

Exchange Rate Movements and Capital-Asset Ratio of Banks: On the Concept of Structural Positions

MITSUHIRO FUKAO

For risk control purposes, the foreign exchange position of banks is often divided into two: the dealing position and the structural position. This paper analyzes the reasons for such a separation and demonstrates that the claims and obligations that are treated as structural have different risk characteristics than those pertaining to the dealing positions. Moreover, for banks with large foreign currency assets, we show that it is advantageous to hold certain open long positions in the same currency in order to insulate capital-asset ratios against a depreciation of the domestic currency, which provides a theoretical explanation to the traditional treatment of foreign investment as a structural item.

I. Introduction

The international financial transactions of banks such as foreign currency loans and deposits necessarily involves risk stemming from exchange rate movements. The net amount of such foreign currency claims and obligations, including off-balance sheet transactions, is called the foreign exchange position of a bank.¹ Often, for risk control purposes, this position is separated into dealing and structural positions. The dealing position is managed by foreign exchange dealers minute by minute and usually includes the net holdings of foreign currency assets and liabilities, forward exchange contracts, and other financial claims and obligations. On the other hand, investment in foreign subsidiaries, the foreign currency convertible bonds issued by banks, and some other assets and liabilities, comprise the structural position of a bank and are treated separately.

This paper analyses the reason of this separation of foreign exchange positions for risk control purpose. We demonstrate the following points:

- (1) The claims and obligations that are treated as structural items indeed have different risk characteristics than those in the dealing position.

The author is grateful to Hideo Kazusa and Kazuo Ueda for their helpful comments.

¹Regarding foreign exchange positions and forward exchange transactions, see Fukao (1990) and Deardorff (1979).

- (2) Banks that have a significant volume of foreign currency claims and obligations in their portfolios can reduce fluctuations in their capital-asset ratio due to exchange rate movements by carrying a part of their capital either in corresponding foreign-currency assets or in foreign-currency subordinated liabilities.

Traditionally, the foreign direct investments of banks have often been carried on balance sheets uncovered with respect to foreign-exchange risks. This conventional treatment of direct investment is consistent with (2) above.

II. Foreign Exchange Exposures Requiring Special Treatment

Financial institutions have to monitor foreign exchange positions in order to avoid large losses due to sharp movements in exchange rates. Thus "foreign exchange position" should be defined as widely as possible. From the viewpoint of economics, the foreign exchange position in each currency can be defined as follows:

The net present value of all the *relevant* future cash flows in each currency discounted by the interest rates of risk-free zero-coupon bonds denominated in respective currencies.²

One complicating factor in calculating positions is the range of cash flows. Future dividend payments on ordinary stocks are clearly not obligations. Therefore, they should be excluded from the calculation. However, in the case of foreign-currency denominated subordinated debt or foreign-currency denominated preferred stock, related payments bear some semblance to both debt and the distribution of profits. Therefore, in calculating foreign exchange positions, extreme care should be given to the nature of cash flows.

In this paper, we basically utilize the above definition in analyzing the concept of foreign exchange exposures. As we will examine below, there are several important cases where the above definition does not work well. Regarding asset side, participation in foreign subsidiaries is important. On the liability-equity side, foreign-currency convertible bond, warrant bond, foreign-currency preferred stock, and loan-loss reserves against foreign currency-denominated assets require special attention.

A. Participation in Foreign Subsidiaries

It is often very difficult to measure the net present value of the participation in foreign subsidiaries because the corresponding inflow of cash is expected in the distant

²Regarding cash flows related to long-term assets such as long-term bonds or currency swaps, future cash flows have to be discounted by long-term interest rates. Therefore, the net present value of foreign currency cash flows is significantly affected by changes in foreign interest rates. Since interest rate and exchange rate movements are often correlated, it is difficult to separate exchange rate and interest rate risk. For example, when dollar interest rates rise, the dollar price of long-term dollar bonds falls. However, a rise in dollar interest rates is likely to cause an appreciation of the dollar, and the yen value of dollar bonds may not fall much.

future and the uncertainty surrounding cash flow is large. Moreover, since foreign subsidiaries conduct most of their business in local foreign currencies, it may be more appropriate to keep their capital in the same currencies (see example later). Reflecting these considerations, some countries which apply position limits on their banks often allow them to exclude their participation in foreign subsidiaries from the calculation of foreign exchange positions. This practice can be justified under the following conditions³:

- (1) *When it is expected that purchasing power parity will hold in the long run.*

The assets of a foreign subsidiary (which corresponds to the capital account held by its parent) are often invested in tangible or intangible assets — real estate, equipment, know-how, good customer relationships, etc. In this case, the economic value of participation is not like a financial asset but a tangible asset: if there is an unexpected acceleration of inflation, the nominal value of participation is expected to rise following the general price level. Therefore, if the exchange rate of the domestic currency to that of the host country of the subsidiary is expected to follow purchasing power parity in the long run, there is little risk from the uncovered position of participation.⁴

- (2) *When a bank wants to protect its capital-asset ratio from exchange rate movement.*

When a bank holds foreign currency assets and liabilities, its capital-asset ratio tends to fall when the home currency depreciates against foreign currencies even if it has no foreign exchange position. However, by intentionally holding some net long positions in foreign currencies, the bank can avoid this unexpected risk of a change in its capital-asset ratio. This is because an increase in its assets through a depreciation of the home currency can be offset by a capital gain from net long positions.

Consider the following balance sheet of a hypothetical Japanese bank, 20% of whose assets are U.S. dollar-denominated and whose capital-asset ratio is 10%. In the following analysis, we consider the conventional capital-asset ratio rather than the BIS capital-risk-asset ratio:

³It is sometimes argued that the open long position of participation in a foreign subsidiary disappears after consolidation. However, this is erroneous. Suppose the parent does not have any foreign currency assets or liabilities except for participation in a foreign subsidiary and that all assets/liabilities of the subsidiary are denominated in a foreign currency. By consolidating, the capital account of the subsidiary and participation of the parent are netted out (except for "goodwill"). All assets/liabilities of the subsidiary are added to those of the parent. Since the balance of foreign currency assets is larger than foreign currency liabilities by an amount equivalent to the capital account of the subsidiary, the consolidated foreign exchange position is a long position by this amount.

⁴See Komiya and Amano (1972, p.411).

In some cases, the parent may expect to receive dividends from foreign subsidiaries. It would be appropriate to recognize such imminent foreign currency cash inflows as foreign exchange positions.

Dollar assets	20	Dollar liabilities	20
Yen assets	80	Yen liabilities	70
		Capital	10
Total	100	Total	100

Capital ratio: 10%

In this example, when the dollar appreciates 100% against the yen, the balance sheet looks like:

Dollar assets	40	Dollar liabilities	40
Yen assets	80	Yen liabilities	70
		Capital	10
Total	120	Total	120

Capital ratio: 8.3%

Thus, the capital-asset ratio declines as the home currency depreciates even if the foreign exchange position is square.

If the bank holds a certain net long position in the dollar intentionally, it can insulate its capital-asset ratio from unexpected exchange rate movements:

Dollar assets	20	Dollar liabilities	18
Yen assets	80	Yen liabilities	72
		Capital	10
Total	100	Total	100

Capital ratio: 10%

In this case, this bank holds a net long position of 2 in the dollar. If the dollar appreciates against the yen by 100%, then the balance sheet appears as follows:

Dollar assets	40	Dollar liabilities	36
Yen assets	80	Yen liabilities	72
		Capital	12
Total	120	Total	120

Capital ratio: 10%

The increase in capital from 10 to 12 is due to the capital gain on the net long position in the dollar. Thus, by having a net long position in foreign currency as per the next formula, the bank can insulate its capital-asset ratio from exchange rate movements:

$$\begin{aligned} & \text{net long position in currency } i \\ & = \text{capital} \times (\text{asset in currency } i / \text{total assets}). \end{aligned}$$

In the above example, we assumed that the capital gain from the open position was not taxed. If taxable, the bank would have to hold a larger long position in the dollar, taking account of the amount of tax.⁵

It is desirable to insulate the capital-asset ratio from unexpected exchange rate movements. From the viewpoint of depositors, a bank's soundness depends not on the absolute amount of its capital on a home-currency basis but on capitalization relative to total assets. When potential losses from bad loans are roughly proportional to the amount of assets, the yen amount of potential losses increases as the yen value of dollar assets increases due to an appreciation of the dollar against the yen. Therefore, in order to provide for credit risks, it is desirable to maintain the capital-asset ratio rather than the nominal amount of capital. Hence, from the viewpoint of maintaining a sound capital base, it is desirable for a bank with foreign currency assets to have certain long positions in such currencies.⁶

⁵In the U.S. accounting system, Statement of Financial Accounting Standard (SFAS) No. 52 treats the net assets of foreign operations as follows (see, Peat Marwick Mitchell & Co., (1981):

Assets/liabilities of foreign operations are translated from the local currency (called "functional currency" in SFAS 52) using the exchange rate in effect at the foreign operation's balance sheet date.

Revenues, expenses, gains, and losses are translated by a weighted average exchange rate for the accounting period.

Valuation changes in the assets/liabilities of foreign operations are accumulated and reported on the balance sheet of the parent as a separate component of equity ("equity adjustment for foreign currency translation") and are not included in the determination of net income until the sale or the liquidation of the foreign net investment.

Under Japanese accounting standards as applied to banks, assets/liabilities of foreign subsidiaries are translated into yen at the exchange rate of the reporting date and consolidated with the balance sheet of the parent. If investments in these subsidiaries are excluded from position limits, these investments are carried on the balance sheet of the parent at the yen value on the date of purchase. Consequently, a discrepancy between the yen value of the net assets of subsidiaries and the yen value of investments arises. This discrepancy is indicated on the consolidated balance sheet as a separate item ("adjustment account for exchange rate translation") and does not affect the profit-loss statement. The profit-loss statement of foreign subsidiaries is translated either using the exchange rate of the transaction or the exchange rate of the reporting date (see, Koyama, 1990, chap. 5).

Regarding EC countries, Article 39, Section 1 of the Council of the European Communities' Directive of 8 December 1986 on the annual accounts and consolidated accounts of banks and other financial institutions states as follows:

"Assets and liabilities denominated in foreign currency shall be translated at the spot rate of exchange ruling on the balance sheet date. The Member States may, however, require or permit assets held as financial fixed assets and tangible and intangible assets, not covered or not specifically covered in either the spot or forward markets, to be translated at the rates ruling on the dates of their acquisition."

⁶If the probability of bad loans is proportional to the risk weights in BIS capital requirements, it is theoretically desirable to keep BIS capital in various currencies proportional to the currency composition of its risk assets. See, Committee on Banking Regulations and Supervisory Practices (1988) for details of capital requirements.

On the other hand, if a bank held its capital in foreign currencies in order to protect the capital-asset ratio, the yen value of its net assets would be affected by exchange rate movements, i.e., from the viewpoint of stockholders, exchange rate risk would be smaller when the bank had a square foreign exchange position in each currency.

Therefore, when a bank holds a significant part of its assets in foreign currencies, there is a conflict of interest between creditors (such as depositors) and stockholders. Consequently, it is not possible to argue that it is always desirable for a bank to hold open long positions in foreign currencies proportional to its foreign currency assets. However, for banks with significant foreign currency assets, it is desirable to hold certain long positions in the same currencies from the viewpoint of maintaining a sound capital base.

In practice, this conflict of interest is reconciled by a compromise. Banks often keep their equity holdings in foreign subsidiaries and endowment capital for overseas branches in open long positions. By doing so, banks can maintain capital-asset ratios to support their international business even if the domestic currency depreciates sharply against foreign currencies.

From the above analysis, we can derive the following conclusions.

- (1) From the viewpoint of maintaining adequate capital-asset ratios, it is advantageous for banks with large foreign currency assets to hold certain open long positions in the same currency. However, there is a possible conflict of interest between creditors and stockholders.
- (2) Taking account of the above consideration, it is desirable to keep the holdings in foreign subsidiaries and endowment capital for overseas branches in open long positions in the respective operational currency.⁷
- (3) From a long-term viewpoint, if relative purchasing power parity is expected to hold in the long run, it is justifiable to finance the acquisition of foreign tangible and intangible assets with domestic currency without covering operations.

B. Risks Stemming from the Issue of Foreign Currency Convertible Bonds (CBs)

Foreign currency CBs are a difficult foreign currency liability to evaluate; most, including those issued by Japanese banks, set the terms of conversion to stock at a price expressed in the same foreign currency. For example, a holder of Swiss franc-denominated CBs can convert them into stock at a fixed price in Swiss francs, enabling a profit (either by selling or exercising the conversion right) if the yen price of the underlying stock rises or if the yen appreciates against the Swiss franc. On the other hand, if the yen stock price falls or the yen depreciates against the Swiss franc, it is not advantageous to exercise conversion.

⁷The BIS capital requirement is applied to the consolidated balance sheet of banks, which involves some complications. However, as explained in Appendix A, the basic conclusions of this section are still valid if the goodwill is properly treated.

For banks issuing Swiss franc CBs, if bonds are converted, foreign currency debt disappears. On the other hand, if the bonds are held until maturity, they remain foreign currency liabilities. This situation is equivalent to the following combination:

- (1) Issuance of low coupon Swiss franc bonds
- (2) Sale of American-type call options on their stocks with strike prices in Swiss francs.

This second component is also equivalent to the sale of American-type put options in Swiss francs in exchange for stock (the right to sell Swiss francs in exchange for stock). Diagrammatically, we can express this situation as follows:

Swiss franc CBs
 = Swiss franc-denominated low-coupon bonds
 + sale of Swiss franc call options on stocks.

When the call options are exercised under advantageous high stock prices, CB holders surrender them in exchange for stock, i.e., the issuer obtains Swiss franc funds to repay the original Swiss franc bonds in exchange for stock. Therefore, the banks which issued CBs have to effect a delta hedge if they want to avoid foreign exchange risk. At the time of issue, the delta equivalent Swiss franc long position of the option component of the CBs is less than the net present value of the Swiss franc debt. Therefore, the issuer has a short position in Swiss francs. If the stock price in Swiss francs rises, the delta of the option in Swiss francs increases reducing the short position. On the other hand, if the stock price falls, the short position increases.

In the actual market, it is said that the timing of exercise is quite different from that in option pricing theory, making it difficult to apply delta hedging techniques. Historically, the speed of converting foreign currency CBs issued by Japanese companies is much faster than the theoretical prediction. Because of this factor, the effective short position of issued CBs is much smaller than the theoretical value calculated from the delta.⁸

The calculation of the effective foreign exchange position from the issued CBs with put options is still more complicated. The issuers of these bonds are effectively selling the put option which gives bondholders the right to sell the bonds with a premium over face value. CB investors have the opportunity of making a profit from higher underlying stock prices. On the other hand, the issuer, which is requested to buy back its own CBs due to the poor prospects for its stock price, has to bear the cost of retiring its CBs.

From the viewpoint of cash flow, this sold put option is the contingent obligation to buy back cash flow (coupon and principal payments) as well as the right of conversion at a

⁸Since the right of conversion is an American-type option on actual stock, the option pricing theory predicts that it is more advantageous to sell an in-the-money option than to exercise it. However, probably because of the limited liquidity of CBs, in-the-money options for CBs are quickly exercised in the actual market.

price higher than the prevailing market value. Consequently, we have the following relationship:

$$\begin{aligned} &\text{CB buy back price} \\ &= \text{buy back price of the right of conversion} \\ &\quad + \text{net present value of the bond.} \end{aligned}$$

In other words, the put option on a CB is the right to sell the option to buy stocks. Therefore, this is an option on an option. The risk related to this put option can also be reduced by delta hedging.

The two types of options related to CBs are both created on the underlying Japanese stock price in terms of Swiss francs. Therefore, the delta of these complex options depends on two prices — the yen price of stocks and the yen-Swiss franc exchange rate. Unless the correlation coefficient of these prices is one, the premium on complex options is less than the sum of premia of two options — option on the stock price in yen and option on the yen-Swiss franc exchange rate.

Given the complex risk structure of foreign currency CBs, it is necessary to treat them as structural positions and control their risk separately from ordinary dealing positions.

C. Risks Stemming from the Issue of Foreign Currency Warrant Bonds

Foreign currency-denominated equity warrant bonds can be similarly treated as CBs. Since bonds do not disappear when warrants are exercised, the bonds should be treated as foreign currency debts.

On the other hand, the risk on issued warrants depends on the currency the strike price was denominated in. If in the domestic currency, then warrants are pure American-type options to sell stocks at strike prices in the domestic currency. In this case, no foreign exchange risk is involved.⁹ However, if the strike price is denominated in a foreign currency, the warrants are American-type options to sell stocks at a strike price in a foreign currency and involve foreign exchange risk. In principle, the delta of these warrants can be evaluated by option pricing theory. However, it is difficult to evaluate the true position for the same reasons as mentioned when discussing foreign-currency convertible bonds. Given the complex risk structure of warrant bonds with foreign currency strike prices, it is necessary to treat them as structural positions and control their risk separately from ordinary dealing positions.

⁹Regarding equity warrant bonds issued by Japanese firms in recent years, the strike prices of equity warrants were denominated in yen. Therefore, the issuing companies do not incur foreign exchange risks on such warrants.

D. Risks Stemming from the Issue of Foreign Currency Preferred Stock and Subordinated Debt

From the viewpoint of economics, capital is defined as the difference between total assets and liabilities. Here, the treatment of mezzanine instruments such as subordinated debt is a difficult question.

In order to consider the treatment of foreign currency-denominated preferred stock and subordinated debt, we take the case of a hypothetical Japanese bank whose assets and senior liabilities are all denominated in yen. Its only foreign currency-denominated liability is a dollar subordinated debt:

Yen assets	100	Yen liabilities	90
		Dollar subordinated debt	2
		Other capital	8
Total	100	Total	100

Capital ratio: 10%

In this situation, the capital-asset ratio does not change from 10% even if the exchange rate moves. However, the yen value of the dollar subordinated debt rises as the dollar appreciates against the yen. For example, if the dollar appreciates against the yen by 100%, then the balance sheet becomes:

Yen assets	100	Yen liabilities	90
		Dollar subordinated debt	4
		Other capital	6
Total	100	Total	100

Capital ratio: 10%

Therefore, in this case, a change in the value of dollar subordinated debt does not change the capital-asset ratio, only the structure of capital. Although the degree of "debtiness" of subordinated debt is weaker than other senior debt, it is clearly stronger than common stock. Therefore, a drop in "other capital" due to a depreciation of the yen in the above example signifies the deterioration in the quality of total capital by increasing its degree of "debtiness." Thus, in general, it is more appropriate to treat such subordinated debt and foreign currency-denominated preferred stock as short positions in foreign currency like other senior foreign currency debt.

It is useful to note that foreign-currency subordinated debt can be used to protect the capital-asset ratios of international banks against a depreciation of the domestic currency. Consider the following example of a Japanese bank:

Dollar assets	20	Dollar debt	18
Yen assets	80	Yen liabilities	72
		Dollar subordinated debt	2
		Other capital	8
Total	100	Total	100

Capital ratio: 10%

If dollar subordinated debt is counted as a short position, this bank has a square position in the dollar. If the dollar appreciates against the yen by 100%, then the balance sheet changes as follows:

Dollar assets	40	Dollar debt	36
Yen assets	80	Yen liabilities	72
		Dollar subordinated debt	4
		Other capital	8
Total	120	Total	120

Capital ratio: 10%

Note that the capital-asset ratio does not fall. Thus, by holding foreign currency-denominated subordinated debt, banks with significant foreign currency assets can protect their capital-asset ratios against a depreciation of the domestic currency. Unlike the earlier method which employed the intentional holding of long positions in foreign currencies, this method does not generate a conflict of interest between stockholders and depositors.

It is possible to combine the two strategies to protect the capital-asset ratio (namely, the intentional holding of long positions in foreign currencies and holding of foreign currency preferred stocks or subordinated debt) against unexpected exchange rate movement. In order to fully insulate the capital-asset ratio from yen-dollar exchange rate movements, a Japanese bank could combine the two strategies as follows:

$$\frac{\frac{\text{Dollar-denominated assets}}{\text{Total assets}}}{\frac{\text{Subordinated dollar debt} + \text{Long position in the dollar}}{\text{Total capital}}}$$

Proof of this formula is given in Appendix B.

E. Loan-loss Reserves Against Foreign Currency-Denominated Assets

Consider a Japanese bank with dollar loans funded by dollar funds, having a square position in the dollar. Suppose that the creditworthiness of the borrower deteriorated

sharply. In this case, while the dollar value of the dollar funding remains the same, the estimated value of the dollar assets falls sharply. Taking account of the market value of the loans, the bank suddenly experiences the unexpected short position in the dollar.

This unexpected short position should be recognized in controlling foreign exchange risk. Therefore, it is desirable to hold loan loss provisions against foreign currency assets in the same currency. In other words, loan loss reserves for foreign currency assets should be treated as a short position in the same currency.

III. Conclusion

The concept of foreign exchange position is often treated as if it is well defined in any situation. When considering ordinary financial assets and liabilities, it can certainly be defined as the net present value of cash flow in each currency. However, there are many cases such as with respect to foreign direct investment and CBs issued when the position is difficult to clearly define.

In addition, since a bank faces both an exchange rate risk and credit risk (default), it has to take account of the ratio of foreign currency assets to total assets in order to appropriately control its foreign exchange position. From the viewpoint of maintaining an adequate capital-asset ratio, it is advantageous for banks with large foreign currency assets to hold certain open long positions in the same currency. This consideration provides a theoretical explanation to the traditional treatment of foreign investment as a structural item.

Appendix A. Complications Stemming from Consolidation

1. The evaluation of "goodwill" for foreign subsidiaries

When a bank has overseas subsidiaries which are consolidated, it is necessary to take account of "goodwill" in measuring the foreign exchange position.

Assume Japanese bank A acquires subsidiary B in the United States, and that the cost of acquisition is larger than B's capital account at the time of acquisition.

U.S. Subsidiary B		Japanese Bank A
Capital account 400	←	Investment in subsidiary B 600

In this case, when parent bank A prepares a consolidated balance sheet, the capital account of its U.S. subsidiary B (400) and investment account of the parent (400) cancel each other and the remaining 200 is reported in "consolidation adjustment account" on the consolidated balance sheet. Since the BIS capital requirement is a regulation on a consolidated basis and goodwill has to be subtracted from tier 1 capital, the balance of this consolidation adjustment account is subtracted

from the capital of the consolidated balance sheet for BIS regulation purposes.

It is possible to regard this adjustment account as corresponding to spurious capital. However, if this goodwill component reflects the high profitability of the subsidiary, the account reflects meaningful invisible assets from an economic viewpoint:

- (a) superior management know-how
- (b) high reputation of the subsidiary in the local market
- (c) good customer relationship
- (d) good, dedicated staff.

As explained in the text, in order to support the foreign currency business of overseas subsidiaries, it is desirable to hold a certain portion of the capital base of the parent in uncovered long positions in the same currency. Therefore, it is appropriate for banks to hold investments in foreign subsidiaries (either the initial investment or investment position minus consolidation adjustment account) as uncovered positions.

2. The evaluation of "goodwill" of merged foreign companies

When a bank absorbs a foreign firm by merger, "goodwill" has to be amortized under usual accounting standards. In this case, exactly the same argument as in 1. of this appendix holds. Therefore, if goodwill reflects the high profitability and large foreign-currency assets of the absorbed foreign operation, it would be appropriate to treat this initial investment (i.e. pre-amortization balance) as a structural item.

Appendix B. Combined Strategy to Protect Capital-Asset Ratios Against Exchange Rate Movements

In the text, we explained that the intentional holding of long foreign exchange positions and foreign-currency denominated subordinated debt could be utilized to protect capital-asset ratios against exchange rate movements. However, as we will show, it is possible to combine these two strategies.

Consider a Japanese bank with the following balance sheet.

Dollar assets	$eA_{\$}$	Dollar debt	$eL_{\$}$
Yen assets	$A_{¥}$	Yen liabilities	$L_{¥}$
		Dollar subordinated debt	$eK_{\$}$
		Other capital	$K_{¥}$
Total	W	Total	W

e : the price of one U.S. dollar

$\$$: U.S. dollar

$¥$: Japanese yen

As explained in the text, if we treat dollar subordinated debt as dollar short positions, the net foreign exchange position, $P_{\$}$, of this bank can be expressed as follows:

$$P_{\$} = A_{\$} - L_{\$} - K_{\$}. \quad (\text{A-1})$$

Also, other capital, $K_{¥}$, is always equal to the difference between total assets and liabilities including subordinated debt, leading to the following equation:

$$K_{¥} = eA_{\$} + A_{¥} - eL_{\$} - L_{¥} - eK_{\$}. \quad (\text{A-2})$$

On the other hand, the capital-asset ratio of a bank is defined as follows:

$$R = \frac{eK_{\$} + K_{¥}}{eA_{\$} + A_{¥}}. \quad (\text{A-3})$$

By replacing other capital $K_{¥}$ in equation (A-3) with the right hand-side of equation (A-2), we can get the following equation:

$$R = \frac{A_{¥} - L_{¥} + e(A_{\$} - L_{\$})}{eA_{\$} + A_{¥}}. \quad (\text{A-4})$$

By designing its balance sheet in a particular way, a bank can insulate its capital-asset ratio from exchange rate movement. In order to ascertain the appropriate conditions for the independence of the capital-asset ratio, R , from exchange rate movement, we differentiate equation (A-4) with respect to e and set it equal to zero. By some rearrangement using equations (A-1) and (A-2), we can obtain the following condition which is introduced in the text:

$$\frac{eA_{\$}}{eA_{\$} + A_{¥}} = \frac{e(P_{\$} + K_{\$})}{eK_{\$} + K_{¥}}. \quad (\text{A-5})$$

The left hand-side of the above equation is the ratio of dollar assets to total assets, while the right hand-side is the ratio of the sum of the net foreign exchange position and dollar subordinated debt to total capital. Therefore, banks which have large foreign currency assets relative to total assets can avoid fluctuations in the capital-asset ratio due to exchange rate movements either by keeping a net long position in the same currency or by maintaining a portion of its capital in foreign currency subordinated debt.

Mitsuhiro Fukao: Manager and Senior Economist, International Finance Division, International Department, Bank of Japan, (now at OECD)

References

- Committee on Banking Regulations and Supervisory Practices, *International Convergence of Capital Measurement and Capital Standards*, Basle, July 1988.
- Deardorff, Alan V., "One-Way Arbitrage and Its Implications for the Foreign Exchange Markets," *Journal of Political Economy*, Vol. 87, No. 2, April 1979.
- Fukao, Mitsuhiro, "The Theory of Exchange Rate Determination in a Multi-Currency World," *Monetary and Economic Studies*, Vol. 1, No. 2, Institute for Monetary and Economic Studies, Bank of Japan, October 1983.
- , "Liberalization of Japan's Foreign Exchange Controls and Structural Changes in the Balance of Payments," *Monetary and Economic Studies*, Vol. 8, No. 2, Institute for Monetary and Economic Studies, Bank of Japan, September 1990.
- Komiya, Ryutaro, and Akihiro Amano, *Kokusai Keizaigaku* (in Japanese), Iwanami Shoten, 1972.
- Koyama, Yoshiaki, *Ginkō no Gaitame Keiri no Jitsumu* (in Japanese), Kinyū Zaisei Jijō Kenkyukai, 1990.
- Peat Marwick Mitchell & Co., *Statement of Financial Accounting Standard No. 52, Foreign Currency Translation: An Executive Summary and a Detailed Review of the Standard*, December 1981.