# Are Interest Rate Swaps Used to Manage Banks' Earnings?

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## Abstract

Previous research has shown that loan loss provisions and security gains and losses are used to manage banks' net income. However, these income components are reported below banks largest operating component, net interest income (NII). This study extends the literature by examining whether banks exploit the accounting permitted under past and current hedge accounting standards to manage NII by entering into interest rate swaps. Specifically, I investigate whether banks enter into receive-fixed/pay-variable swaps to increase earnings when unmanaged NII is below management's target for NII. In addition, I investigate whether banks enter into receive-variable/pay-fixed swaps to decrease earnings when unmanaged NII is above management's target for NII. Swaps-based earnings management is possible because past and current hedge accounting standards allow receive-fixed/pay-variable swaps (receive-variable/pay-fixed) to have known positive (negative) income effects in the first period of the swap contract. However, entering into swaps for NII management is not costless, because such swaps change the interest rate risk position throughout the swap period. Thus, I also examine whether banks find it cost-beneficial to enter into offsetting swap positions in the next period to mitigate interest rate risk caused by entering into earnings management swaps in the current period. Using 546 bank-year observations from 1995 to 2002, I find that swaps are used to manage NII. However, I do not find evidence that banks immediately enter into offsetting swap positions in the next period. In sum, this research demonstrates that banks exploit the accounting provided under past and current hedge accounting rules to manage NII. This NII management opportunity will disappear if the FASB implements full fair value accounting for financial instruments, as foreshadowed by FAS No. 133.

# I. INTRODUCTION

This study examines whether interest rate swaps are used to manage bank holding companies' (hereafter, banks) earnings. Previous research has shown that loan loss provisions (LLP) and security gains and losses (SGL) are used (1) to manage earnings and taxes, and (2) to reduce regulatory costs (e.g., Moyer, 1990; Scholes et al., 1990; Warfield and Linsmeier, 1992; Beatty et al., 1995; Collins et al, 1995; Ahmed et al., 1999; Beatty et al., 2002). As distinct from previous studies, this study shows that net interest income (NII) can be managed by using interest rate swaps (hereafter, swaps). The main difference between earnings management using LLP and SGL and earnings management using swaps is where the managed earnings are reported in the income statement. Swap transactions directly affect NII, the first primary subtotal in banks' income statements. In contrast, LLP and SGL directly affect net income, not NII.

NII is a significant portion of earnings in banks' income statement. In 2002, NII is 3.5% of total bank assets, while LLP and SGL are 0.68% and 0.1% of bank assets, respectively (see Table 1 in Section II). In addition, Ryan (2002, p. 212) indicates that NII is the main source of banks' income. Despite the significance of NII, research has not investigated any methods that bank managers may exploit to manage this largest component of earnings. Given the importance of NII, the objective of this study is to examine whether banks manage NII by using interest rate swaps.

Two pieces of anecdotal evidence suggest this may be the case. First, according to the recent report by Baker Botts L.L.P (2003) to the Board of Directors of the Federal Home Loan Mortgage Corporation (known as Freddie Mac), $420 million of operating earnings were transferred from 2001 into subsequent years by entering into a series of swap transactions.

Freddie Mac deferred its earnings because realized NII far exceeded its expectations and it did not want to inflate NII expectations in future periods.

Second, Partnoy (2003, p. 45) suggests in his book, Infectious Greed: How Deceit and Risk Corrupted the Financial Markets that:

> There were a few ugly stories about firms using swaps to manipulate their accounting results. One bank contemplated internal swaps −swaps with itself− whereby it would set aside reserves depending on how much profit it wanted to declare in a particular quarter.

Swaps are private agreements between two parties to exchange cash flows in future periods based on a predetermined formula (Hull, 1997). The most common type of interest rate swap is the "plain vanilla" swap. Under this swap agreement, one party (e.g., *Bank A*) pays to the other party (e.g., *Bank B*) cash flows equal to interest at a predetermined fixed rate on a notional amount for a specified number of periods. At the same time, *Bank A* receives from the *Bank B* cash flows equal to interest at a variable rate (e.g., LIBOR[1], prime rate, etc.) on the same notional amount for the same periods. In this example, the swap is a receive-variable/pay-fixed swap (hereafter, RV swap) for *Bank A*, while the same swap is receive-fixed/pay variable swap (hereafter, RF swap) for *Bank B*.

Swap valuation is based on the expected *net* cash flows between fixed and variable legs of the swap. Suppose the interest yield curve is upward sloping (the most frequent case). This implies that forward interest rates are expected to increase (see Section III for details). Therefore, the variable rate payer's (*Bank B*) future cash outflows from the variable leg of the swap are expected to increase. Given these expected variable swap cash flows, to construct an at-the-money swap *Bank A* and *Bank B* need to agree upon a fixed interest rate that makes the initial

[1] The London Interbank Offered Rate (LIBOR) is the rate of interest offered by banks on deposits from other banks in Eurocurrency markets (Hull, 1997). This rate has become a common variable rate swap index.

value of the swap zero. Since the current period interest rate is the lowest point on the upward-sloping variable rate yield curve, the interest rate for the fixed leg of the swap must be set equal to a higher value that equates the present value of expected cash flows to be exchanged between *Bank A* and *Bank B*.

Due to this mechanism and assuming an upward-sloping yield curve, banks holding RF swaps will receive positive cash inflows in the early periods of the swap. Similarly, banks holding RV swaps will experience negative cash outflows in early swap periods. Moreover, given the positive and negative cash flow effects from the swap's initial period cash flows are set by interest rates at the swap inception date, managers know the exact initial period cash flow effect of swaps. If the accounting model reflects this economic effect in NII, managers can exploit this opportunity to manage NII.

Past and current hedge accounting models permit reporting of the net cash flows from the swaps as adjustments to reported interest revenue and expenses of hedged items. Thus, under these hedge accounting models, the positive or negative cash flow effects in the early periods of the swap generally are reflected in NII in income statements. However, there is an additional issue in these hedge accounting models: recognition of any changes in fair values of hedging swaps. Since managers do not have knowledge at swap inception as to the direction of future interest rate changes, recognizing any unrealized fair value gains or losses on swaps due to unexpected interest rate changes may counteract the earnings management effects of recognizing the initial swap cash flows in NII. Then, managers would not be able to fully exploit this NII management opportunity using swaps, resulting in a less attractive tool to manage earnings.

Under past and current hedge accounting standards, however, bank managers often can directly manage NII without having to recognize any counteracting effects on net income. Prior to Financial Accounting Standard Board Statement No. 133 (FAS No. 133), *Accounting Derivative Instruments and Hedging Activities*,[2] interest rate swaps accounted for as hedges were not recognized at fair value (Herz, 1994).[3] This hedge accounting model recognized only periodic net cash settlements under the swap in NII. Thus, the concern about counteracting earnings management effects by recognizing unrealized fair value gains or losses on swaps was not an issue.

In contrast, swaps are required to be recognized at fair values in post-FAS No. 133 periods. However, this does not mitigate the NII management opportunity as long as the swap is accounted for as a hedge because it is also required that corresponding hedged items' gains or losses be recognized in earnings.[4] Specifically, if a swap is designated as a fair value hedge, changes in fair values of both swaps and hedged items are recognized in earnings. As long as a fair value hedge is effective, gains (losses) on hedged items are offset by losses (gains) on swaps, resulting in no counteracting effects on either NII or net income. If a swap is designated as a cash flow hedge, gains or losses on the swap are recognized in other comprehensive income (OCI) not net income. Thus, the recognition of unrealized gains or losses on swaps accounted for as cash flow hedges also does not have any counteracting current period effect on NII (see Appendix for details).

In sum, as long as the swap is accounted for as a hedge, the mandated fair value recognition of swaps under FAS No. 133 generally does not eliminate the NII management

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[2] FAS No. 133 is amended by Financial Accounting Standard Board Statement No. 138 (FAS No. 138), *Accounting for Certain Derivative Instruments and Certain Hedging Activities-An Amendment of FASB Statement No. 133* and by Financial Accounting Standard Board Statement No. 149 (FAS No. 149), *Amendment of Statement 133 on Derivative Instruments and Hedging Activities*.

[3] The accounting guidance supporting this hedge accounting model was issued in Emerging Issue Task Force Issue Nos. 84-7 and 84-36.

[4] In order for managers to be able to treat earnings management swaps as hedges, the following two conditions must be met: (1) prior to putting on the earnings management swaps, the hedge ratio is less than 1, and (2) appropriate hedged items exist in interest earnings assets and liabilities to support hedge accounting treatment. I assume that banks have ability to meet both conditions.

opportunity provided by recognizing periodic cash flow settlements in NII.[5] As a result, I hypothesize that banks enter into RF swaps accounted for as hedges to manage NII upward if unmanaged NII is expected to be below management's target for NII. Similarly, I hypothesize that banks enter into RV swaps accounted for as hedges if they want to transfer current earnings into future periods because unmanaged NII exceeds management's target for NII.

The decision to enter into swaps for NII management purposes, however, is not costless. Entering into additional swaps to manage earnings is costly because such investments change banks' interest rate risk positions. Therefore, if maintaining risk management equilibrium is crucial, banks may seek to mitigate quickly the additional interest rate risk by entering into offsetting swap positions at the start of the next period. For example, if banks use RF swaps to increase earnings, they may enter into RV swaps at the start of the next period to mitigate the interest rate risk taken on by entering into the RF swaps this period. As long as earnings management swaps and reversing swaps are well matched, the concern about the cost of using swaps for earnings management can be somewhat mitigated.

However, banks may not necessarily enter into offsetting swap positions. Depending upon interest rate changes in the initial period and the length of maturity of NII management swaps, it may be difficult to enter into well-matched offsetting swaps in subsequent periods. Therefore, instead of entering into offsetting swap positions immediately in the next period, bank managers may observe both initial and subsequent periods' interest rate changes and current period earnings realizations before deciding whether or not to enter into offsetting swap positions. I, therefore, also test whether or not risk management costs are significant enough to cause banks

[5] When swaps are accounted for as trading instruments, bank managers are unable to manage earnings (either NII or net income) by predetermined amounts by entering into swap contracts. Trading swaps' unrealized gains or losses, after adjustment for net of periodic net cash settlements, are recognized in earnings. Since these net effects are reported outside NII, there is no NII management opportunity. In addition, due to the uncertainty about future interest rate changes at swap inception, the net effect on net income is unknown (see Appendix for details).

entering into earnings management swaps to generally enter into opposite swap positions early in the subsequent period.

Using a sample of 546 bank-year observations from 1995 to 2002, I find that, after controlling for investments in RF and RV swaps for risk management purposes, bank managers appear to enter into swaps to manage NII. Specifically, I find that if unmanaged NII is less (greater) than the target, banks enter into RF (RV) swaps to increase (decrease) NII. In addition, I provide evidence that bank managers do not appear to immediately enter into offsetting swap positions in subsequent periods to mitigate the additional interest rate risk taken on by investing in swaps to manage NII. A possible explanation for this latter finding is that, instead of strictly maintaining risk management equilibrium, managers consider subsequent periods' interest rate changes and the new NII target before deciding on entering into new swap positions in the subsequent period.

This paper contributes to the current literature by providing evidence on whether swap instruments are widely used to manage earnings in the banking industry. To the best of my knowledge, this is the first study showing that derivative instruments are used for earnings management rather than risk management purposes.[6] Secondly, while most of previous studies focus on LLP and SGL as tools to manage banks' total net income (Moyer, 1990; Beatty et al., 1995; Collins et al., 1995; Ahmed et al., 1999; Beatty et al., 2002), this study shows that swaps often are used to manage NII, an intermediate and significant component of total net income. However, this NII management opportunity arises only if swaps are accounted for as hedges

[6] Barton (2001) and Pincus and Rajgopal (2002) find a substitute relationship between derivatives usage and discretionary accruals management by nonfinancial companies. Since earnings are a sum of cash flows and accruals, they show that smoothing cash flows with derivatives has (1) a direct effect on the volatility of earnings by smoothing cash flows, and (2) an indirect effects on earnings management by reducing the need to smooth earnings through discretionary accruals. These studies assume that derivatives are used for risk management purposes only. In contrast, this study examines whether derivatives are used for both risk management and earnings management purposes.

under either the past and current hedge accounting models. Interestingly, it should be noted that this NII management opportunity will be eliminated if the FASB moves to a full fair value model for financial instruments, as foreshadowed in FAS No. 133.[7]

This paper is organized as follows. Section II provides evidence on importance of NII. Section III explains how swap instruments are used for both risk and earnings management purposes. Section IV develops the hypotheses. Section V introduces the research design. Section VI defines the sample and provides descriptive statistics. Section VII presents results. Section VIII provides conclusions and implications.

## II. IMPORTANCE OF NET INTEREST INCOME

The relative importance of NII to bank managers is supported by several sources. First, NII is the main source of banks' earnings (Ryan, 2002, p.212). Table 1 provides a summary of average U.S. commercial banks' income components as a percentage of total assets. For all commercial banks in 2002, net interest income is 3.5% on average of total assets. In contrast, LLP and SGL are only 0.68% and 0.1% of total assets, respectively. For medium sized banks, the importance of NII is even greater. Specifically, for these banks LLP and SGL are only 0.54% and 0.04% of total assets, respectively, while NII is 3.94% of total assets.

[7] In December 2000, Financial Accounting Standards Board (FASB) issued a Special Report regarding accounting for financial instruments and similar items prepared by Financial Instruments Joint Working Group of standard setters (JWG). JWG tentatively concluded that all derivatives are not interest-bearing financial instruments (FASB, 2000b, p. 244). Therefore, consistent with the full fair value accounting for derivatives described in this paper, fair value gains or losses after adjustment for swap cash receipts and payments are reported outside NII in the income statement (FASB, 2000b, paragraph 137 (e)).

| | All Banks | 10 Largest Banks | Medium Sized Banks (Ranked 101 through 1000) |
|---|---|---|---|
| | Income and expenses as a percentage of average net consolidated assets | | |
| Interest revenue | 5.29 | 4.78 | 5.88 |
| Interest expense | (1.80) | (1.65) | (1.94) |
| Net interest income | 3.50 | 3.13 | 3.94 |
| Loan loss provision | (0.68) | (0.73) | (0.54) |
| Net interest income after loan loss provision | 2.82 | 2.40 | 3.40 |
| Non-interest income | 2.53 | 2.32 | 2.38 |
| Non-interest expense | (3.46) | (3.15) | (3.74) |
| Gains on investment account securities | 0.10 | 0.13 | 0.04 |
| Income before taxes | 1.98 | 1.69 | 2.08 |
| Taxes | (0.65) | (0.57) | (0.69) |
| Net income | 1.33 | 1.12 | 1.40 |

Source: Federal Reserve Bulletin, "Profits and Balance Sheet Developments at U.S. Commercial Banks in 2002," June 2003. The statistics are based on regulatory call report; thus represent commercial banks, not bank holding companies.

Table 1. Average U.S. Commercial Banks' Income Components as a Percentage of Total Assets

Second, bank regulators pay attention to six items in their *CAMELS* rating to determine safety and soundness of banks: *C*apital adequacy, *A*sset quality, *M*anagement, *E*arnings, *L*iquidity, and *S*ensitivity to market risk. The judgment rating on earnings is based on several factors, including (1) the level, trend, and stability of earnings, and (2) the quality and sources of earnings (FDIC, 2002). Given that NII is the main source of banks' income (Ryan, 2002, p. 212); managers may want to ensure that NII is stable and growing.

Third, the relative importance of NII as a bank performance indicator is supported by SEC disclosure requirements. SEC Industry Guide 3 requires banks to make disclosures about the level and changes in NII. Specifically, banks are required to provide an analysis of net interest income, which contains information about (1) the average outstanding amounts of interest-earnings assets and interest-bearing liabilities, (2) the average yield earned and paid, and (3) the interest earned and paid. Another required disclosure is a rate-volume analysis. This disclosure decomposes the change in net interest income into two components: (1) interest rate effects, which represent the effects on NII due to changes in interest rates and (2) volume effects, which represent the effects on NII due to changes in volume of interest-earning assets and interest-bearing liabilities.[8]

Last, research evidence supports the importance of NII as an indicator of bank's performance. Eccher et al. (1996) find that NII is a significant factor in explaining banks' market-to-book ratio. Similarly, Barth et al. (1990) show that the stock market puts different weights on earnings components, with the greatest emphasis being placed on earnings before SGL. Considering NII is a significant portion of earnings before SGL, they provide additional evidence supporting the relative importance of NII to bank managers.

In sum, due to the significance of NII as a component of total bank earnings, managers may have a strong incentive to manage NII. Interest rate swaps provide an ideal mechanism to manage NII because the first period NII effect from entering into swaps is known precisely at swap inception. However, to achieve this NII management outcome, it is required that banks account for the new swaps as hedging instruments. Next, I will present economic and accounting models for swaps to explain (1) how banks use swaps to hedge interest rate risk, and (2) how NII management is possible under the past and current accounting models. Since earnings management effects are closely related to the economics of swap valuation, I also will describe the relationship between swap valuation and swap-based earnings management.

[8] For more detailed information, see Ryan (2002).

## III. SWAPS AS RISK AND EARNINGS MANAGEMENT TOOLS

### A. Swaps as Interest Rate Risk Management Tools

Suppose *Bank A* issues a $1 million fixed-rate (11.85%) loan and *Bank B* issues a $1 million variable-rate (1-year LIBOR) loan. Since *Bank A*'s cash inflows from the loan are fixed regardless of future changes in interest rates, the fair value of the loan will change as interest rates change. Thus, *Bank A*'s loan is exposed to fair value risk. In contrast, because *Bank B*'s cash inflows from the loan are updated based on the prevailing interest rate, fair value risk generally is not an issue. Rather, future cash flows will fluctuate with changes in the interest rate. Thus, *Bank B* primarily is exposed to cash flow risk.

To hedge these risks, *Bank A* and *Bank B* can consider a three-year swap initiated at January 1, Year 1, where *Bank A* agrees to pay a rate of 11.85% on the notional amount of $1 million to *Bank B* and in return *Bank B* agrees to pay 1-year LIBOR on the same notional amount to *Bank A*. The net payments are agreed to be exchanged at the end of every year. This swap is summarized in Figure 1.

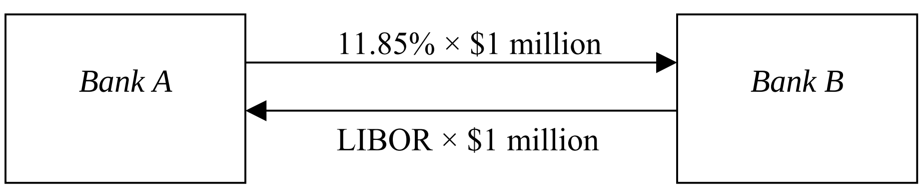


Figure 1. Interest rate swap between *Bank A* and *Bank B*

By entering into the swap as shown in Figure 1 (the swap is a RV swap for *Bank A*, but a RF swap for *Bank B*), *Bank A* and *Bank B* each can hedge their respective fair value and cash flow risks. Specifically, for *Bank A*, the RV swap effectively converts the fixed-rate loan into a variable-rate loan. As described in Figure 2, for *Bank A*, cash inflows from the fixed-rate loan are offset by cash outflows from the fixed-rate leg of the swap. Thus, the net interest cash flows in the loan and swap are the variable-rate cash inflows from the swap. This implies that the RV swap has effectively caused the fixed-rate loan to become a variable-rate loan; hence *Bank A*'s fair value risk is hedged.

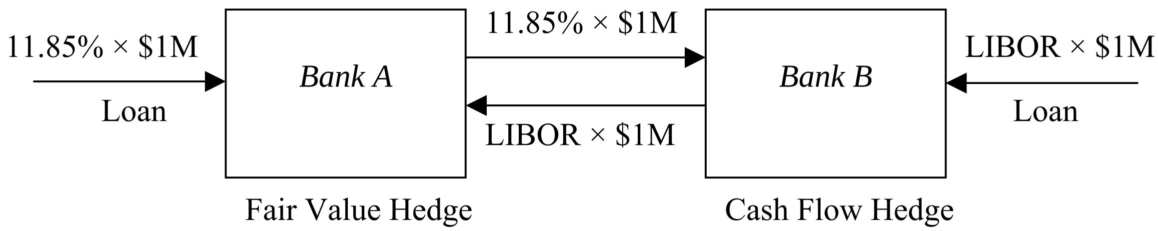


Figure 2. Fair Value and Cash Flow Hedges of Loans using a Swap

On the other hand, for *Bank B*, the RF swap effectively converts the variable-rate loan into a fixed-rate loan. As shown in Figure 2, variable-rate cash inflows from the loan are offset by cash outflows of the variable-leg of the swap. The net interest cash flows become the fixed (11.85%) cash inflows from the fixed leg of the swap. Therefore, *Bank B* effectively converts the variable-rate loan into a fixed-rate loan. Thus, *Bank B*'s cash flow risk is hedged.

Table 2 summarizes effective interest rates on the combined loan and swap, assuming that 1-year LIBOR for Years 1 through 3 is 10%, 12.01%, and 14.03%, respectively. Note that after considering swap effects, *Bank A*'s loan effectively becomes a variable-rate loan and *Bank B*'s loan is converted effectively into a fixed-rate loan.

| | | Year 1 | Year 2 | Year 3 |
|---|---|---|---|---|
| LIBOR | | 10.00% | 12.01% | 14.03% |
| *Bank A* | Loan Interest Inflows | 11.85% | 11.85% | 11.85% |
| | Swap-Receive Variable | 10.00% | 12.01% | 14.03% |
| | Swap-Pay Fixed | (11.85%) | (11.85%) | (11.85%) |
| | Effective Int. Rate | 10.00% | 12.01% | 14.03% |
| *Bank B* | Loan Interest Inflows | 10.00% | 12.01% | 14.03% |
| | Swap-Receive Fixed | 11.85% | 11.85% | 11.85% |
| | Swap-Pay Variable | (10.00%) | (12.01%) | (14.03%) |
| | Effective Int. Rate | 11.85% | 11.85% | 11.85% |

Table 2. Effective interest rates after using swaps

Fixed- or variable-rate liabilities also can be hedged using swaps. Figure 3 provides an example of a liability hedge. Suppose *Bank A* has a $1 million variable-rate (1-year LIBOR) liability and *Bank B* has a $1 million fixed-rate (11.85%) liability. Therefore, *Bank A*'s liability is exposed to a cash flow risk because interest payments for the liability will depend on future interest rates. In contrast, *Bank B*'s liability is exposed to a fair value risk because interest payments for the liability are predetermined. By entering into the swap as shown in Figure 1, both *Bank A* and *Bank B* can hedge their risks. As described in Figure 3, the RV swap effectively converts *Bank A*'s variable-rate liability into a fixed-rate liability, thus the cash flow risk is hedged. Also *Bank B*'s RF swap effectively converts the fixed-rate liability into a variable-rate liability, thus the fair value risk is hedged.

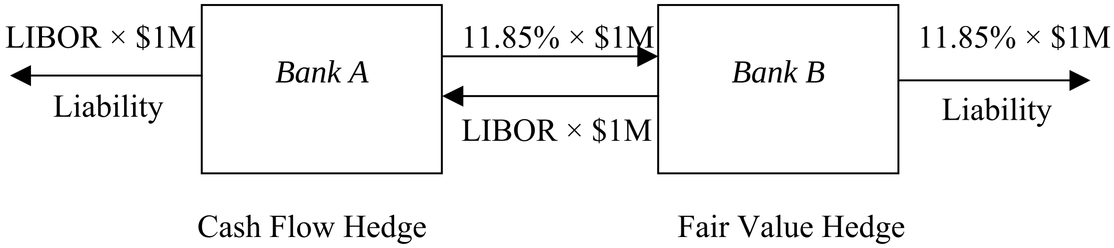


Figure 3. Cash Flow Hedge of a Variable-Rate Liability using a RV Swap

In sum, by using swaps, fixed-rate and variable-rate assets & liabilities can be converted into variable-rate and fixed-rate assets & liabilities, respectively. During the conversion process, either cash flow risk or fair value risk is hedged. Although banks can convert variable- or fixed-rate assets and liabilities into fixed- or variable-assets and liabilities, interest risks cannot be removed completely. For example, if *Bank A* hedges the cash flow risk of a variable-rate liability by using a RV swap, this hedging process transforms the cash flow risk into fair value risk; risk is changed but not eliminated.

In general, banks' interest rate risks are caused by maturity mismatches. For example, suppose *Bank B* has only a $1 million variable-rate loan asset which will mature tomorrow and be reinvested at the prevailing interest rate, while the funding source is a fixed-rate (11.85%) liability that will mature three years later. If the variable interest rate falls below 11.85% tomorrow, then a loss will occur because the lower variable interest revenue on the renewed loans will not cover the higher fixed interest expense. The opposite is true if the variable interest rate increases. Therefore repricing and/or maturity differences between assets and liability make cash flows and earnings volatile. To reduce cash flow and/or earnings volatility, banks often attempt to match the duration of their assets/liabilities portfolio. This goal can be achieved using swaps by converting, for example, variable-rate assets into fixed-rate assets or fixed-rate liabilities into variable-rate liabilities.

### B. Swap Valuation

In the Table 2 example, because the interest rate yield curve is upward-sloping (the most frequent case[9]), the swap's fixed interest rate (11.85%) is set to be greater than the variable interest rate (10%) at Year 1. Given this relationship, *Bank B* (*Bank A*) will receive (pay) cash

[9] See yield curves from 1995 to 2002 in Figure 7, Section VI.

flows from *Bank A* (*Bank B*) at the end of Year 1 by entering into RF (RV) swaps. The reverse is true if the interest rate yield curve is downward-sloping. To understand the relationship between fixed and variable swap rates, I next describe swap valuation.

Swap interest rates are based on the relation between spot and forward interest rates. The *n*-year spot interest rate is defined as the per annum interest rate on an investment that is made for a period of time starting today and lasting for *n* years (Hull, 1997). For example, if you invest \$1 million for two years and will receive \$232,100 interest at the end of the second year without receiving any other interest payments during the periods, the 2-year spot interest rate is 11% per annum.[10] Sometimes the *n*-year spot interest rate is called the *n*-year zero-coupon yield.

| Year (*n*) | Spot rate for n-year investment (% per annum) | Forward rate for $n^{th}$ year (% per annum) |
|---|---|---|
| 1 | 10% | |
| 2 | 11% | 12.01% |
| 3 | 12% | 14.03% |

Table 3. Spot and Forward Interest Rates

Forward interest rates are defined as the interest rates implied by current spot rates for periods of time in the future (Hull, 1997). For example, suppose the second column in Table 3 represents current spot interest rates for years 1 through 3 and you want to invest \$1 million for two years. Then, you have two options: (1) invest \$1 million for two years at the current two-year spot rate, which will yield $(1+.11)^2 \times \$1$ million, or (2) invest \$1 million for one year at 10%, the current one-year spot rate, and then invest the accumulated sum at the end of the first year at the second year's expected one-year spot rate, which is the forward rate. Assuming an efficient market, there should be no arbitrage gains between these two options and thus the

[10] Assuming annual compounding, $\$1{,}000{,}000 \times (1+0.11)^2 - \$1{,}000{,}000 = \$232{,}100$.

second year forward rate is the estimate of the second year's one-year spot rate. This guarantees that the following equations will hold.

$$(1+r_2)^2 = (1+r_1)\cdot(1+{}_1r_2) \quad (1)$$
$$(1+r_3)^3 = (1+r_1)\cdot(1+{}_1r_2)\cdot(1+{}_2r_3) \quad (2)$$

where $r_1$ , $r_2$ and $r_3$ represent current spot rates for 1-year (=10%), 2-years (=11%), and 3-years (=12%), respectively. Also, ${}_ir_j$ is a forward rate defined as expected 1-year spot interest rate for year *j* as of the end of year *i*. For example, ${}_1r_2$ represents Year 2's expected 1-year spot rates as of the end of Year 1. ${}_1r_2$ is 12.01% from equation (1), implying that the expected 1-year spot interest rate at the end of the Year 1 is 12.01%. Similarly, ${}_2r_3$ is 14.03% which is the forward rate at the end of the Year 2. As shown in Figure 4, the forward interest rate curve is always above the spot interest rate curve as long as the spot rate yield curve is upward-sloping (see Hull (1997), p. 80 for the proof).[11]

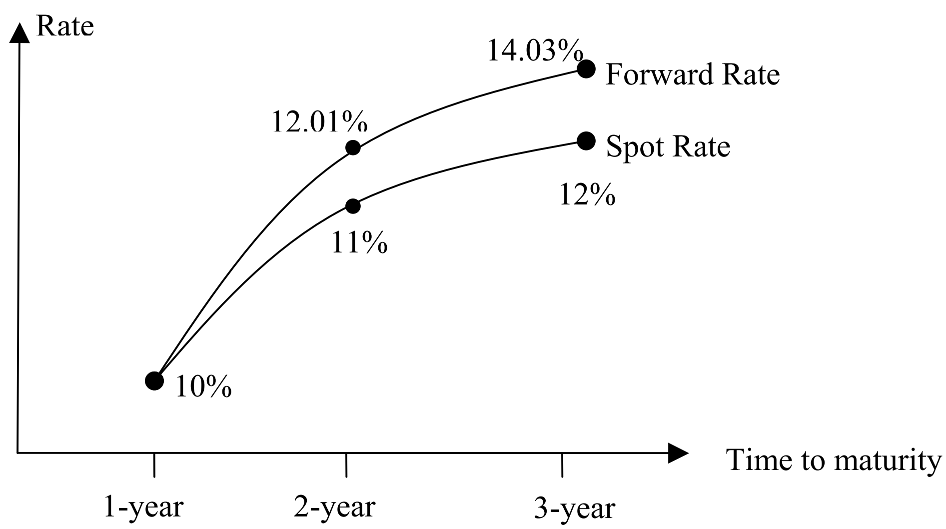


Figure 4. Spot and Forward Rate Yield Curves

[11] If the spot yield cure is downward-sloping, the forward yield curve is always below the spot yield curve.

Suppose *Bank B* wants to enter into a RF swap to hedge the fixed-rate liability as shown in Figure 3. Given the current yield curve in Figure 4 and assuming the notional amount is $1 million, expected cash flows from the variable leg of the swap are shown in the third column of Table 4.[12] Note that variable cash flows at the end of the period are determined based on the one-year forward rate (e.g., LIBOR) at the beginning of each period in Figure 4. For example, since the interest rate at the swap inception is 10%, *Bank B* pays $100,000 at the end of the Year 1 because the variable rate used to determine the Year 1 cash flow is set at the beginning of Year 1. This implies that, when entering a swap transaction, there is no uncertainty about the first period net cash flow.[13]

| Date | Forward LIBOR | Expected Variable Cash Outflows | Expected Fixed Cash Inflows | Expected Net Cash Flows | PV of Net Cash Flows |
|---|---|---|---|---|---|
| Jan. 1, Year 1 | | | | | |
| Dec.31, Year 1 | 10% | $100,000 | $118,500 | + $18,500 | $16,818 |
| Dec.31, Year 2 | 12.01% | $120,100 | $118,500 | − $ 1,600 | − $ 1,299 |
| Dec.31, Year 3 | 14.03% | $140,300 | $118,500 | − $21,800 | − $15,517 |
| Total | | $360,400 | $355,500 | − $ 4,900 | $ 0[14] |

Table 4. Cash Flows from a RF Swap

If the two banks seek to enter into an at-the-money swap, the next step is that *Bank A* and *Bank B* must set an interest rate for the fixed leg of the swap that makes the initial swap value zero. Let $\bar{k}$ be the *Bank B*'s fixed cash inflow from the swap. Then, equation (3) should hold. Thus, $\bar{k}$ is $118,500, which means the fixed coupon-interest rate of the swap is 11.85%.

$$\frac{(\bar{k}-100{,}000)}{(1+0.1)}+\frac{(\bar{k}-120{,}100)}{(1+0.11)^2}+\frac{(\bar{k}-140{,}300)}{(1+0.12)^3}=0 \qquad (3)$$

[12] It is assumed that there is no credit risk.

[13] Hull (1997), p. 112.

[14] $\frac{18{,}500}{(1+0.1)}+\frac{-1{,}600}{(1+0.11)^2}+\frac{-21{,}800}{(1+0.12)^3}=0$ (rounding error)

The expected fixed and net cash flows from the RF swap are shown in the fourth and fifth columns of Table 4, respectively. Note that the first net cash flow is positive and second and third net cash flows are negative. If the yield curve is upward sloping, the following statements about the swaps are always true:[15] (1) if the forward rate (i.e., 10%) is less than the fixed interest rate (i.e., 11.85%) of the swap, then the net cash flows are positive, (2) if the forward rate (i.e., 12.01% and 14.03%) is greater than the fixed interest rate (i.e., 11.85%) of the swap, then the net cash flows are negative.[16] In this example, the net cash flow in Year 1 is positive, and this positive cash flow is offset with negative future cash flows, resulting in zero initial present value of the swap. In general, if the fixed interest rate is set at α % as shown in Figure 5, the expected RF swap payments up to period *t* will generate positive net expected cash flows. From the period *t* to maturity, net expected cash flows from the RF swap will be negative. As shown in column 6 of Table 4, the sum of present values of these net positive and negative cash flows is zero at the initiation of an at-the-money swap contract.

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[15] The reverse is true when yield curve is downward sloping.
[16] See Chapter 5 of Hull (1997) for more details.

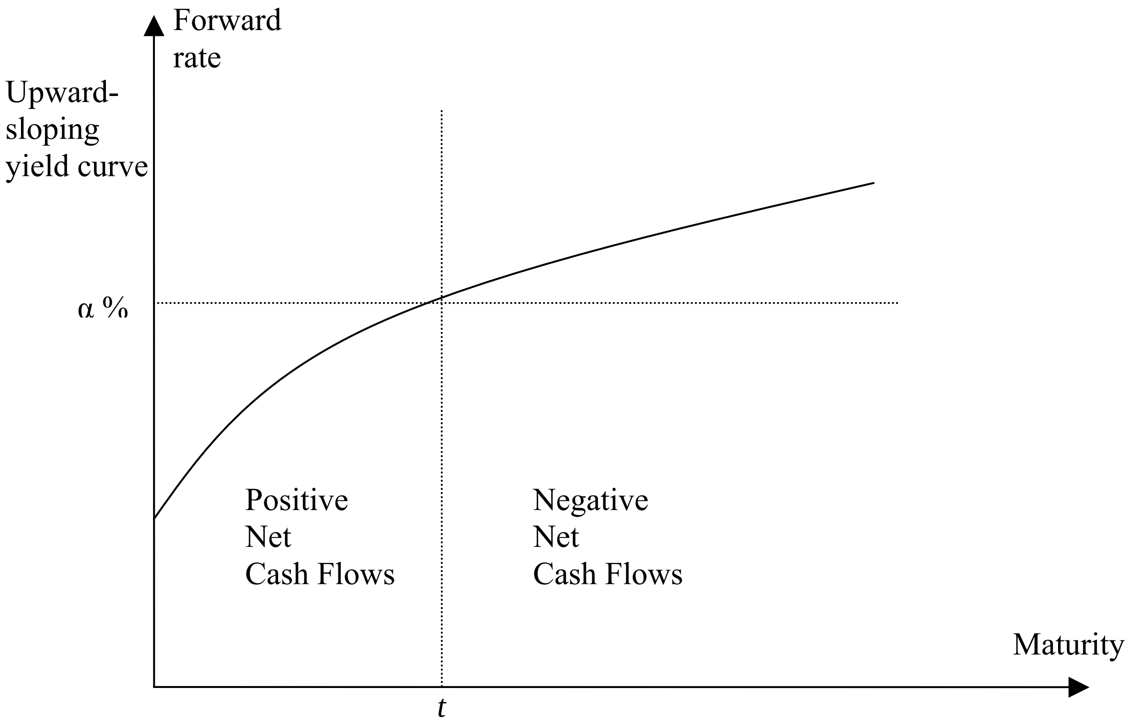


Figure 5. Relationship between forward rate and net cash flows of swaps[17]

To understand the net economic effects of swaps, Table 5 summarizes the economic effects during Year 1 under the assumption that interest rates move as expected.[18] At the end of Year 1, *Bank B* receives a positive net cash flow of $18,500 from *Bank A*, but the present value of *Bank B*'s commitment to pay cash flows to *Bank A* in years 2 and 3 is $18,500. Thus, there are no net economic effects for either *Bank A* or *Bank B* from the swap.

[17] Hull (1997), p. 125.

[18] At the end of Year 1, 1-year and 2-year spot interest rates are 12.01% and 13.01%, respectively. This implies that (1) Year 2's forward interest rate becomes the actual 1-year spot interest rate as expected, and (2) Year 3's forward interest rate remains the same as before.

| Date | Forward LIBOR | Expected Variable Cash Outflows | Expected Fixed Cash Inflows | Net Cash Flows | PV of Net Cash Flows at 12/31/Year 1 |
|---|---|---|---|---|---|
| Dec.31, Year 2 | 12.01% | $120,100 | $118,500 | − $ 1,600 | − $ 1,428 |
| Dec.31, Year 3 | 14.03% | $140,300 | $118,500 | − $21,800 | − $17,070 |
| | | | | Fair Value Loss | − $18,500[19] |
| | | | | Realized Cash Inflows at Dec. 31, Year 1 | $18,500 |
| | | | | Net Economic Effect of the swap | $ 0 |

Table 5. Expected Net Economic Effects from RF Swap at End of Period 1

However, if the variable interest rate moves unexpectedly, net effects could be either positive or negative depending upon directional changes in interest rates. This implies that net economic effects of a swap itself are uncertain, creating interest rate risk.

## C. Swaps as Net Interest Income Management Tools

In this section, I describe how accounting standards account for the economics of swaps. As shown in Table 5, the accounting model needs to capture two economic effects: (1) realization of the net cash flows caused by the difference in interest rates between the fixed and the variable legs of a swap, and (2) changes in the present value of future expected cash flows. Let us call the first effect the cash settlement effect and the second effect the fair value effect. The cash settlement effect provides bank managers with NII management opportunities because past and current hedge accounting models permit reporting of the net cash settlement under the swap as adjustments to reported interest revenue and expenses of hedged items. This is consistent with the economic outcome from hedging activities. Recall, Table 2 previously demonstrated how swaps can be used to change the current period effective net interest rate for banks. *Bank A* (*Bank B*) effectively converted a fixed-rate (variable-rate) loan into a variable-rate

19 $\frac{-1{,}600}{(1+0.1201)^2}+\frac{-21{,}800}{(1+0.1301)^3}=-18{,}500$ (rounding error)

(fixed-rate) loan by using a RV (RF) swap. By recognizing the cash settlement effects from the swap contract as adjustments to reported interest revenue or expenses, reported NII from the hedged item will reflect the same interest rate on the hedged transaction as illustrated in Table 2. Moreover, because the first period cash flow settlement under the swap is set equal to the difference between the variable and fixed interest rates at swap inception, bank managers can use the accounting permitted by this hedge accounting model to change NII by a known amount in the first period. Specifically, if the interest rate yield curve is upward sloping, managers can increase (decrease) NII by known amounts in Year 1 by entering into a RF (RV) swap position.[20]

However, as shown in the example in Table 5, this cash settlement effect could be counteracted by the fair value effect if changes in forward rates are recognized in net income as unrealized gains or losses. However, past and current hedge accounting standards do not require recognition of most or any of the fair value effect in net income. This is because (1) fair value changes for hedging swaps were not required to be recognized prior to FAS No. 133, and (2) post FAS No. 133, banks are required to recognize changes in fair value of *both* swaps and hedged items during the same time period for both fair value and cash flow hedges. Since under hedging accounting, the unrealized gains or losses on hedging swaps often offset the opposite, corresponding changes in the fair value of the hedged items, there is generally no fair value effect on net income (see Appendix for details). Therefore, as long as swaps are designated as hedges, managers can adjust NII to reflect the change in net interest rate effectuated by the swap without any significant countervailing effect on reported net income.

In contrast to hedging swaps, accounting rules for trading swaps did not change post-FAS No. 133. Under this fair value accounting model, the cash settlement and fair value effects are

[20] If the yield cure is downward-sloping, a RF (RV) swap will decrease (increase) earnings at the early periods of the swap contract.

both required to be recognized in net income (not NII). Therefore, the two effects can offset because there are no counteracting gains or losses on designated hedged items for trading swaps. In addition, because management has no knowledge at swap inception as to the direction of future fair value changes, the net effect of trading swaps on net income is uncertain. In sum, this suggests that bank managers cannot use trading swaps to manage earnings by a predetermined amount.[21] Because the accounting treatment for new swap acquisition under the full fair value accounting is identical to the accounting for trading swaps under the current partial fair value hedge accounting model, the NII management opportunity would be lost if FASB were to adopt full fair value accounting for financial instruments, as foreshadowed by FAS No. 133.

## IV. Hypothesis Development

In contrast to prior studies' focus on using derivatives for risk management purposes (e.g., Smith and Stulz, 1985; Froot et al., 1993; DeMarzo and Duffie, 1995), this study argues that derivatives, specifically interest rate swaps, also can be used to meet earnings targets. As shown in Section III, when the interest rate yield curve is upward sloping (the typical case), the decision to enter into a RF swap will generate positive net cash flows in early contract periods. Moreover, there is no uncertainty about net swap cash flows in the first period because the amount is predetermined by the difference in fixed and variable interest rate indices at swap inception. Therefore, because net swap cash settlements are reported in NII when the swap is accounted for as a hedge, managers know with certainty the magnitude of the first period NII effect when entering into a swap contract. As a consequence, my first research hypothesis is (assuming an upward sloping interest rate yield curve) that bank managers will exploit the known positive

[21] The cash settlement and fair value effects are reported outside NII. Therefore, trading swaps also provide no opportunity to manage NII.

(negative) effect of RF (RV) swaps on NII to manage earnings. Specifically, banks will enter into RF swaps if they anticipate that unmanaged NII will be less than management's target for NII. In contrast, if the current year's unmanaged NII exceeds targeted NII, managers may want to defer NII to future periods. This goal can be attained by entering into RV swaps because (assuming an upward sloping interest rate yield curve) RV swaps will have a negative NII effect in early swap periods. This analysis leads to my first hypothesis (stated in alternative form).

*H1: After controlling for investments in RF and RV swaps for risk management purposes and assuming an upward sloping interest rate yield curve, (1) if unmanaged NII is below management's target for NII, banks will enter into additional RF swaps to increase current NII, or (2) if unmanaged NII exceeds management's target for NII, banks will enter into additional RV swaps to defer current NII to future periods.*

Using swaps for NII management purposes is not costless, however, because the NII management swaps will move banks' swap portfolio away from the amount desired for risk management purposes.[22] If maintaining an equilibrium risk management level throughout the entire period is critical, banks need to minimize the risk effects induced by NII management swaps. This can be achieved, albeit imperfectly, by entering into offsetting swaps in the subsequent period. For example, if banks use RF swaps to increase current NII, they could enter into similar magnitude RV swaps in the next period to offset the change in risk exposure caused by entering into the RF swap this period. The reverse is true for RV swaps.

However, banks may not find it cost-effective to immediately enter into offsetting swaps positions in the subsequent period because it may be difficult to enter into well-matched offsetting swap positions when significant changes in the current period interest rate yield curve occur subsequent to the acquisition of a NII management swap contract. Thus, instead of

[22] Conversations with derivative dealers indicate that transactions costs are only 2 basis points (.0002) of the notional amount of the swap contract.

immediately entering into offsetting swaps, bank managers may find it cost-effective to delay entering into swap positions in the subsequent period until they know the distance from earnings targets and the subsequent period interest rate risk exposure.

To test whether or not banks find it cost-effective to immediately enter into offsetting swap position in the subsequent period to mitigate the effects arising from entering into swaps for earnings management purposes, I propose this second research hypothesis (stated in alternative form).

*H2: If banks use either RF swaps or RV swaps to manage NII, they will enter into offsetting swap positions in the subsequent period to mitigate the interest rate risk induced by entering into swaps for earnings management purposes.*

## V. RESEARCH DESIGN

### A. Hypothesis 1

To test *H1*, I estimate the following model:

$$\Delta NETSWAP_{it} = \alpha_0 + \alpha_1 DIFF_{it} + \alpha_2 \Delta GAP1Y_{it} + \alpha_3 \Delta LTGAP_{it} + \varepsilon_{it} \qquad (4)$$

where: $\Delta NETSWAP_{it}$: Change in net swap positions for bank *i* in period *t*, i.e., Δ(RFSWAP−RVSWAP), where RFSWAP (RVSWAP) is notional amounts of RF swaps (RV swaps). ΔNETSWAP is deflated by beginning total assets.

$DIFF_{it}$: difference between NII target and unmanaged NII for bank *i* in period *t* deflated by beginning total assets (a more precise definition is provided by equations (5)-(9)),

$\Delta GAP1Y_{it}$: Change in 1-year GAP for bank *i* in period *t* deflated by beginning total assets.

$\Delta LTGAP_{it}$: Change in long-term GAP for bank *i* in period *t* deflated by beginning total assets.

To explain changes in net swap positions, I first introduce two variables (ΔGAP1Y and ΔLTGAP) that measure the basic risk management relationship between swap positions and interest rate risk. Changes in asset/liability compositions influence net changes in swap positions because interest rate risk is mainly driven by the maturity mismatch in asset/liability composition.[23] GAP1Y and LTGAP are defined as the differences between interest-earning assets and interest-bearing liabilities that will respectively mature or reprice within one year or subsequent to one year.[24] Positive (negative) GAP1Y indicates that interest rate sensitive assets that mature or reprice within one year are greater (less) than similar interest rate sensitive liabilities. Similarly, positive (negative) LTGAP indicates that interest rate sensitive assets that mature or reprice outside a one-year period are greater (less) than similar interest rate sensitive liabilities.

To achieve risk management objectives, bank managers may want to enter into new swap positions as interest rate risk changes (i.e., as GAP positions change). For example, suppose that both (1) GAP1Y and LTGAP at year *t-1* are positive, and (2) ΔGAP1Y and ΔLTGAP increase. Since during period *t* both GAP positions moved further away from zero when compared to the positions at period *t-1*, interest rate risk is increased. Thus, managers may want to hedge these increased risks. Specifically, because interest rate sensitive assets and liabilities that mature or

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[23] Previous studies find that several variables (such as size, levels of deposit financing, liquidity, and bank capital) influence the decision to use swaps. However, there are no studies examining what characteristics of companies affect the use of certain type of swaps, i.e., RF swaps or RV swaps. For example, it is known that there is economies of scale regarding initiating and maintaining a hedging program (e.g., Booth et al., 1984; Mian, 1996; Geczy et al., 1997, Haushalter, 2000, Kim and Koppenhaver, 1992). This implies that bank size is positively associated with the level of total swap usage. However, there is no reason to believe that bank size has a certain relationship with using more RF swaps than RV swaps or vice versa. Therefore, I do not include these variables in equation (4).

[24] Total interest-earning assets are computed as a sum of interest-earning deposits, securities, federal funds sold, securities purchased under agreements to resell, and loan and lease financing receivables. Total interest-bearing liabilities are computed as a sum of interest-bearing deposits, federal funds purchased, securities sold under agreements to repurchase, commercial paper, other borrowed money, mortgage indebtedness, and subordinated notes and debentures. One year maturity information is obtained from the Interest Sensitivity Schedule in the FR Y9-C report.

reprice within one-year require frequent resetting of the instrument's interest rates, a positive ΔGAP1Y implies that cash flow risk has increased. To hedge this additional cash flow risk, managers may choose to increase RF swaps in Year 1 to convert cash flow sensitive net assets into fair value sensitive net assets. Similarly, because interest rate sensitive assets and liabilities that mature or reprice in periods outside one-year have fixed interest rates for extended time periods, a positive ΔLTGAP implies that fair value risk is increased. To hedge this additional fair value risk, managers may enter into RV swaps in Year 1 to convert increased fair value sensitive net assets into cash flow sensitive net assets. When the signs of ΔGAP1Y and ΔLTGAP at *t-1* are different from this example, the same rationale can be applied to predict what swap positions should be entered into to maintain the same risk level.

Note, as illustrated above, I expect that positive changes in GAP1Y and LTGAP may induce management to enter into different net swap positions for risk management purposes, i.e., management either will increase RF or RV swaps depending on whether there has been an increase in ΔGAP1Y or ΔLTGAP, respectively. Therefore, I use net swap positions as the dependent variable in equation (4) instead of total notional amounts of swaps.[25] The net swap position is defined as the difference in notional amounts between RF and RV swaps. As stated previously, I expect that positive ΔGAP1Y (ΔLTGAP) to be associated with positive changes in RF (RV) swaps. This implies that ΔGAP1Y (ΔLTGAP) is positively (negatively) associated with changes in net swap positions, ΔNETSWAP. Thus, I predict $\alpha_2$ and $\alpha_3$ to be positive and negative, respectively.

After controlling for changes in net swap positions for risk management purposes, *H1* predicts that managers may enter into additional swaps for NII management purposes. To test

[25] Most previous studies (e.g., Kim and Koppenhaver, 1992; Jagtiani, 1996; Carter and Sinkey, 1998) use total notional amounts to examine the relationship between the use of interest rate swaps and bank characteristics.

whether bank managers appear to enter into RF and RV swaps for NII management purpose, I first must identify the direction and amount by which NII is needed to be managed to meet targeted NII. As defined in equation (5), this is measured by the difference between the NII target (NIIT) and unmanaged NII (UNII).

$$DIFF_{it} = NIIT_{it} - UNII_{it} \quad (5)$$
$$NIIT_{it} = NIM_{it-1} \cdot AEA_{it} \quad (6)$$

where, $NIIT_{it}$: net interest income target for bank *i* in period *t*
$UNII_{it}$: unmanaged net interest income for bank *i* in period *t*
$NIM_{it-1}$: net interest margin percentage (NII/average interest-earning assets) for bank *i* in period *t-1*
$AEA_{it}$: average interest-earning assets for bank *i* in period *t*

Similar to the prior year net income threshold used by Degeorge et al. (1999), this study bases its net interest income target ($NIIT_{it}$) on the prior year's net interest margin percentage ($NIM_{it-1}$).[26] In specific, to control for annual changes in the net earning assets of sample banks, $NIIT_{it}$ is estimated in equation (6) by multiplying prior year's $NIM_{it-1}$ by current year's average earnings assets ($AEA_{it}$). If UNII is less than NII target, *H1* predicts that bank managers will use RF swaps to manage NII upward. Similarly, if UNII is greater than reported NII, then *H1* predicts that bank managers will use RV swaps to manage NII downward.

To estimate unmanaged net interest income (UNII), a firm-specific NIM beta ($\beta_{i,1}$) is estimated in equation (7) by regressing the individual banks' quarterly NIM ($NIM_{iq}$) on the average historical quarterly industry NIM ($INDNIM_q$).

$$NIM_{iq} = \beta_{i,0} + \beta_{i,1} INDNIM_q + \varepsilon_{iq} \quad (7)$$

[26] Net interest margin is defined as ratio of NII to average earning assets. I selected it as the target because my examination of 36 bank earnings releases in 2002 indicated that 31 of these banks compare current period's NIM and/or NII to same amount in the prior period when assessing bank performance.

where, $NIM_{iq}$: net interest margin percentage (NII/average interest-earning assets) for bank $i$ at quarter $q$

$INDNIM_q$: industry average net interest margin percentage for bank $i$ at quarter $q$

To estimate equation (7), I use a maximum of 32 and a minimum of at least 24 of the 32 quarterly observations immediately prior to the target period.[27] Equation (7) derives $\hat{\beta}_{i,1}$, which captures the firm specific NIM sensitivity to industry average NIM. Each bank's unmanaged NIM ($UNIM_{it}$) then is obtained by plugging the estimated betas from equation (7) and the test period's quarterly industry average NIM into equation (8).

$$\overline{UNIM}_{it} = \sum_{q=1}^{4} (\hat{\beta}_{i,0} + \hat{\beta}_{i,1} INDNIM_q) \quad (8)$$

where, $\overline{UNIM}_{it}$: predicted value of unmanaged net interest margin for bank $i$ at year $t$

$INDNIM_q$: industry average net interest margin percentage for bank $i$ at quarter $q$

To control for periodic changes in banks net interest earnings assets (like in equation (6)), this unmanaged NIM is multiplied by current year's average interest-earning assets to get UNII as in equation (9).

$$UNII_{it} = \overline{UNIM}_{it} \cdot AEA_{it} \quad (9)$$

where, $UNII_{it}$: unmanaged net interest income for bank $i$ at year $t$

$\overline{UNIM}_{it}$: predicted value of unmanaged net interest margin for bank $i$ at year $t$

$AEA_{it}$: average interest-earning assets for bank $i$ at year $t$

DIFF (as defined in equation (5)) reflects the difference between target (NIIT) and unmanaged net interest income (UNII) and is used to define the degree to which bank managers

[27] At least 24 observations are used to estimate equation (7) to (i) improve stability of regression estimates, and (ii) minimize any effects that prior period earnings management may have on equation (7) estimates by increasing the probability that the regression observations reflect periods in which NII was managed both upward and downward and, therefore, increasing the probability that earnings management effects are averaged away in the estimation procedure.

seek to manage NII. If banks manage NII using swaps, DIFF should be associated with the ΔNETSWAP (Δ(RFSWAP-RVSWAP)) position after controlling for changes in swaps due to risk management purposes. If the DIFF is positive, it implies that banks have managed NII upward by increasing RF swap positions. Increasing RF swap positions causes a positive ΔNETSWAP and, therefore, a positive coefficient on DIFF. Similarly, a negative DIFF implies that banks have managed NII downward by decreasing their ΔNETSWAP (by increasing RV swaps), which again suggests a positive coefficient on DIFF.[28] Thus, to test *H1*, I assess whether $\alpha_1$ in equation (4) is positive.

**B. Hypothesis 2**

*H2* predicts that after increasing swap positions for NII management in the current period, bank managers may attempt to immediately offset these positions in subsequent periods to mitigate the deleterious risk management effects caused by entering into NII management swaps. However, this action may neither be cost-effective nor feasible because the ability to achieve perfect offset becomes increasingly more difficult as the current period interest rate yield curve changes during the time period after swaps are entered into to manage NII. To test whether or not bank managers find it cost-effective to immediately enter into offsetting swap positions in the subsequent period, I add $DIFF_{it-1}$ to equation (4).

$$\Delta NETSWAP_{it} = \delta_0 + \delta_1 DIFF_{it} + \delta_2 DIFF_{it-1} + \delta_3 \Delta GAP1Y_{it} + \delta_4 \Delta LTGAP_{it} + \varepsilon_{it} \quad (10)$$

[28] The test documented in the text assumes increases in net swap positions can occur by either entering into RF swaps at year-end or failing to replace RV swaps maturing near year-end. Similarly, decrease in net swap positions are assumed to occur by entering into RV swaps at year-end or failing to replace RF swaps maturing near year-end. As a follow-on test, I also assess whether NII management occurs primarily by purchasing RF and RV swaps near year-end.

where: ΔNETSWAP: Change in net swap positions, i.e., Δ(RFSWAP−RVSWAP), where RFSWAP (RVSWAP) is notional amounts of RF swaps (RV swaps). ΔNETSWAP is deflated by beginning total assets.

DIFF: NII target − Unmanaged NII deflated by beginning total assets,

ΔGAP1Y: Change in 1-year GAP deflated by beginning total assets.

ΔLTGAP: Change in long-term GAP deflated by beginning total assets.

$DIFF_{it-1}$ is used to assess (1) if banks manage their NII upward by entering into RF swaps at *t-1*, (2) whether banks also enter into RV swaps at *t* to offset the NII management effects in subsequent periods. If this is true, then $DIFF_{it-1}$ should be negatively associated with $\Delta NETSWAP_{it}$. Similarly, if banks manage their NII downward by entering into RV swaps at *t-1*, then $DIFF_{it-1}$ should be negatively associated with $\Delta NETSWAP_{it}$ if offsetting swaps are entered into in period *t*. Therefore, if bank managers find it cost-effective to enter into offsetting swap to mitigate interest risk, I predict $\delta_2$ to be negative. However, if bank managers do not find it cost-effective to make such offsetting swap acquisition, $\delta_2$ will be zero. The expected sign on other variables are the same as in equation (4).

## VI. SAMPLE AND DESCRIPTIVE STATISTICS

### A. Sample

Panel A of Table 6 describes the sample selection process. To identify swap users, I start with all risk management derivative activities reported in bank holding companies' regulatory data (FR Y-9C) from 1995 to 2002. I found that 598 banks (2,073 observations) report non-zero derivative notional amounts including swaps. From this list, I delete banks (bank-year observations) that do not meet the following conditions. First, Beatty et al. (2002) show that public banks have a much greater proclivity to manage earnings than do private banks. Therefore, I include only public banks in the sample and delete a total of 267 private banks (618 observations). Second, to ensure that sample banks were active derivative users, I also excluded 101 banks (101 observations) having only one non-zero derivative observation in FR Y-9C reports. Finally, because FR Y-9C reports provide income information on a calendar year basis, I deleted 9 banks (26 observations) having non-December 31 fiscal year-ends. These sample selection criteria create an initial sample of 221 banks (1,328 bank-year observations) that are active derivative users.

*Insert Table 6 here*

For these 221 active derivative users, I manually collected information from annual reports about swap activities accounted for as hedges. For these sample banks, I deleted 36 banks (519 observations) because they did not use interest rate swaps during the sample period. Since at least 24 quarter observations are needed to estimate NIM beta, and first differences are used to construct variables, a total of 39 banks (263 observations) also are excluded from the sample due to missing data. The final sample consists of 146 banks (546 observations). Panel B of Table 6 provides the number of final sample observations by year. The numbers of banks are evenly distributed across the sample period.

### B. Descriptive Statistics

Panel A of Table 7 reports overall swap positions of sample banks. Average investments in RF swaps as a percentage of total assets are almost two times greater than for RV swaps. Specifically, the notional amounts of RF swaps are on average 5.24% of total assets, while the notional amounts of RV swaps are 2.01% of total assets on average. Figure 6 graphs the trend of sample banks' swap usage from 1996 to 2002. For RV swaps, the mean notional amounts deflated by total assets are stable over the sample period. In contrast, the mean notional amounts of RF swaps deflated by total assets are decreasing over the sample period. One interesting item is the dramatic decrease in RF swaps in the FAS No. 133 adoption year (2001). However, the trend recovers in 2002.

*Insert Table 7 & Figure 6 here*

To determine whether swap usage is significantly different before and after FAS No. 133, I test for differences in the mean notional swap amounts deflated by total assets. The results are reported in Panel B of Table 7. While mean difference in RV swaps between pre- and post-FAS No. 133 is not significant, the mean of RF swaps before FAS No. 133 is significantly greater than after FAS No. 133. The notional amounts of RF swaps before FAS No. 133 is 5.67% of total assets, but only 4.07% after FAS No. 133. This difference, however, is driven by the decline in RF swap usage in the FAS No. 133 adoption year. In the year subsequent to FAS No. 133 adoption, the mean difference in RF swap usage between the pre- and post-period is not statistically significant.

To better understand the nature of sample banks, I compare firm-characteristics of sample (swap-using) banks to non-swap using banks. Panel A of Table 8 tabulates this comparison. From a sample of banks indicating in FR Y-9C that they registered with the SEC, I find 815 non-swap users (3,504 observations) from 1996 to 2002. My sample banks (146 banks) therefore comprise 15.2% of swap-using and non-swap using banks, suggesting that only a small percentage of banks use swaps. Average total assets of swap users ($42 billion) are significantly greater than that of non-swap users ($910 million). This is consistent with previous studies showing that larger banks are more likely to use swaps (e.g., Booth et al., 1984; Kim and Koppenhaver, 1992). The average NIM for non-swap-using banks is slightly greater than swap-using banks, but the difference is not statistically significant.

*Insert Table 8 here*

I also compare maturity gaps between users and non-users. Swap users' GAP1Y (13.39% of total assets) is significantly greater than non-users (2.33% of total assets). In contrast, swap users' LTGAP (2.56% of total assets) is significantly less than non-users (12.97% of total assets). While swap users' GAP1Y and LTGAP are both positive, GAP1Y is significantly larger than LTGAP. Thus, if banks are primarily entering into swaps for risk management purposes, this suggests a greater demand for RF swaps than RV swaps because RF swaps provide the mechanism to manage short-term interest rate risk, i.e., GAP1Y. Consistent with this prediction, I find that average notional amount of RF swaps ($4.6 billion) is greater than the notional amount of RV swaps ($1.6 billion) during the sample period.

The direction of NII management using either RF or RV swaps depends on whether yield curves during the sample periods are upward or downward sloping. Figure 7 plots monthly averages interest rate yields from 1995 to 2002 for 3-month, 6-month, 1-year, 3-year, 5-year, and 10-year constant maturity treasury bills. Except for long-term maturities in the year 2000, yield curves are uniformly upward sloping. Given this yield curve environment, RF swaps (RV swaps) generally can be used to increase (decrease) earnings in the early periods of contracts, as predicted in hypothesis 1.

*Insert Figure 7 here*

Given the upward sloping interest rate yield curve, I estimate the potential change in NII from entering into swaps during the sample period. To compute this estimate, I multiplied the difference in interest rate between fixed and variable legs by the annual change in the notional amount of swaps for the period.[29] In this calculation, I do not separate out the income effects of swaps used for risk management and earnings management purposes. Preliminary results are reported in Panel B of Table 8.[30] For RF swaps, the mean difference in interest rates between fixed and variable legs of swaps is 1.38%. For RV swaps, the mean difference is -0.94%. The mean dollar magnitude net effect of swaps on NII is $41 million. On average, banks increase NII by 12 cents per share using swaps.

Table 9 shows descriptive statistics for the variables used to test hypothesis 1 and 2. All variables are deflated by beginning total assets. Average ΔNETSWAP is 0.5% of total assets. Estimated firm-specific NIM betas have a large cross-sectional variation. Average ΔGAP1Y and ΔLTGAP are 2.2% and 0.04% of total assets, respectively. Average DIFF is -0.15% of total assets.[31] Panel B of Table 9 shows pairwise correlations among variables. Consistent with hypothesis 1, ΔNETSWAP is positively (negatively) associated with ΔGAP1Y (ΔLTGAP). In addition, the pairwise correlations between ΔGAP1Y and ΔLTGAP and $DIFF_t$ and $DIFF_{t-1}$ are -0.93 and 0.44, respectively. Both these correlations are statistically significant, suggesting potential multicollinearity problem. To assess the extent of this problem, I estimate the variance inflation factor (VIF) for each of the variables included in equations (4) and (10). VIF values for $DIFF_{it}$, $\Delta GAP1Y_{it}$ and $\Delta LTGAP_{it}$ in equation (4) are 1.02, 7.75 and 7.79, respectively. The VIF values for $DIFF_{it}$, $DIFF_{it-1}$, $\Delta GAP1Y_{it}$ and $\Delta LTGAP_{it}$ in equation (10) are 1.24, 1.25, 6.86 and 6.92, respectively. Neter et al. (1996) suggest that mean VIF values considerably larger than 1 are indicative of serious multicollinearity problems. Therefore, it appears that multicollinearity problems exist in both equations and tests of the significance on ΔGAP1Y and ΔLTGAP may be

[29] The estimated economic effects of decreased swaps may not accurate because information about fixed interest rates for decreased swaps is not available. I use current swaps' weighted average fixed interest rates.
[30] Since data collection is not yet complete, the reported statistics are based on 58 observations.
[31] For the majority of sample banks, the NIM betas used in to estimate DIFF are positive and statistically significant. Sample banks' mean NIM beta and standard deviation are 0.08 and 0.17, respectively.

affected.[32] Due to this concern, I first test the confounded effects of the risk management variables by testing whether ΔGAP1Y or ΔLTGAP are jointly significant in both equations (4) and (10). Next, to separately evaluate the magnitude and sign of the coefficients on the risk management variable absent any influence due to collinearity, I also estimate two separate regressions containing either ΔGAP1Y or ΔLTGAP only.

*Insert Table 9 here*

## VII. RESULTS

Table 10 reports regression results relating to *H1*. The regression model assesses whether annual changes in net swap positions can be explained in terms of two sets of variables; one relating to risk management effects (ΔGAP1Y and ΔLTGAP), and the other relating to NII management (DIFF). In terms of the risk management variables, equation (4) predicts changes in net swap positions are positively and negatively associated with ΔGAP1Y and ΔLTGAP, respectively. For equation (4), the coefficient on ΔGAP1Y is significantly positive, but the coefficient on ΔLTGAP is positive and not statistically significant. However, as mentioned in the previous section, there are significant collinearity issues with the ΔGAP1Y and ΔLTGAP variables. To better isolate the sign and statistical significance of these two variables, I first test whether ΔGAP1Y and ΔLTGAP are jointly significant. The associated F-test indicates significance at the 1% level. I also estimate two separate regressions that only included either ΔGAP1Y or ΔLTGAP. Individual coefficients on the risk management variables in these regressions behave as predicted. The coefficients on ΔGAP1Y and ΔLTGAP are significantly

[32] However, the low VIF for DIFF suggests that the high degree of correlation between ΔGAP1Y and ΔLTGAP will not cause bias in DIFF coefficient (Wooldridge, 1999).

positive and negative, respectively. The joint results, therefore, indicate that net swap positions are positively and negatively associated with ΔGAP1Y and ΔLTGAP, respectively, suggesting that banks change their net swap positions for risk management purposes.

*Insert Table 10 here*

Given this risk management relationship, I next examine whether banks also manage net swap positions for NII management purposes. The coefficient on DIFF is significantly positive across each of the different regression specifications. Therefore, it appears that changes in swap positions are related to NII management after controlling for changes in interest rate risk. These results are consistent with *H1*.

Table 11 presents estimates of equation (10), which are used to assess whether banks enter into opposite swap positions in the subsequent period to offset the increased risk induced by entering into swaps for NII management. Despite adding the lagged DIFF variable to the estimated regression, the inferences remain the same for variables common to equation (4) and (10). The coefficient on ΔGAP1Y is significantly positive, but the coefficient on ΔLTGAP is positive and not statically significant. An F-test indicates that ΔGAP1Y and ΔLTGAP are jointly significant at 5% significance level. Similarly, individual coefficients on ΔGAP1Y and ΔLTGAP reported in column 4 and 5 of Table 11 are significantly positive and negative, respectively. Therefore, the results of the relationship between changes in net swap positions and ΔGAP1Y or ΔLTGAP remains the same as before.

*Insert Table 11 here*

In terms of the DIFF variables, the coefficient on DIFF remains positive and significant, again suggesting that sample banks acquire swaps to manipulate current period NII. In regards to

*H2*, however, the coefficient on lagged DIFF is negative as predicted, but not significant. This implies that current changes in net swap positions are not associated with prior year's DIFF, counter to predictions in *H2*. A possible explanation is that strictly maintaining risk management equilibrium by entering into offsetting swap positions is not cost-effective. Managers instead seem to consider subsequent periods' earnings and risk management positions before entering into new swap positions in the subsequent period.

## VIII. CONCLUSIONS

This study examines whether interest rate swaps are used as earnings management tools by banks. Current and past hedge accounting models permit bank managers to increase (decrease) NII by predetermined amounts by acquiring RF swaps (RV swaps). I examine whether banks managers exploit this opportunity to manage NII. I provide evidence that after controlling for risk management-based swap acquisitions, banks also change swap positions to manage NII. Specifically, I provide evidence suggesting that if unmanaged NII is below management's target for NII, banks increase investments in RF swaps to increase NII. Similarly, I provide evidence suggesting that if unmanaged NII is above management's target for NII, banks increase investments in RV swaps to defer NII to future periods.

Using swaps for earnings management purposes, however, is not costless because it causes banks' net swap position to deviate from risk management equilibrium. As a result, I also test whether managers enter into offsetting swap positions in subsequent periods to mitigate additional risk induced by entering into swaps for earnings management purposes. My research findings show that this is not the case. A possible explanation is that the decision to enter into new swap positions in the subsequent period depends primarily on current period interest rate changes and the distance from the current NII target.

In sum, this study provides evidence that bank managers exploit accounting permitted by current and past hedge accounting models to manage NII. This research contributes to the literature by documenting for the first time that swaps are used for both earnings and risk management purposes. Interestingly, it should be noted that if the FASB were to adopt a full fair value accounting model for financial instruments, as foreshadowed in FAS No. 133, then bank managers will lose the opportunity to exploit the accounting model by acquiring swaps for earnings management purposes.

# APPENDIX

## Hedge Accounting for Interest Rate Swaps Pre- and Post-FAS No. 133

### A. Before the Adoption of FAS No. 133

Before the adoption of FAS No. 133, there was no level a authoritative accounting guidance for interest rate swaps (Herz, 1994).[33, 34] Emerging Issues Task Force (EITF) Issues Nos. 84-7 and 84-36 provided the only accounting guidance. These EITF issues address the accounting at inception (84-36) and termination of an interest rate swap (84-7). This guidance can be summarized as follows (Wishon and Chevalier, 1985; Herz, 1994):

- For swaps not designated as hedging instruments, swaps are recorded at fair values in balance sheet and changes in fair values are recognize as unrealized gains or losses in net income (not NII).
- For swaps designated as hedge instruments,
  - Swaps are recognized at historical cost (usually zero) in the balance sheet and interest income and expense is adjusted by periodic net cash settlements under the swap contract.
  - Gain or loss from the settlement of termination should be deferred and recognized when offsetting gains or losses on hedged items are recognized.

### B. After the Adoption of FAS No. 133

A fundamental decision made by the FASB in FAS No. 133 is that derivative instruments meet the definition of assets and liabilities and should be measured at fair value, because fair value is the most relevant measure for financial and derivative instruments.

[33] Statement on Auditing Standards (SAS) No. 69, *The Meaning of 'Present Fairly in Conformity with Generally Accepted Accounting Principles' in the Independent Auditor's Report*, specifies five levels in the GAAP hierarchy with level a being the most authoritative. EITF Issues are found in level c.

[34] In contrast, accounting guidance for currency swaps were explicitly addressed by Financial Accounting Standard Board Statement No. 52 (FAS No. 52), *Foreign Currency Translation* in the period prior to FAS No. 133.

Under FAS No. 133, interest rate swaps either (1) are treated as stand-alone instruments or (2) can be designated as either a fair value hedge or cash flow hedge. Stand-alone derivatives are fair valued in the balance sheet with changes in these fair values recognized in current net income as unrealized gains or losses. In a fair value hedge, a derivative is entered into to hedge the exposure to change in fair value of an asset or liability. In a cash flow hedge, a derivative is entered into to hedge the exposure to variable cash flows. If swaps are accounted for as a fair value hedge: (1) NII income captures the net periodic cash settlements under the swap, and (2) unrealized gains or losses on the hedging instruments and the hedged items are recognized in earnings as they occur. Therefore, the net effect of (2) on earnings is the extent to which the hedge is not effective in offsetting changes in fair values. This is called hedge ineffectiveness. In contrast, if swaps are accounted for as a cash flow hedge, FAS No. 133 requires that (1) NII income captures the net periodic cash settlements under the swap, and (2) to the extent a hedge is effective, unrealized gains or losses on derivatives are reported initially in other comprehensive income (OCI) and reclassified into earnings at the time the hedged item affects earnings. The ineffective portion of a cash flow hedge is recognized in earnings immediately.

### C. Example

As initially presented in Section III, suppose that (1) *Bank A* has $1 million of 3-year, variable-rate (1-year LIBOR) assets, and (2) *Bank B* also has $1 million of 3-year, fixed-rate (11.85%) assets. *Bank A*'s assets reprice at the end of each year. *Bank A* wants to hedge its cash flow risk and *Bank B* wants to hedge its fair value risk. Thus, they agree to enter into a swap contract. Under this swap agreement, *Bank A* pays to *Bank B* variable interest rate on $1 million. At the same time, *Bank A* receives from *Bank B* fixed interest (11.85%) on $1 million. This swap is a RF swap for *Bank A* and a RV swap for *Bank B*. Given the current yield curve in Figure 4, cash flows for *Bank A* and *Bank B* are as follows:

| | Date | Jan. 1, Year 1 Cash Flows | Dec. 31, Year 1 Cash Flows | Dec. 31, Year 2 Expected CF | Dec. 31, Year 3 Expected CF |
|---|---|---|---|---|---|
| | Spot Rate<br>Forward Rate | | 10% | 11.00%<br>12.01% | 12.00%<br>14.03% |
| **BANK A** | Variable-Rate Asset | (1,000,000)[35] | 100,000 | 120,100 | 140,300<br>1,000,000 |
| | Swap-Rec. Fixed | | 118,500 | 118,500 | 118,500 |
| | Swap-Pay Var. | | (100,000) | (120,100) | (140,300) |
| | Total | (1,000,000) | 118,500 | 118,500 | 1,118,500 |
| **BANK B** | Fixed-Rate Asset | (1,000,000)[36] | 118,500 | 118,500 | 118,500<br>1,000,000 |
| | Swap-Rec. Var. | | 100,000 | 120,100 | 140,300 |
| | Swap-Pay Fixed | | (118,500) | (118,500) | (118,500) |
| | Total | (1,000,000) | 100,000 | 120,100 | 140,300 |

Table A. Cash flows from assets and swaps

At the end of Year 1, under FAS No. 133, *Bank A* and *Bank B* need to know the fair value of both the swap and their assets to be able to mark them to market. Suppose one-year and two-year spot rates at the end of the Year 1 are 12% and 13%, respectively. Then, the fair values (i.e., present value of expected cash flows discounted at expected spot interest rate) of the assets and swap at the end of Year 1 are as follows:

35 $$\frac{100{,}000}{(1+0.1)}+\frac{120{,}100}{(1+0.11)^2}+\frac{1{,}140{,}300}{(1+0.12)^3}=1{,}000{,}000$$

36 $$\frac{118{,}500}{(1+0.1)}+\frac{118{,}500}{(1+0.11)^2}+\frac{1{,}118{,}500}{(1+0.12)^3}=1{,}000{,}000$$

| Date | | Dec. 31, Year 2 Expected CF | Dec. 31, Year 3 Expected CF | PV | Gain/Loss |
|---|---|---|---|---|---|
| Spot Rate | | 12% | 13% | | |
| Forward Rate | | | 14.01% | | |
| BANK A | Variable-Rate Asset | 120,000 | 140,100<br>1,000,000 | 1,000,000 | 0 |
| | Swap-Rec. Fixed | 118,500 | 118,500 | | |
| | Swap-Pay Var. | (120,000) | (140,100) | | |
| | Swap-Net | (1,500) | (21,600) | (18,268)[37] | (18,268) |
| | Total | 118,500 | 1,118,500 | 981,732 | OCI (18,268) |
| BANK B | Fixed-Rate Asset | 118,500 | 118,500<br>1,000,000 | 981,732[38] | (18,268) |
| | Swap-Rec. Var. | 120,000 | 140,100 | | |
| | Swap-Pay Fixed | (118,500) | (118,500) | | |
| | Swap-Net | 1,500 | 21,600 | 18,268[37] | 18,268 |
| | Total | 120,000 | 140,100 | 1,000,000 | NI 0 |

Table B. Fair values of the *Bank A* and *Bank B*'s assets and swaps at the end of Year 1

Before adoption of FAS No. 133, *Bank A*'s journal entries for Year 1 are provided in Table C. Since prior to FAS No. 133 fair value recognition of the swap and hedged item is not required by the hedge accounting model, only the interest on the hedged item and the net positive interest rate effect from the RF swap is recognized in NII.

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37 $\frac{-1{,}500}{(1+0.12)}+\frac{-21{,}600}{(1+0.13)^2}=-18{,}268 \text{ (rounding error)}$

38 $\frac{118{,}500}{(1+0.12)}+\frac{1{,}118{,}500}{(1+0.13)^2}=981{,}732 \text{ (rounding error)}$

| Before FAS No. 133 (*Bank A*, RF swap) | |
|---|---|
| 01-01-Year 1<br><br>Assets 1,000,000<br>Cash 1,000,000<br>(Record investment) | 12-31-Year 1<br><br>Cash 100,000<br>Interest Revenue 100,000<br>(Record interest on assets)<br><br>Cash 18,500<br>Interest Revenue 18,500<br>(Record cash flow from swap) |

Table C. Bank A's Journal Entries before FAS No. 133

Each bank's journal entries for Year 1 after FAS No. 133 adoption are provided in Table D. The first column of Table D represents journal entries when *Bank A*'s RF swap is not designated as a hedge, and therefore, treated as a stand-alone derivative.[39] If swaps are not designated as hedge, the income statement effects of the swap affect net income not NII. Moreover, changes in fair value of swaps mitigate the earnings increasing effect from the RF swap on net income. Specifically, *Bank A* can increase its non-interest income by entering into the RF swap by $18,500. However, due to the recognition of the fair value loss on the swap (loss $18,268) the net effect on earnings is only $232.

The second column of Table D presents Year 1 journal entries when *Bank A*'s RF swap is accounted for as a cash flow hedge. *Bank A*'s RF swap increases NII by $18,500. This positive effect is not mitigated by fair value loss on the swap because to the extent it is effective changes in the fair value of the swap are reported in OCI under a cash flow hedge. Therefore, to the extent it is effective in Year 1 of the hedge, the valuation of the swap itself does not have an effect on earnings under a cash flow hedge.

[39] The same accounting was prescribed for trading swaps prior to FAS No. 133.

| No Designation (Bank A) | *Bank A* (Cash Flow Hedge, RF swap) | *Bank B* (Fair Value Hedge, RV swap) |
|---|---|---|
| 01-01-Year 1<br>Assets 1,000,000<br>Cash 1,000,000<br>(Record investment) | 01-01-Year 1<br>Assets 1,000,000<br>Cash 1,000,000<br>(Record investment) | 01-01-Year 1<br>Assets 1,000,000<br>Cash 1,000,000<br>(Record investment) |
| 12-31-Year 1<br>Cash 100,000<br>Interest Revenue 100,000<br>(Record interest on assets)<br><br>Cash 18,500<br>Swap payable 18,500<br>(Record cash flow from swap)<br><br>Swap payable 232<br>Non-interest income 232<br>(Record fair value of swap, $18,500-$18,268 = $232) | 12-31-Year 1<br>Cash 100,000<br>Interest Revenue 100,000<br>(Record interest on assets)<br><br>Cash 18,500<br>OCI 18,500<br>(Record cash flow from swap)<br><br>OCI 18,500<br>Interest Revenue 18,500<br>(Reclassify into earnings)<br><br>OCI 18,268<br>Swap payable 18,268<br>(Record fair value of swap, see Table B) | 12-31-Year 1<br>Cash 118,500<br>Interest Revenue 118,500<br>(Record interest on assets)<br><br>Interest Expense 18,500<br>Cash 18,500<br>(Record cash flow from swap)<br><br>Unrealized loss on assets 18,268[40]<br>Assets 18,268<br>(Record change in fair value of hedged item, see Table B)<br><br>Swap Receivable 18,268<br>Unrealized gain on swap 18,268<br>(Record fair value of swap, see Table B) |
| Income Statement<br><br>Interest Revenue 100,000<br>NII 100,000<br><br>Non-interest Income 232<br>NI 100,232 | Income Statement<br><br>Interest revenue 118,500<br>NII 118,500<br><br>NI 118,500<br>OCI (18,268) | Income Statement<br><br>Interest revenue 118,500<br>Interest Expense (18,500)<br>NII 100,000<br>Non-interest income<br>Unrealized loss on assets (18,268)<br>Unrealized gain on swap 18,268<br>NI 100,000 |

Table D. Journal Entries after FAS No. 133

[40] At swap inception, spot and forward interest rates in Year 2 and Year 3 are expected to be 12.01% and 14.03%. However, actual spot and forward interest rates are 12% and 14.01%. These unexpected interest rate changes cause the difference between $18,500 and $18,268.

The third column of Table D represents Year 1 journal entries when *Bank B*'s RV swap is accounted for as a fair value hedge. *Bank B*'s RV swap decreases NII by $18,500. The change in fair value of the swap is perfectly offset by the change in fair value of hedged item, resulting in zero effect on net income.

This example in Table D represents the case of a perfect hedge. However, hedging is not always perfect because of (1) differences between the variable rate indices under the swap (e.g., LIBOR) and hedged item (e.g., prime rate) and/or (2) differences in critical terms between swaps and hedged items, such as notional amounts, maturities, interest payment dates. FAS No. 133 requires reporting any hedge ineffectiveness in earnings. Under the fair value hedge accounting, since the changes in fair value of both a hedged item and a hedging instrument are reported as they occur, the effective and ineffective amounts of the hedging relationship are recognized in earnings. In contrast, under the cash flow hedge, it is required to decide whether a hedge is effective, because the portion of the hedge income deferred in OCI is limited to the extent to which a hedging instrument protects against exposure to changes in cash flow risk. Therefore, the deferred amount reported in OCI represents the effective hedge amount. The ineffective portion of a cash flow hedge is reported immediately in net income. All hedging relationships should be assessed both prospectively and retrospectively as to whether the relationships have been and will be highly effective. If the hedge fails the effectiveness test at any time, the hedge ceases to qualify for hedge accounting.

If certain conditions are met,[41] FAS No. 133 allows a shortcut method to simplify necessary computations to determine hedge effectiveness (FAS No. 133, paragraph 68). If the

[41] The following conditions should be met: (1) the notional amount of the swap matches the principal amount of hedged item, (2) the fair value of the swap is zero at the inception, (3) the formula for computing net settlements under the swap is the same for each net settlement, (4) the hedged item is not prepayable unless embedded call or put option mirrored in swap, and (5) index for variable leg of the swap is the same as hedged benchmark rate.

shortcut method criteria are met, it is assumed that there is no hedge ineffectiveness. Under the shortcut method, banks compute and recognize immediately the fair values of swaps in the balance sheet. In addition, the fair value of the hedged items is adjusted by the same amount as the change in the fair value of the swap, guaranteeing perfect effectiveness. As a result, under the shortcut method, (1) there is no need to compute the fair values of the hedged item because a perfect hedge is assumed, and (2) a journal entry for hedge ineffectiveness is not necessary. Therefore, under the shortcut method, interest expense equals the net cash interest payment for the hedged item and swap (FAS No. 133, paragraph 118). Table E (on the next page) summarizes swaps' effects on NII and net income pre- and post-FAS No. 133 and provides the basis for the statements made about NII and net income management in Section II.

| | Hedging Instrument | | | Stand-alone Derivative | | |
|---|---|---|---|---|---|---|
| | Effect of Periodic net Cash flows | Effect of unrealized gains or losses (Perfect hedge or short-cut method) | Effect of unrealized gains or losses (Imperfect hedge) | Effect of net CF from swap | Effect of unrealized gains or losses (Perfect hedge or short-cut method) | Effect of unrealized gains or losses (Imperfect hedge) |
| Pre-FAS No. 133 | NII | Not required to recognize | Not required to recognize | Adjusted in unrealized gains or losses on swaps (no effect on NII) | Required to recognize in net income. (not NII) | Required to recognize in net income. (not NII) |
| Post-FAS No. 133 | NII | Required to recognize in net income. However, no net effect on net income due to no ineffectiveness | The amount of ineffectiveness affects net income (not NII) | Adjusted in unrealized gains or losses on swaps (no effect on NII) | Required to recognize in net income. (not NII) | Required to recognize in net income. (not NII) |

Table E. Swaps' effects on NII and net income pre- and post-FAS No. 133

# References


Ahmed, A. S., C. Takeda, and S. Thomas, 1999, Bank Loan Loss Provisions: A Reexamination of Capital Management, Earnings Management and Signaling Effects, *Journal of Accounting and Economics*, Vol. 28, pp. 1-25.

Baker Botts L.L.P, 2003, Report to the Board of Directors of the Federal Home Loan Mortgage Corporation: Internal Investigation of Certain Accounting Matters.

Barth, M. E., W. H. Beaver, and M. A. Wolfson, 1990, Components of Earnings and the Structure of Bank Share Prices, *Financial Analysts Journal*, Vol. 46, No. 3, pp. 53-60.

Barton, J., 2001, Does the Use of Financial Derivatives Affect Earnings Management Decisions?, *The Accounting Review*, Vol. 76, No. 1, pp. 1-26.

Beatty, A., S. L. Chamberlain, and J. Magliolo, 1995, Managing Financial Reports of Commercial Banks: The Influence of Taxes, Regulatory Capital, and Earnings, *Journal of Accounting Research*, Vol. 33, No. 2, pp. 231-261.

Beatty, A., B. Ke, and K. Petroni, 2002, Differential Earnings Management to Avoid Earnings Declines and Losses Across Publicly and Privately-Held Banks, *The Accounting Review*, Vol. 77, No. 3, pp. 547-570.

Booth, J. R., R. L. Smith, and R. W. Stolz, 1984, Use of Interest Rate Futures by Financial Institutions, *Journal of Bank Research*, Vol. 15, pp. 15-20.

Carter, D. A. and J. F. Sinkey, 1998, The Use of Interest Rate Derivatives by End-users: The Case of Large Community Banks, *Journal of Financial Services Research*, Vol. 14, pp. 17-34.

Collins, J. H., D. A. Shackelford, and J. M. Wahlen, 1995, Bank Differences in the Coordination of Regulatory Capital, Earnings, and Taxes, *Journal of Accounting Research*, pp. 263-291.

Degeorge, F., J. Patel, and R. Zeckhauser, 1999, Earnings Management to Exceed Thresholds, *Journal of Business*, Vol. 72, No. 1, pp. 1-33.

DeMarzo, P.M. and D. Duffie, 1995, Corporate Incentives for Hedging and Hedge Accounting, *The Review of Financial Studies*, Vol. 8, No. 3, pp. 743-771.

Eccher, E. A., K. Ramesh, and S. R. Thiagarajan, 1996, Fair Value Disclosures by Bank Holding Companies, *Journal of Accounting & Economics*, Vol. 22, pp. 79-117.

Federal Deposit Insurance Corporation (FDIC), 2002, DOS Manual of Exam Policies: Basic Examination Concepts and Guidelines, Section 1.1, February 2002.

Financial Accounting Standards Boards, 1981, Statement of Financial Accounting Standards No. 52: *Foreign Currency Translation*, Norwalk, CT.

Financial Accounting Standards Boards, 1998, Statement of Financial Accounting Standards No. 133: *Accounting for Derivative Instruments and Hedging Activities*, Norwalk, CT.

Financial Accounting Standards Boards, 2000a, Statement of Financial Accounting Standards No. 138: *Accounting for Certain Derivative Instruments and Certain Hedging Activities, An Amendment of FASB Statement No. 133*, Norwalk, CT.

Financial Accounting Standards Boards, 2000b, *Recommendations on Accounting for Financial Instruments and Similar Items*, Financial Accounting Series No. 215-A, Special Report by Joint Working Group of Standard Setters.

Financial Accounting Standards Boards, 2003, Statement of Financial Accounting Standards No. 149: *Amendment of Statement 133 on Derivative Instruments and Hedging Activities*, Norwalk, CT.

Froot, K. A., D. S. Scharfstein, and J. C. Stein, 1993, Risk Management: Coordinating Corporate Investment and Financing Policies, *The Journal of Finance*, Vol. 48, No.5, pp. 1629-1658.

Geczy, C., B. A. Minton, and C. Schrand, 1997, Why Firms Use Currency Derivatives, *The Journal of Finance*, Vol. 52, No.4, pp. 1323-1354.

Haushalter, G. D., 2000, Financing Policy, Basis Risk, and Corporate Hedging: Evidence from Oil and Gas Producers, *The Journal of Finance*, Vol. 55, No. 1, pp. 107-152.

Herz, R. H., 1994, Accounting and Financial Reporting for Derivatives and Synthetics, Chapter 43 in *The Handbook of Derivatives and Synthetics*, McGraw-Hill.

Hull, J. C., 1997, *Options, futures, and other derivatives*, Prentice-Hall, Inc, 3rd edition.

Jagtiani, J., 1996, Characteristics of Banks That Are More Active in the Swap Market, *Journal of Financial Services Research*, Vol. 10, pp. 131-141.

Kim, S. and G. D. Koppenhaver, 1992, An Empirical Analysis of Bank Interest Rate Swaps, *Journal of Financial Services Research*, pp. 57-72.

Mian, S. L., 1996, Evidence on Corporate Hedging Policy, *Journal of Financial and Quantitative Analysis*, Vol. 31, No. 3, pp. 419-439.

Moyer, S. E., 1990, Capital Adequacy Ratio Regulations and Accounting Choices in Commercial Banks, *Journal of Accounting and Economics*, Vol. 13, pp. 123-154.

Neter, J., M. H. Kutner, C. J. Nachtsheim, and W. Wasserman, 1996, *Applied Linear Statistical Model*, McGraw-Hall, Inc, 4th edition.

Partnoy, F., 2003, *Infectious Greed: How Deceit and Risk Corrupted the Financial Markets*, Henry Holt and Company, LLC, 1st edition.

Pincus, M. and S. Rajgopal, 2002, The Interaction between Accrual Management and Hedging: Evidence from Oil and Gas Firms, *The Accounting Review*, Vol. 77, No. 1, pp. 127-160.

Ryan, S. G., 2002, *Financial Instruments and Institutions: Accounting and Disclosure Rules*, John Wiley & Sons, Inc.

Scholes, M., G. P. Wilson, and M. A. Wolfson, 1990, Tax Planning, Regulatory Capital Planning and Financial Reporting Strategy for Commercial Banks, *Review of Financial Studies* 3, No. 4, pp. 625-650.

Smith, C. W. and R. M. Stulz, 1985, The Determinants of Firms' Hedging Policies, *Journal of Financial and Quantitative Analysis*, Vol. 20, No. 4, pp. 391-405.

Warfield, T. D. and T. J. Linsmeier, 1992, Tax Planning, Earnings Management, and Differential Information Content of Bank Earnings Components, *The Accounting Review*, Vol. 67, No. 3, July 1992, pp.546-562.

Wishon, K. and L. S. Chevalier, 1985, Interest Rate Swaps – Your Rate or Mine?, *Journal of Accountancy*, September 1985, pp.63-84.

Wooldridge, J. M., 1999, *Introductory Econometrics: A Modern Approach*, South-Western College Publishing.

**Figure 6**
**Mean & Median of Notional Amount of Interest Rate Swaps as Percentage of Total Assets from 1995 to 2002**

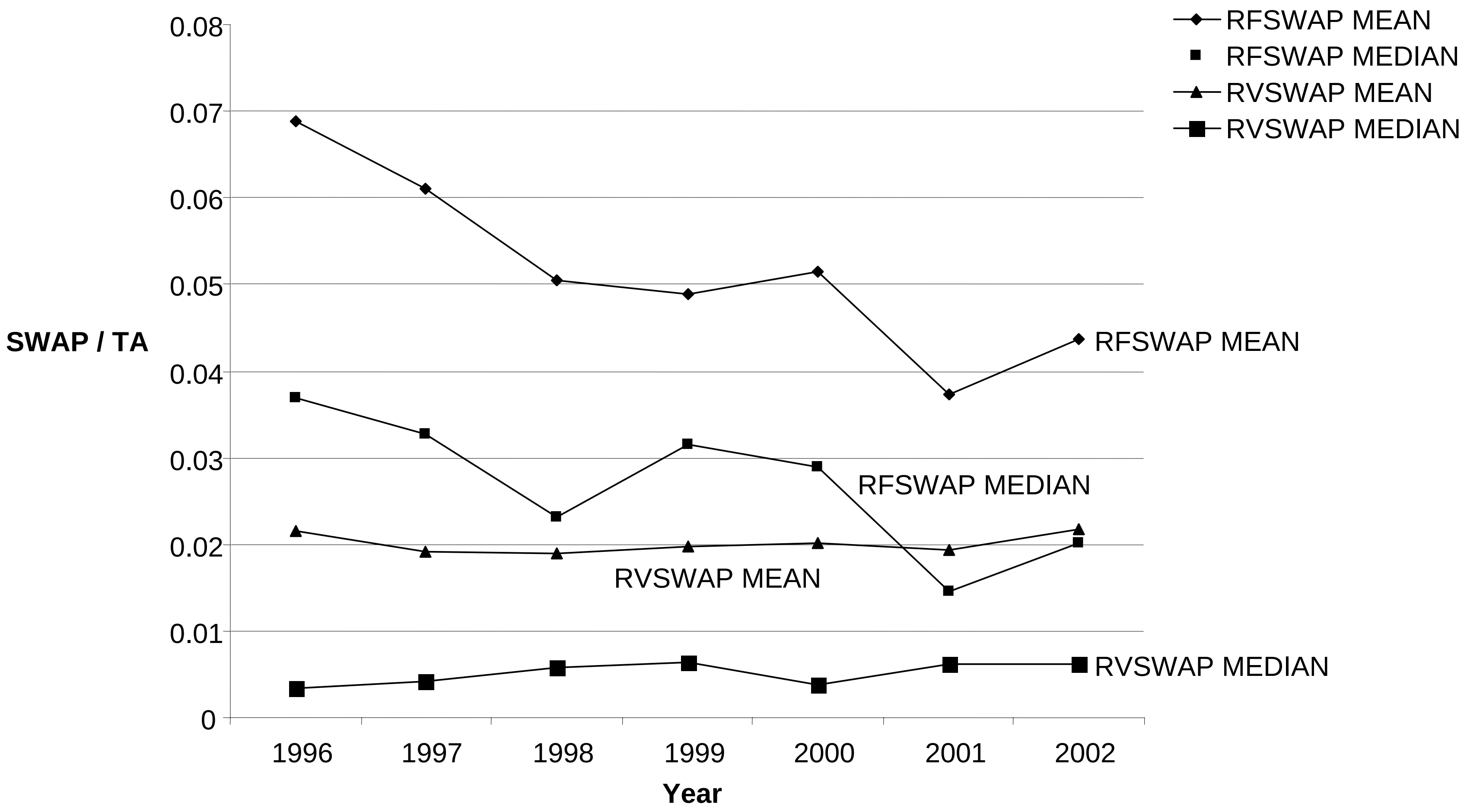

**Figure 7**
**Interest Rate Yield Curves from 1995 to 2002**

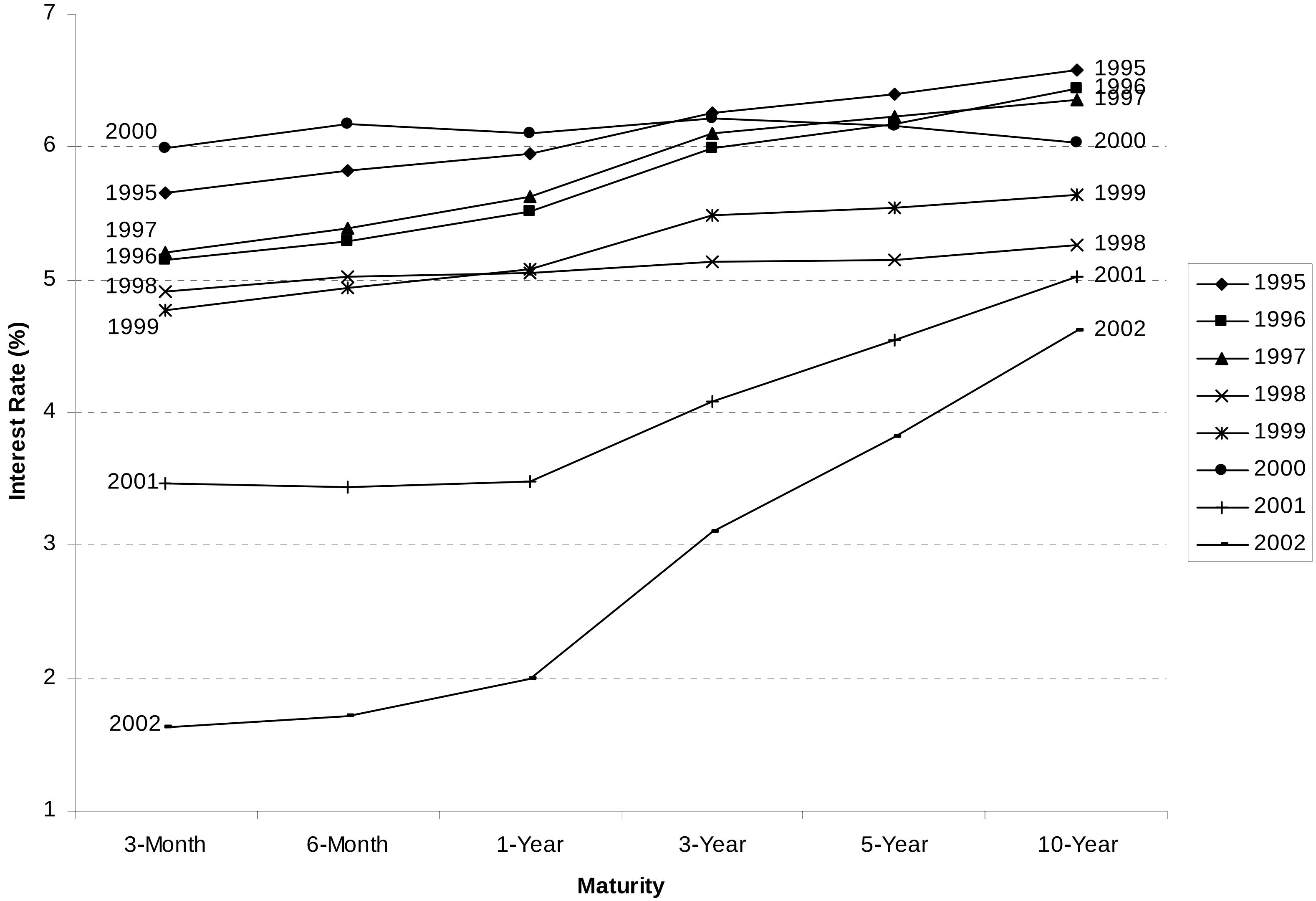

**Table 6**
**Descriptive Statistics for Sample Banks**

*Panel A. Sample selection procedures*

| | # of Banks | # of Observations |
|---|---|---|
| Banks that report non-zero derivative notional amounts in Y9-C data from 1995 to 2002 | 598 | 2,073 |
| Private banks | (267) | (618) |
| Only one observation of non-zero derivative notional amounts reported in Y9-C | (101) | (101) |
| Non December fiscal year end | (9) | (26) |
| Total derivative users | 221 | 1,328 |
| Non-swap observations | (36) | (519) |
| Total swap users | 185 | 809 |
| Missing data due to first differencing and NIM beta estimation | (39) | (263) |
| Final sample | 146 | 546 |

*Panel B. Number of observations by year*

| Year | # of observations |
|---|---|
| 1996 | 84 |
| 1997 | 90 |
| 1998 | 83 |
| 1999 | 77 |
| 2000 | 66 |
| 2001 | 70 |
| 2002 | 76 |
| Total | 546 |

**Table 7**
**Descriptive Statistics of Swap Usage**

*Panel A. Descriptive statistics for swaps*

| | N | Mean | Median | Std. Dev. |
|---|---|---|---|---|
| RFSWAP ($ Million) | 546 | 4,636 | 200 | 14,350 |
| RVSWAP ($ Million) | 546 | 1,625 | 26 | 8,143 |
| RFSWAP / TA | 546 | 0.0524 | 0.0268 | 0.0752 |
| RFSWAP / TA | 546 | 0.0201 | 0.0046 | 0.0424 |

*Panel B. Descriptive statistics for swaps before and after FAS No. 133*

| | | Before FAS No. 133 (N = 400) | After FAS No. 133 (N = 146) | Year 2002 (N = 76) |
|---|---|---|---|---|
| RFSWAP ($ Million) | Mean | 4,957 | 3,758 | 4,063 |
| | Median | 231 | 181 | 200 |
| | Std. Dev. | 14,919 | 12,668 | 14,698 |
| RVSWAP ($ Million) | Mean | 1,655 | 1,544 | 1,936 |
| | Median | 30 | 25 | 25 |
| | Std. Dev. | 8,765 | 6,152 | 7,777 |
| RFSWAP / TA | Mean | 0.0567 | 0.0407[§] | 0.0438 |
| | Median | 0.0321 | 0.0170 | 0.0201 |
| | Std. Dev. | 0.0805 | 0.0569 | 0.0600 |
| RVSWAP / TA | Mean | 0.0200 | 0.0206 | 0.0217 |
| | Median | 0.0046 | 0.0063 | 0.0063 |
| | Std. Dev. | 0.0450 | 0.0344 | 0.0358 |

RFSWAP: Notional amounts of receive-fixed/pay-variable swaps
RVSWAP: Notional amounts of receive-variable/pay-fixed swaps
TA: Total assets
[§]: The mean of RFSWAP/TA is statistically different (.05 level) from that of the same number before FAS No. 133 using t-test. All other variables are not statistically different across the pre-FAS No. 133 and post-FAS No. 133 period.

**Table 8**
**Descriptive Statistics for Swap users & Non-users and Economic Effects of Swaps on NII**

*Panel A. Descriptive statistics for swap users and non-users*

| | | Non-swap users (1) (N = 3,504) | Swap users (2) (N = 546) | Difference (1) – (2) |
|---|---|---|---|---|
| Number of banks | | 815 | 146 | |
| TA ($ Million) | Mean | 910 | 42,233 | − 41,323*** |
| | Median | 419 | 10,831 | |
| | Std. Dev. | 1,616 | 88,318 | |
| NIM | Mean | 0.0527 | 0.0422 | 0.0105 |
| | Median | 0.0427 | 0.0422 | |
| | Std. Dev. | 0.4680 | 0.0087 | |
| GAP1Y / TA | Mean | 0.0233 | 0.1339 | − 0.1106*** |
| | Median | 0.0191 | 0.1371 | |
| | Std. Dev. | 0.1829 | 0.1665 | |
| LTGAP / TA | Mean | 0.1297 | 0.0256 | 0.1041*** |
| | Median | 0.1287 | 0.0184 | |
| | Std. Dev. | 0.1690 | 0.1551 | |

NIM: Net interest margin
GAP1Y: 1-year maturity gap
LTGAP: Long-term gap
TA: Total assets
*** Significant at the 0.01 level for a two-tailed t-test

*Panel B. Economic effects of swaps on NII*

| Variable | N | Q1 | Mean | Median | Q3 | Std. Dev. |
|---|---|---|---|---|---|---|
| Interest Rate Spread | | | | | | |
| RF Swaps (%) | 58 | 0.339 | 1.384 | 0.806 | 1.70 | 1.549 |
| RV Swaps (%) | 58 | -1.540 | -0.938 | -0.590 | -0.01 | 1.195 |
| Net effect ($million) | 58 | 1.36 | 41.27 | 4.29 | 42.35 | 83.36 |
| Net effect (per share) | 58 | 0.009 | 0.123 | 0.052 | 0.118 | 0.201 |

Interest rate spread: The difference in interest rates between variable and fixed legs of a swap.

**Table 9**
**Descriptive Statistics for Variables in Regression Model**

*Panel A. Descriptive statistics for variables in regression model*

| Variable | N | Q1 | Mean | Median | Q3 | Std. Dev. |
|---|---|---|---|---|---|---|
| ΔNETSWAP | 546 | -0.0128 | 0.0053 | 0 | 0.0192 | 0.0427 |
| $DIFF_t$ | 546 | -0.0043 | -0.0015 | -0.0016 | 0.0016 | 0.0064 |
| $DIFF_{t-1}$ | 490† | -0.0033 | -0.0008 | -0.0006 | 0.0022 | 0.0061 |
| ΔGAP1Y | 546 | -0.0421 | 0.0222 | 0.0135 | 0.0756 | 0.1331 |
| ΔLTGAP | 546 | -0.0566 | 0.0004 | 0.0062 | 0.0640 | 0.1263 |

*Panel B. Pearson correlation (p-value)*

| | $DIFF_t$ | $DIFF_{t-1}$† | ΔGAP1Y | ΔLTGAP |
|---|---|---|---|---|
| ΔNETSWAP | 0.094<br>(0.028) | 0.024<br>(0.595) | 0.121<br>(0.005) | -0.093<br>(0.031) |
| $DIFF_t$ | | 0.437<br>(< .0001) | -0.044<br>(0.309) | 0.082<br>(0.056) |
| $DIFF_{t-1}$† | | | -0.086<br>(0.057) | 0.125<br>(0.006) |
| ΔGAP1Y | | | | -0.933<br>(< .0001) |

ASSET: Total assets
ΔNETSWAP: Change in net swap positions which is the difference between RF swaps and RV swaps, i.e., Δ(RFSWAP−RVSWAP). This variable is deflated by beginning total assets.
DIFF: The difference between NII target and unmanaged NII deflated by beginning total assets. Positive (negative) DIFF represents the magnitude by which unmanaged NII misses (meets) target NII.
ΔGAP1Y: Change in 1-year maturity gap deflated by beginning total assets.
ΔLTGAP: Change in long-term gap deflated by beginning total assets.

†: Correlation of $DIFF_{t-1}$ is based on 490 observations. 57 observations are excluded from the analysis due to insufficient data to calculate the lagged first difference in DIFF.

**Table 10**
**Regression Results for H1**

$$\Delta NETSWAP_{it} = \alpha_0 + \alpha_1 DIFF_{it} + \alpha_2 \Delta GAP1Y_{it} + \alpha_3 \Delta LTGAP_{it} + \varepsilon_{it}$$

| Variable | Expected sign | Coefficient Estimate (Standard Error) | | |
|---|---|---|---|---|
| Intercept | | 0.00444** | 0.00534*** | 0.00627*** |
| | | (0.00206) | (0.00188) | (0.00186) |
| $DIFF_{it}$ | + | 0.62599** | 0.66044** | 0.67899** |
| | | (0.28399) | (0.28217) | (0.28366) |
| $\Delta GAP1Y_{it}$ | + | 0.07771** | 0.04017*** | |
| | | (0.03784) | (0.01361) | |
| $\Delta LTGAP_{it}$ | − | 0.04251 | | −0.03410** |
| | | (0.03998) | | (0.01442) |
| N | | 546 | 546 | 546 |
| Adj. $R^2$ | | 0.0211 | 0.0209 | 0.0153 |

ΔNETSWAP: Change in net swap positions which is the difference between RF swaps and RV swaps, i.e., Δ(RFSWAP−RVSWAP). This variable is deflated by beginning total assets.
DIFF: The difference between target NII and unmanaged NII deflated by beginning total assets. Positive (negative) DIFF represents the magnitude by which unmanaged NII misses (meets) target NII.
ΔGAP1Y: Change in 1-year maturity gap deflated by beginning total assets.
ΔLTGA*P*: Change in long-term gap deflated by beginning total assets.

*** Significant at the 0.01 level for a two-tailed t-test
** Significant at the 0.05 level for a two-tailed t-test

**Table 11**
**Regression Results for H2**

$$\Delta NETSWAP_{it} = \delta_0 + \delta_1 DIFF_{it} + \delta_2 DIFF_{it-1} + \delta_3 \Delta GAP1Y_{it} + \delta_4 \Delta LTGAP_{it} + \varepsilon_{it}$$

| Variable | Expected sign | Coefficient Estimate (Standard Error) | | |
|---|---|---|---|---|
| Intercept | | 0.00466** | 0.00582*** | 0.00679*** |
| | | (0.00222) | (0.00202) | (0.00201) |
| $DIFF_{it}$ | + | 0.68699** | 0.70924** | 0.71917** |
| | | (0.33538) | (0.33508) | (0.33635) |
| $DIFF_{it-1}$ | − | -0.11956 | -0.08203 | -0.07977 |
| | | (0.35683) | (0.35574) | (0.35774) |
| $\Delta GAP1Y_{it}$ | + | 0.08826** | 0.04195*** | |
| | | (0.04047) | (0.01552) | |
| $\Delta LTGAP_{it}$ | − | 0.05305 | | -0.03319** |
| | | (0.04281) | | (0.01648) |
| N | | 490† | 490 | 490 |
| Adj. $R^2$ | | 0.0190 | 0.0179 | 0.0114 |

ΔNETSWAP: Change in net swap positions which is the difference between RF swaps and RV swaps, i.e., Δ(RFSWAP−RVSWAP). This variable is deflated by beginning total assets.
DIFF: The difference between target NII and unmanaged NII deflated by beginning total assets. Positive (negative) DIFF represents the magnitude by which unmanaged NII misses (meets) the target NII.
ΔGAP1Y: Change in 1-year maturity gap deflated by beginning total assets.
ΔLTGA*P*: Change in long-term gap deflated by beginning total assets.

*** Significant at the 0.01 level for a two-tailed t-test
** Significant at the 0.05 level for a two-tailed t-test

†: 56 observations are excluded from the analysis due to insufficient data to calculate the lagged first difference in DIFF.