can be considered to be $\beta = \beta_L$, but there is a risk that it jumps up to be β_H suddenly during $t \in (0, 1)$.

There is a liquidity shock on each local when the agent has to consume his/her entire wealth. This timing is not predictable on an individual basis and is observed in isolation for different agents at the time of consumption. It occurs in the period $t \in (0, 1)$ and is assumed to be i.i.d. with a cumulative density function F. Therefore, the date of consumption is a random event in the interval $0 < t < 1$, whereas for the population as a whole, the distribu-

tion of the liquidity shocks is non-stochastic with an empirical distribution function F. In order to avoid trivialities, the function F is assumed to be strictly increasing, $F^{'}(t) > 0$, $F(0) = 0$, and $F(1) = 1$. Furthermore, the preference of a representative local over his/her lifetime is assumed solely on the basis of what he/she consumes at the time of consumption.

Since the time discount rate of the representative local is equal to zero, his/her expected utility at time t = 0 can be written as follows,

$$U = \int_0^1 u\left(c(t)\right) dF(t),$$

where $u(c)$ expresses the instantaneous utility function that satisfies $u' > 0$, $u'' < 0$, $u'(0) = \infty$ and $u(\infty) = 0$, and $c(t)$ represents the consumption at time t. In this model, the instantaneous utility function is given by $u(c) = c^{1-\gamma}/(1-\gamma)$ with $\gamma > 0$. Assuming CRRA preferences simplifies the solution even though this assumption is stronger than required to describe the model. In addition, locals maximize the expected utility conditional on the information available to them and resource constraints.

As suggested by Diamond and Dybvig (1983), the uncertainty regarding the timing of consumption is the key to the locals' investment strategy in this setup. The absence of aggregate uncertainty implies that locals may gain by pooling their resources and acting collectively rather than in isolation. Therefore, it is assumed that they form a coalition called a "company." The objective of the company is to maximize the welfare of the representative local by selecting an investment-borrowing strategy and a consumption stream for each home agent depending on the date of consumption.

Given the environment described above, the value of assets that the company owns depends on the amount of liquidation as well as the amount of the initial investment. Let $V(t)$ denote the aggregate value of the asset available for the technology at time t and λ denote the aggregate borrowing of dollars

by foreign investors. On the initial date, assume that $V(0) = 1 + \lambda$. On the final date, the repayment for the foreign liabilities requires $V(1) = \lambda e^{\beta}$. Let $c(t)$ represent the aggregate rate of liquidation of the investment in the technology at time t. The evolution of $V(t)$ is determined by $c(t)$, and $V(t)$ would increase instantaneously with $\pi(t)$ in the absence of liquidation. Hence, the transition of the aggregate value of the technology at points of differentiability of F yields

$$V'(t) = \frac{\pi'(t)}{\pi(t)} V(t) - c(t) F'(t). \tag{2.1}$$

$V(t)$ can be obtained by a straightforward integration of (2.1) with the initial condition $V(0) = 1 + \lambda$, i.e.,

$$V(t) = \pi(t) \left(1 + \lambda - \int_0^t \frac{c(\tau)}{\pi(\tau)} dF(\tau) \right). \tag{2.2}$$

The aggregate value of the asset in the technology at any time is given by its gross return minus what has been harvested from it.

Since the objective of the company is to enhance the representative local's welfare, the first-best solution is to maximize the aggregate expected utility for the representative local subject to resource constraints. Mathematically,

$$\max_{c,\lambda} \int_0^1 \frac{c(t)^{1-\gamma}}{1-\gamma} dF(t), \tag{2.3}$$

subject to

$$c \geq 0, \ V \geq 0, \tag{2.4}$$

$$0 \leq \lambda \leq \bar{\lambda}, \ V(1) \geq \lambda e^{\beta} \tag{2.5}$$

The first-order condition requires that the optimal allocation should satisfy the following relationship:

$$\left(\frac{c^*(t)}{c^*(1)} \right)^{\gamma} = \frac{\pi(t)}{\pi(1)}. \tag{2.6}$$

If β is known, the optimal consumption path at time t = 0 for the representative local can be obtained by solving equations (2.3) - (2.5). It is

determined by the following:

$$c^*(t) = c_0 \pi(t)^{\frac{1}{\gamma}}, \tag{2.7}$$

where the constant c_0 is obtained by solving

$$c_0 \int_0^1 \pi(t)^{\frac{1}{\gamma}-1} dF(t) = 1 + \lambda^*. \tag{2.8}$$

The optimal λ^* is determined by

$$\lambda^* = \begin{cases} \bar{\lambda} & \text{if } e^\beta \leq \pi(1), \\ 0 & \text{if } e^\beta > \pi(1). \end{cases} \tag{2.9}$$

The first-best solution is characterized by three distinct features. The first important feature is that each local can consume from the coalitional investment, which provides a superior return at any time by forming a company. The optimal allocation is not available in a direct investment economy where each local harvests his/her investment using his/her endowment. This feature indicates the superiority of intermediate finance in the view of risk sharing.

Second, the optimal return path grows slower than production if $\gamma > 1$. This suggests that consumers who have liquidity shocks earlier receive greater returns compared to what the initial endowment and the foreign borrowing would have yielded, at the expense of consumers who did not receive shocks in the early stages. From an ex-ante perspective, this ex-post redistribution among home agents is desirable.

Third, this company uses foreign capital if and only if the parameter β satisfies the condition $e^\beta \leq \pi(1)$. This implies that foreign capital inflow occurs when the interest rate in the world market is lower than the growth rate of the economy. This is self-explanatory and explains the behavior of international capital flows in the real economy.

Next question is whether the first-best solution is decentralized. I consider stock market arrangement in this framework by following reasons. Foreign

capital inflows take the form of investment in the stock market where foreign investors can freely sell/buy stocks as locals do. This is because a stock market is a large channel for foreign capital in an emerging economy.[4] Also, portfolio inflow is likely to be the largest component in capital accounts in a country where foreign capital inflows are encouraged.

Each local receives one unit of stock of the company per unit of investment of his/her endowment at time $t = 0$. The company distributes dividends to the stockholders in dollars at any point in time. The ex-dividend stocks of the company can be traded in a stock market. Let $y(t)$ represent the dividend per unit of the stocks and $p(t)$ represent the price of the ex-dividend stock. The stock price $p(t)$ depends on the dividend policy of the company and the market clearing condition.

To begin the discussion, recall the optimal consumption stream in the economy. A fraction $F^{'}$ of locals receive $c^*(t)$, where $t \in (0, 1)$, and the foreign investors receive $\lambda^* e^{\beta}$ at the final date. This is equivalent to considering that there is a fraction $F^{'}(1)$ of locals plus $\lambda^* e^{\beta}/c^*(1)$ agents who demand $c^*(1)$ as the dividend at the final date. If the foreign investors acquire $c^*(1)$ when they own one unit of the stock at time $t = 0$, they will purchase the stock at a price $c^*(1)e^{-\beta}$ in terms of dollars at the initial date. This means that foreign investors purchase $\lambda^* e^{\beta}/c^*(1)$ of the company's stock at a price $c^*(1)e^{-\beta}$, and consequently, the total capital inflow amounts to λ^*. Let η denote the amount of stocks issued by the company. Since the locals receive one unit of the stock per dollar invested, $\eta = 1 + \lambda^* e^{\beta}/c^*(1)$. Set the per-stock dividend $y(t)$ to $y(t) = c^*(t)F^{'}(t)/\eta$, where $t \in (0, 1)$ and the liquidation dividend at the final date to, $c^*(1)(\eta - 1)/\eta$.

In order to avoid unnecessary details, it is assumed that there is no capital

[4]Refer to Singh (1997).

control levied on foreign investors at any time t. Thus, the foreign investors are able to liquidate their asset at any time if they sell their stocks in the stock market. It does not matter when foreign investors re-invest their received dividend in the stock market. In such an arrangement, this economy can achieve the optimal allocation.

Proposition 3 *There exists a set of parameters $\{\beta, \gamma\}$ such that the first-best solution is implemented by stock market arrangement.*

Proof. Let $S(t)$ denote the amount of stock owned by a stockholder who owned one unit of stock at the initial date and has not consumed until time t. Consider the case where foreign investors decide to re-invest in the stock by using the received dividend and do not consume until time $t = 1$. Based on this assumption, a fraction $F(t)$ of locals have already received liquidity shocks, and there are η units of the stocks in circulation in the market. If and only if all the stocks are uniformly owned by the remaining stockholders, i.e., by locals who have not received liquidity shocks and foreign investors, S(t) should be expressed as

$$S(t) = \frac{\eta}{\eta - F(t)}. \tag{2.10}$$

Differentiating (2.10) yields

$$S^{'}(t) = \frac{\eta F^{'}(t)}{(\eta - F(t))^{2}}. \tag{2.11}$$

The evolution of $S(t)$ would be determined by the amount of stock that can be purchased by using the received dividend. Therefore, $S(t)$ can be expressed as

$$S^{'}(t) = \frac{y(t)}{p(t)} S(t), \tag{2.12}$$

where I define the inherent price of the stock $p(t)$ as the stock price that

satisfies equations (2.10)-(2.12), i.e.,

$$p(t) = \frac{y(t)\,(\eta - F(t))}{F'(t)} = \frac{c^*(t)\,(\eta - F(t))}{\eta}. \tag{2.13}$$

The inherent price is the price resulting from the market clearing when locals who receive the liquidity shock at that point in time sell their stocks and the remaining locals and the foreign investors purchase them.

Since locals who receive a liquidity shock at time t have an infinite marginal rate of substitution between current and future consumption, it is evident that they sell all their assets at any price $p(t) > 0$. On the other hand, locals who have not received a liquidity shock have a zero time preference rate at time t. The remaining locals who have not received a liquidity shock until time t will purchase the ex-dividend stock at the inherent price $p(t)$ because the rate of return of the stock exceeds his/her time preference rate. This indicates $\frac{p^{'}(t)+y(t)}{p(t)} = \frac{c^{*'}(t)}{c^*(t)} > 0$ for all $t \in (0,1)$.

It should be noted that foreign investors have access to the world market. The world market offers an interest rate β at any marginal time point per unit of investment. Foreign investors decide to sell/buy the stock based on a comparison between the expected return from the stock and that from the world market. They purchase the stocks if and only if

$$\frac{p^{'}(t) + y(t)}{p(t)} \geq \beta. \tag{2.14}$$

When the inherent price satisfies the inequality (2.14), foreign investors find it advantageous to reinvest in the stock. From the first-best solution, the rate of return of the share can be expressed as follows:

$$\begin{aligned} \frac{p^{'}(t) + y(t)}{p(t)} &= \frac{c^{*'}(t)}{c^*(t)} \\ &= \frac{1}{\gamma} \cdot \frac{\pi^{'}(t)}{\pi(t)}. \end{aligned}$$

From the assumption that $\pi^{'}(t)/\pi(t)$ is non-decreasing over $t \in [0,1]$, obvi-

ously there exists a set of parameters $\{\beta, \gamma\}$ that satisfies

$$\frac{1}{\gamma} \cdot \frac{\pi^{'}(t)}{\pi(t)} \geq \beta. \tag{2.15}$$

In such cases, the first-best solution is implemented in the economy by stock market arrangement (Figure I).

It is sufficient to examine the case of $t = 1$ in order to prove that there is a set $\{\beta, \gamma\}$ that satisfies (2.15) since $\frac{\pi^{'}(t)}{\pi(t)}$ is non-decreasing on time. As in Figure I, the set $\{\beta, \gamma\}$ is obviously non-empty. Q.E.D.

Foreign investors, however, may retrieve their capital once they decided to invest in the country at the initial date if they find it profitable to return to the world market. In such a case, the first-best solution is not decentralized.

Corollary 1 *Once the parameter β changes, there is a set of the parameters $\{\beta_H, \gamma\}$ such that the first-best solution cannot be implemented by stock market arrangement.*

Proof. Foreign investors decide to sell/buy the stock based on a comparison between the expected return from the stock and that from the world market. Since the world interest rate can change from β_L to β_H, it can suddenly jump up during $t \in (0, 1)$. If it happens, foreign investors sell off the stocks when $p(t)$ violates the inequality (2.14), that is,

$$\frac{1}{\gamma} \cdot \frac{\pi^{'}(t)}{\pi(t)} < \beta_H. \tag{2.16}$$

If the rate of return on the stock is lower than the world interest rate, foreign investors immediately sell the stocks owned by them and repatriate their capital to the world market instead of reinvesting in the stock market.

Since $\beta_L < \beta_H$, there exists a set $\{\beta_H, \gamma\}$ at some time $t \in (0, 1)$ that satisfies the inequality (2.16). Clearly, the set $\{\beta_H, \gamma\}$ that satisfies the inequality (2.16) is non-empty as in Figure II, which implies that untimely

capital reversals accompany premature liquidation of tradable production technology in the economy. Q.E.D.

This proposition implies that there are some cases where the first-best solution is not decentralized by stock market arrangement, which is ex ante expected to be implemented. This indicates that foreign investors retrieve their capital before the expected maturity date and then an untimely capital reversal occurs once the world interest rate rises. As the result of an untimely capital reversal, foreign investors consume a part of liquidity, which decreases locals' expected consumption.

As shown in figure II, capital reversals occur when the parameters β_H and/or γ are large. A large β_H can be interpreted as a high interest rate in the world market. It is obvious that a high interest rate in the world market would deprive an emerging market of the opportunity for economic growth.

Moreover, large γ causes the early repatriation of capital by foreign investors. The parameter γ represents the relative risk aversion of locals. A large γ indicates that locals who received liquidity shocks in the early stages gain more consumption than they can harvest from their initial endowment and foreign capital. This implies that excessive liquidity is provided in the early stages of the economy. In this case, consumption expands before the economy grows if the locals are risk averse. This implies that locals with large γ consume capital in the early stages at the expense of investment that leads to future development.

The proposition suggests that there is a unique equilibrium in this economy. This implies that untimely capital reversals are not the consequence of the self-fulfilling speculation motivated by "animal spirits" of the foreign

investors, which arises from the coexistence of good and bad equilibria.[5] The key is excessive liquidity. Obviously from (2.13), the excessive liquidity pushes the stock price in the early stages along with consumption expansion. This indicates that the excessive liquidity flows into the stock market in early stages, which enables locals who receive a liquidity shock earlier consume more than they invest. At the same time, the rising stock price is equivalent to the increase of the market value of the assets owned by foreign investors. If γ is large, the market value of foreign liabilities in early stages exceeds the liquidate value of the share of the production process that is expected to be distributed to foreign investors at the final date.

There is no advantage for foreign investors to reinvest in the stock market when excessive liquidity is provided in the early stages. In order to achieve economic growth through the encouragement of foreign capital inflow, locals should delay consumption until the production processes mature. Then, foreign investors will find it advantageous to reinvest in the stocks of the country. In contrast, the consumption of locals expands too early if excessive liquidity is provided in the early stages because of the overreaction to unexpected liquidity shocks when the parameter γ is large. In this case, foreign investors acquire liquidity before $t = 1$, which simultaneously indicates that locals lose their expected consumption.

Note that untimely capital reversals can occur while the world interest rate is low enough to satisfy the condition of foreign capital inflows ($e^{\beta_H} \leq \pi(1)$). This is because excessive liquidity induces untimely capital reversals. Nevertheless, the unexpected jump in the world interest rate triggers untimely capital reversals explicitly, while risk-averse behavior of

[5]For example, Chang and Velasco (2000), (2001) provided the analysis of currency crisis in an emerging market where the bad equilibrium dominates the economy.

the locals causes the problem implicitly. The domestic weakness spreads to foreign investors in the phase of untimely capital reversals.

If the long-term debt contracts are available for the company, capital reversals never occurs in this economy. The problem is in this chapter is that even though the first-best solution is implemented at the initial date and the growth rate of the company, $\frac{\pi(t)'}{\pi(t)}$ is still larger than the possible future world interest rate, β_H, there is a risk of untimely capital reversals. This is because excessive liquidity is provided when γ is large, which expands the stock price in early stages. Although it is an optimal risk-sharing property that the company allocates greater returns to the consumers who recieves liquidity shocks earlier than they could harvested from their initial endowment and foreign capital, this property makes the stock market in the country less profitable for foreign investors.

2.3 Conclusion

I have shown that untimely capital reversals in an emerging economy can occur in a unique equilibrium model despite the potential of economic growth. There are external factors (the world interest rate) and internal factors (the risk-averse tendency of domestic stockholders) that determine the direction of foreign capital movements. It is evident that a low interest rate in the world market encourages foreign capital flows into an emerging market. On the other hand, it is noteworthy that the higher risk aversion of market participants in the stock market causes an early repatriation of capital by foreign investors. When the risk aversion of home agents is substantial, they overreact to unexpected liquidity shocks. They demand liquidity more than they harvest from the production process in the early stages of the economy,

which enables foreign capitals to outflow easily.

Excessive liquidity leads to consumption expansion at the expense of future production, which is the implicit cause of untimely capital reversals. Yet high national consumption is reflected in higher growth rates for real GDP, it can be achieved if and only if foreign capital inflows continuously. Once a capital reversal occurs, such an economy suffers economic collapse. Furthermore, when excessive liquidity financed by foreign capital inflows increases stock and real estate prices,[6] the market value of foreign liabilities tends to exceeds the liquidate value of assets. In this economy, financial meltdown provokes when foreign capital outflows occur.[7] Consequently, excessive liquidity creates the risk of untimely capital reversals even in an emerging market that has potential of economic growth. There needs substantial social reforms, financial system development for example, that allows domestic investors not to overreact to liquidity shocks. Then, an emerging market can provide appropriate liquidity without the risk of untimely capital reversals created by excessive liquidity.

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[6]Portfolio flows to the Asian and Latin American countries in 1990s was accompanied by sharp increases in stock and real estate prices (Calvo, Leiderman, and Reinhart (1996)).

[7]This is one of the causes of the currency crises (Corsetti, Pesenti, and Roubini, (1999b)).

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Chapter 3

Female Labor Participation Rate and Income Inequality

abstract

I construct a general equilibrium model that is capable of explaining the relationship betweenthe female labor participation rate and income inequality. My thesis here is that as female labor in each household changes its income/leisure preference according to income level. This leads that large income inequality flattens the movement of the female labor participation rate to business cycles.

3.1 Introduction

We have observed a strong correlative movement between business cycles and the female labor participation rate in the past Japanese economy. The female labor participation rate declined during recessions and it rose during

economic booms, demonstrating pro-cyclical movement. During the past recessions, many employed females were discouraged from working and left the labor market. For example, the female labor participation rate declined from 49.9% to 45.7% during the recession of the early 1970s (Table I). This trend of pro-cyclical movement of female labor participation rate decreased the unemployment rate in Japan. After the 1990s, however, this pro-cyclical movement between business cycles and the female labor participation rate flattened. Despite the prolonged stagnation in the Japanese economy, few female workers left the labor market. In fact, in the recent recession, the majority of the female work force stayed in the labor market. Consequently, the unemployment rate increased. Currently, business cycles do not have a strong impact on the movement of the female labor participation rate as compared to those in past recessions.

In the recent stagnation in Japan, we are concerend about the widening income inequality (Table II). Tachibanaki (1998) has emphasized the trend of widening income inequality in the Japanese economy. While Tomioka and Ohtake (2003) claimed that their empirical study showed that income distribution was stable in the same period, they also admitted that income inequality has been found increasing among working women and middle aged college graduate. Moreover, they considered that people's perceptions extend into the future, that is, the distribution of expected lifetime income has probably become wider in recent year.

This perception of the widening income inequality leads working female workers to attach to the labor market during recessions. The risk of male workers' unemployment causes female workers to attach to the labor market. I consider that the widening income inequality flattens the movement of the female labor participation rate as compared to those in past recessions.

Previous researches suggested several factors for the recent female workers' attachment to the market. Shimada and Higuchi (1985) claimed that an increase in female education and female wages increased female employment. Ogawa and Ermisch (1996) observed that female labor participation declined as the number of young children increased. Moreover, Ogawa and Ermisch (1996) and Houseman and Osawa (1995) stated that part-time employment opportunities enabled Japanese women to enter the labor market easily.

On the other hand, OECD (2002) pointed out that the employment rates of women with high education are similar to or lower than those of women with low education levels in Japan. There is also a study that questions the negative effect of the presence of young children on the female labor participation rate. Hill (1988) found an inconsistent tendency wherein the number of young children has a negative effect on the female labor participation rate but has a positive effect on the working hours of female employees. Darby, Hart, and Vecchi (2001) reported only a slight net increase in the participation rate during the period 1970–1995 in Japan although there was a large decline in the birth rate during the same period. This is in contrast to the strong positive growth in female labor participation in other developed countries. Furthermore, an increase in the percentage of female part-time workers in the total female working population did not raise the female labor participation rate because Japanese companies increased the demand for female part-time workers in order to buffer fluctuations in labor demand (Houseman and Osawa (1995)). The factors indicated in the previous research do not fully explain the recent increase in the Japanese female workers' attachment to the market.

I focus on the impact of income inequality on the female labor participation rate and develop a general equilibrium model in order to analyze the

relationship between the female labor participation rate and income inequality. We usually assume a representative agent. This enables us to obtain a simple implication for the economy. Female labor participation behavior, however, varies depending on household income levels. I find that income inequality has a strong impact on the movement of the female labor participation rate. Thus, I introduce a distribution of agents instead of a representative agent into a general equilibrium model. I borrow the framework of Zabalza (1983), which provides a stochastic behavior of agents who must decide between housework and participating in the labor market.

The main objective of this chapter is to show that large income inequality flattens the change in the female labor participation rate due to business cycles. I focus on the values placed on leisure and household production because these values also influence a household's decision to enter the labor market. A representative agent has a unique income/leisure preference ratio. Thus, whether female workers in the representative households enter or leave the labor market is uniquely determined. Furthermore, I assume heterogeneity in the households' earning ability in the model. Heterogenuity in household income leads to heterogenuity in the the decision regarding female labor participation. I found that a wider distribution of income makes the female labor participation less elastic to the fluctuations of business cycles.

The rest of the chapter is organized as follows. Section 3-2 outlines a female labor supply model and section 3-3 provides the concluding remarks and suggestions for further researches.

3.2 The Model

The economy is endowed with fixed amounts of two types of labors: labor 1 and labor 2. The endowments of labor 1 and 2, are denoted as L_1 and L_2, respectively. Labor 1 consists of highly skilled workers, and labor 2 consists low-skilled workers, mostly female workers.[1] All highly skilled workers must participate in the labor market, whereas low-skilled workers have a choice between labor market participation and housework.

The aggregate production function is given by below:

$$Q = AL_1^{\theta}L_2^{1-\theta}, \quad 0 < \theta < 1, \tag{3.1}$$

where Q is the aggregate output and A is the productivity that represents the level of technology, knowledge capital, and so on. Productivity is an exogenous parameter.

All markets are perfectly competitive, and prices are perfectly flexible. I define the wage rate of labor j as w_j. The equilibrium wage levels are;

$$\frac{w_1}{w_2} = \frac{\theta}{1-\theta} \cdot \frac{L_2}{L_1}. \tag{3.2}$$

Under perfect competition, firms producing positive outputs earn zero economic profit, which implies

$$Q = w_1 L_1 + w_2 L_2. \tag{3.3}$$

By rearranging equations (3.1)–(3.3), I obtain

$$w_1 = \theta Q/L_1 = \theta A \left(\frac{L_1}{L_2}\right)^{-(1-\theta)}, \tag{3.4}$$

$$w_2 = (1-\theta)Q/L_2 = (1-\theta)A \left(\frac{L_1}{L_2}\right)^{\theta}. \tag{3.5}$$

The economy under analysis has the continuum households with a mea-

[1] To simplify the model, I consider only the households that consist of a highly skilled male worker and a low-skilled female worker. As stated in section 3-1, increasing education levels of women can be ignored with respect to employment.

sure equal to one. Each household consists of labor 1, $\bar{L}_{1i}$, and labor 2, $\bar{L}_2$. I introduce a variation into labor 1 for each household. Define $\bar{L}_{1i}$ as

$$\bar{L}_{1i} = \frac{\exp(X)}{E[\exp(X)]} \cdot \bar{L}_1 \tag{3.6}$$

where $\bar{L}_1$ is a constant variable and X is a variable that is normally distributed with zero mean and variance σ^2, $X \sim N(0,\ \sigma^2)$. Assume that the variation of X is the distribution of earning ability.

Since labor 2 consists of low-skilled workers, earning ability of $\bar{L}_2$ does not vary. Hence, the variation in $\bar{L}_{1i}$ is the source of income inequality. Usually, the income level of each household depends on the earning ability of the main earning member. Labor 1's earning abilities determine labor 2's decision between being engaged in jobs and doing housework.

To simplify the problem, saving is not considered in this economy. Each household derives utility from household income, denoted by I_i, and housework, denoted by h_i $(0 \leq h_i \leq \bar{L}_2)$. Each household's preference is given by

$$U_i = \left[I_i^{\varepsilon} + \frac{h_i^{\varepsilon}}{\alpha} \right]^{\frac{1}{\varepsilon}}, \quad \alpha > 0,\ 0 < \varepsilon < 1,\ \forall i, \tag{3.7}$$

where α and ε are parameters.

The budget constraint of each household is written as follows:

$$I_i = w_1 \bar{L}_{1i} + w_2(\bar{L}_2 - h_i). \tag{3.8}$$

The maximization of (3.7) subject to (3.8) with respect to h_i and I_i yields

$$\begin{cases} \frac{h_i}{I_i} = (\alpha w_2)^{\frac{1}{\varepsilon-1}} & \text{if } \frac{\bar{L}_2}{w_1 \bar{L}_{1i}} \geq (\alpha w_2)^{\frac{1}{\varepsilon-1}}, \\ h_i = \bar{L}_2 & \text{if } \frac{\bar{L}_2}{w_1 \bar{L}_{1i}} < (\alpha w_2)^{\frac{1}{\varepsilon-1}} \end{cases} \tag{3.9}$$

The behavior of labor 2 determines the housework-income ratio. Labor 2 will search a job if the optimal housework-income ratio is smaller than $\frac{\bar{L}_2}{w_1 \bar{L}_{1i}}$.

Labor 2, however, will not participate in the labor market if the optimal housework-income ratio is equal to $\frac{\bar{L}_2}{w_1 \bar{L}_{1i}}$. Thus, the participation rate of

labor 2, denoting Φ, is obtained by bellow;

$$\Phi = F(Y_P), \tag{3.10}$$

where $F(\cdot)$ is the standardized cumulative normal distribution function, and Y_P is defined as

$$\begin{aligned} Y_P &= \frac{1}{\sigma}\left[-\ln w_1 - \ln \bar{L}_1 + \frac{1}{1-\varepsilon}\ln w_2 \right. \\ &\quad \left. + \ln \bar{L}_2 + \frac{1}{1-\varepsilon}\ln \alpha + \ln E[\exp(X)]\right]. \end{aligned} \tag{3.11}$$

Figure III shows the participation rate of labor 2. Notably, the parameter σ, that represents the income inequality, affects the participation rate of labor 2.[2]

To examine the linkage between the growth of productivity in the economy and the participation rate of labor 2, we must calculate the aggregate labor supply. Labor 1 always works by assumption. Thus, we have $L_1 = \bar{L}_1$. L_2, however, changes. Define i_P as the households where labor 2 participates in the labor market. The aggregate supply of labor 2 is

$$L_2 = \int_{i \in i_P} (\bar{L}_2 - h_i) di. \tag{3.12}$$

From (3.9), I have

$$L_2 = \Phi \bar{L}_2 - (\alpha w_2)^{\frac{1}{\varepsilon-1}} \int_i I_i di + (\alpha w_2)^{\frac{1}{\varepsilon-1}} \int_{i \notin i_P} w_1 L_{1i} di. \tag{3.13}$$

From (3.3), $\int_i I_i di = Q$. Then, using (3.5), L_2 is given by

$$\begin{aligned} L_2 &= \Phi \bar{L}_2 - \frac{\alpha^{\frac{1}{\varepsilon-1}} w_2^{\frac{\varepsilon}{\varepsilon-1}} L_2}{1-\theta} + (\alpha w_2)^{\frac{1}{\varepsilon-1}} \int_{i \notin i_P} w_1 L_{1i} di, \\ \frac{1-\theta+\alpha^{\frac{1}{\varepsilon-1}} w_2^{\frac{\varepsilon}{\varepsilon-1}}}{1-\theta} L_2 & \\ &= \Phi \bar{L}_2 + (\alpha w_2)^{\frac{1}{\varepsilon-1}} \cdot \frac{w_1 \bar{L}_1}{E[\exp(X)]} \int_{Y_P}^{\infty} \exp(Y) f(Y) dY. \end{aligned} \tag{3.14}$$

Let $\hat{z}$ represent the growth rate of any variable z. Through differentiation

[2] when α distributes, I have a similar equation to (3.12). However, the negative effect of the presence of young children on female employment is questioned, α can be considered a constant parameter.

and rearrangement of (3.14), I have

$$\frac{\varepsilon}{\varepsilon-1}\cdot\frac{\alpha^{\frac{1}{\varepsilon-1}}w_2^{\frac{\varepsilon}{\varepsilon-1}}L_2}{1-\theta}\hat{w}_2+\frac{1-\theta+\alpha^{\frac{1}{\varepsilon-1}}w_2^{\frac{\varepsilon}{\varepsilon-1}}L_2}{1-\theta}\hat{L}_2$$
$$=\left(\frac{1-\theta+\alpha^{\frac{1}{\varepsilon-1}}w_2^{\frac{\varepsilon}{\varepsilon-1}}}{1-\theta}\cdot L_2-\Phi\bar{L}_2\right)\left(\frac{1}{\varepsilon-1}\hat{w}_2+\hat{w}_1\right),$$
$$\hat{L}_2=\hat{w}_1-\hat{w}_2$$
$$+\frac{1-\theta}{1-\theta+\alpha^{\frac{1}{\varepsilon-1}}w_2^{\frac{\varepsilon}{\varepsilon-1}}}\left\{\frac{\varepsilon}{\varepsilon-1}\hat{w}_2-\Phi\frac{\bar{L}_2}{L_2}\left(\hat{w}_1-\frac{1}{1-\varepsilon}\hat{w}_2\right)\right\}. \quad (3.15)$$

Using (3.4) and (3.5),

$$\hat{L}_2=\frac{\varepsilon\left(\Phi\frac{\bar{L}_2}{L_2}-1\right)}{\Phi\frac{\bar{L}_2}{L_2}(1-\varepsilon+\varepsilon\theta)-\varepsilon\theta}\hat{A}. \quad (3.16)$$

Incorporating (3.4), (3.5), and (3.16) into (3.12),

$$d\Phi=f(Y_P)\cdot\frac{1}{\sigma}\cdot\frac{\varepsilon}{\Phi\frac{\bar{L}_2}{L_2}(1-\varepsilon+\varepsilon\theta)-\varepsilon\theta}\hat{A}. \quad (3.17)$$

Clearly, $\Phi\frac{\bar{L}_2}{L_2}>1$ and $\frac{\varepsilon}{\Phi\frac{\bar{L}_2}{L_2}(1-\varepsilon+\varepsilon\theta)-\varepsilon\theta}>0$. The change in the participation rate of labor 2 moves cyclically to productivity shocks.

Remarkably, σ that implies the household income distribution flattens $d\Phi$ when $\hat{A}$ fluctuates. This is different from equation (3.16) in which σ does not affect the aggregate supply of labor 2. This difference is derived from aggregation and the tail of distribution of household responses to business cycles. In the aggregate supply, it provides the average representative figure of labor 2. In the tail of distribution, however, each household is concerned about labor 2's participation in the labor market. The income levels of labor 1 are significant in the decision regarding female labor participation. From (3.9), labor 2 in households with similar income level decide whether to enter or leave the labor market. Hence, the income distribution affects the change in labor 2's participation rate, leading to a productivity shock.

When income is widely distributed, the net effect of the productivity growth on the participation rate of labor 2 is small. According to equation

(3.17), σ determines the change in labor 2's participation rate by business cycles. The parameter $\frac{1}{\sigma}$ acts as a multiplier. In other words, a large $\frac{1}{\sigma}$ increases the net effect of the wage growth on the participation rate, and the participation decision is not strongly influenced by business cycles when $\frac{1}{\sigma}$ is small.

The multiplier effect of the parameter σ can be explained by the following mechanism. Business fluctuation affects labor 2's labor participation rate through wage levels changes. The threshold that determines the labor participation decision of labor 2 becomes narrow when the income inequality is large. Middle class households are strongly influenced by the economic situation. Simultaneously, the female workers of such households must decide whether to enter or leave the labor markets. A small number of households reconsiders labor 2's choice depending on the business fluctuation when the income distribution is large. A large number of them, however, may switch labor 2's allocation between engaging in housework and participating in the labor market when the income distribution is small.

3.3 Concluding Remarks

This chapter provided a theoretical analysis of the female labor participation rate and income inequality in a closed economy. Widening income inequality has caused the recent phenomena wherein the female labor participation rate does not move to the business cycles. A smaller income inequality enlarges the net effect of the business cycle on the female labor participation rate, and the participation decision to participate in the labor market is not strongly influenced by a productivity shock when income inequality is large. This is because the threshold of household income distribution that determines

female labor participation becomes narrow when the income inequality is large. The impact of a recession on each household does not produce an adequately strong change in the female labor participation rate if the income is widely distributed.

In Japan, the labor participation rate, particularly the female labor participation rate, has remained stable during the 1990s. This indicates that correlative movement between business cycles and the female labor participation rate has not observed the economy, unlike in the previous recessions. The analysis of this chapter suggests that the perception of the widening income inequality is a possible cause of the current weak correlation between business cycles and the female labor participation rate. For future researches, empirical investigation will be done in order to confirm the validity of the model provided in this chapter.

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