BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

DIVISION OF RESEARCH AND STATISTICS

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To: Michael Gibson

From: James O'Brien and Matthew Chesnes[*]

Subject: Derivatives Information Provided on Bank Call Reports

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Banks have been reporting information on their financial derivatives positions in quarterly call reports since 1983. Initially, the information reported was quite limited but it has expanded substantially over time. Notional amounts and, since 1995, fair values are reported for various breakdowns of derivatives. Also since 1995, there is a breakdown between positions "held for trading" and "held for purposes other than trading." Further, some information is provided on remaining term-to-maturity for broad categories of derivatives. However, relatively little information is provided on the instruments underlying derivatives positions (which generally would be necessary to assess the quantitative importance of derivatives in the banks' risk profiles).[1]

In this memo, we use the call report information to provide a review of the growth in banks' use of derivatives and the types of derivatives held. Derivatives held by banks that do not engage in derivatives trading is also reviewed. In an appendix, we provide detailed code for accessing derivatives call report data for banks. The appendix also contains a brief description of call report schedules and a cross-check of our results with those from other reports on derivatives in commercial banks.

1. Historical Trends

The modern era of financial derivatives begins in the early 1970s, with exchange-traded currency futures beginning in 1972, stock options in 1973, and U.S. Treasury bond

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[*] Huilun Tsao retrieved bank call report data that was used in this report and Hank Leddon provided coding and programming assistance. Linda Powell and Wanda Dreslin provided guidance on banking institutions and call report data as compiled by the Federal Reserve and in the NIC database. We are grateful for their substantial help in preparing this memo.

[1] Nonetheless, for one study that estimates the importance of derivatives in non-financial firms' risk profiles using reported notional amounts of derivatives, see W. Guay and S.P. Kothari, "How much do firms hedge with derivatives?," *Journal of Financial Economics*, forthcoming, 2003.

and bill futures in the mid-1970s. Currency swaps developed in the late 1970s and the first interest rate swap occurred in 1981. The rapid growth in derivatives markets in the U.S. and world-wide since these beginnings and the dominant role of large commercial banks as over-the-counter (OTC) dealers in derivatives is well documented.

Historical information on derivatives in U.S. commercial banks since 1985 is presented in Table 1.[2] Individual banks in the first column consolidates any bank subsidiary of a parent bank with the parent. "Banking institutions" reported in the second column consolidates all banks that belong to a bank holding company into a single unit. The latter definition of a "bank" (or "banking institution") will be used throughout as

Table 1: Derivatives at Insured Commercial Banks in the U.S.

Year[1]	Number of Individual Banks[2]	Number of Banking Institutions	Derivatives Notional Amount (billions)[3]	Banking Institutions with Derivatives	
				number	percent
1985	14,354	11,065	1,035	389	3.5
1986	14,155	10,570	1,110	390	3.7
1987	13,661	10,186	2,497	368	3.6
1988	13,085	9,804	3,120	367	3.7
1989	12,674	9,547	4,473	352	3.7
1990	12,307	9,321	6,806	289	3.1
1991	11,890	9,093	7,339	290	3.2
1992	11,433	8,800	8,765	292	3.3
1993	10,942	8,387	11,878	289	3.4
1994	10,429	7,954	15,772	282	3.5
1995	9,917	7,625	16,860	271	3.6
1996	9,506	7,365	20,034	279	3.8
1997	9,122	7,167	25,064	297	4.1
1998	8,751	6,886	33,006	274	4.0
1999	8,555	6,773	34,807	254	3.8
2000	8,290	6,711	40,566	286	4.3
2001	8,057	6,615	45,051	279	4.2
2002	7,867	6,529	56,068	341	5.2

1. Yearly values are as of December 31. 2. Banks that are a subsidiary of another bank are consolidated into the parent bank (a maximum of 8 banks in any one year). 3. Includes credit derivatives since 1997.

[2] Numbers in this and following tables are based on programs developed for identifying banks and aggregating call report information across banks. While the procedures followed are believed to be consistent with other sources of bank and derivatives information, we are not aware of any single "official" source. In the Appendix (section 2), we present a selective comparison of our results with reports from other sources. There are slight differences between our numbers and those from the other sources and also between the other sources themselves.

being more representative of a distinct decision-making entity. Between 1985 and 2002, the number of banks, declined by 41 percent (individual banks declined by 45 percent).

Notional amounts of bank derivatives, reported in the third column, have increased in every year since 1985, being more than 50 times higher in 2002. However, for the percentage of banks using derivatives, the story is different. As shown in the fourth column, the number of banks using derivatives has actually declined. This reflects the decline in individual banks and industry consolidation over the period. As a percent of banks, derivatives users rose modestly in the second half of the 1980s—from 3.5 to 3.7 percent—before declining to 3.1 percent in 1990. While the percentage of banks using derivatives has grown significantly since 1990, it is now only slightly above 5 percent.[3]

Table 2 presents a breakdown of the frequency of banks using derivatives by asset size in 1985 and 2002. The last column in both panels of the Table shows that the percentage of banks using derivatives increases dramatically with asset size. Among the top 1 percentile by asset size, about 96 percent held derivatives both in 1985 and 2002.

Table 2. Derivatives by Bank Asset Size

December 1985

	Asset Size Category		With Derivatives	
category	number of banks	median assets[1] (mil)	number	percent
top 1 percent	111	11408	107	96.4
2 to 5 percent	443	1043	143	32.3
6 to 10 percent	553	300	31	5.6
11 to 25 percent	1,659	137	32	1.9
below 25 percent	8,296	36.3	76	0.9
all banks	11065	50	389	3.5

December 2002

	Asset Size Category		With Derivatives	
category	number of banks	median assets[2] (mil)	number	percent
top 1 percent	66	31,963	63	95.5
2 to 5 percent	261	2,009	107	41.0
6 to 10 percent	326	673	49	15.0
11 to 25 percent	980	295	66	6.7
below 25 percent	4,897	68	56	1.1
all banks	6529	96	341	5.2

1. Expressed in 2002 dollars (using GDP deflator). 2. Current dollars

[3] The percentage of individual banks with derivatives was 3.8 in 1985 and 5.5 in 2002. While these percentages are similar to those for banking institutions, the trends in the two series are different. For individual banks, the percentage using derivatives increased from 3.8 percent in 1985 to 6 percent in 1993 before declining to its current 5.5 percent.

From 1985 to 2002, derivatives use increased the most for banks between the 6th and 25th percentiles. Below the 25th percentile, only about 1 percent of the banks used derivatives in 2002, not much above that in 1985.

Not shown in Table 2 is that the top 1-percentile banks by asset size accounted for 99.9 percent of the notional amount of bank derivatives in Dec. 2002. These banks also accounted for 76 percent of bank assets. Thus, banks that account for much of U.S. bank assets are both frequent users (96 percent) and account for most of the notional amount of derivatives. Within the top 1-pecentile banks, 95 percent of the notional amount is held in trading accounts and two-thirds of the banks with derivatives engage in trading (see below for information on derivatives for non-trading banks).

In 1995, derivatives information in bank call reports was significantly expanded. The expanded information is used in Table 3 to show some recent trends in bank derivatives by use and type. The number and percent of banks with derivatives are repeated for reference in the first two columns. The third and fourth columns show that most banks with derivatives hold OTC contracts, while relatively few have exchange-traded contracts.[4] Also, the frequency of banks using derivatives has grown only for OTC derivatives. However, the notional dollar volume of exchange-traded, as well as OTC, derivatives has increased by about 300 percent since 1995 (not shown in Table).

Table 3. Types and Uses of Derivatives by Banks
(banks with derivatives in each category expressed as percent of total number of banks)

Banks			OTC and Exch-Traded[1]		Trading and Non-trading[1]		Credit Derivatives		
Year	number	with deriva-tives	OTC	exch-traded	trading	non-trading	credit deriv	as guar-antor	as benefi-ciary
1995	7,625	3.6	3.4	0.9	1.2	3.4	na[1]	na	na
1996	7,365	3.8	3.7	0.9	1.2	3.6	na	na	na
1997	7,167	4.1	4.0	0.8	1.1	3.9	0.2	0.2	0.1
1998	6,886	4.0	3.9	0.7	1.1	3.8	0.3	0.2	0.2
1999	6,773	3.8	3.7	0.7	1.0	3.6	0.3	0.3	0.2
2000	6,711	4.3	4.1	0.7	1.0	4.0	0.3	0.2	0.2
2001	6,615	4.2	4.0	0.8	1.1	3.9	0.4	0.3	0.3
2002	6,529	5.2	5.1	0.7	1.0	5.0	0.4	0.3	0.3

1 The percentage breakdowns do not include credit derivatives. 2. na = not available

[4] OTC derivatives include all forward contracts, OTC option contracts (including swaptions, caps, floors, and collars), and swaps. Exchange-traded contracts include futures contracts and exchange-traded option contracts.

As can be seen from the fifth and sixth columns, 5 times as many banks held derivatives in non-trading accounts as in trading accounts in 2002, up from 2.8 percent in 1995. Thus, the increased frequency of banks using derivatives shown in Table 1 has been oriented to non-trading purposes. Nonetheless, banks may also use derivatives in trading accounts for managing non-trading risks. Also, as was noted, most of the notional amount of derivatives is held in trading accounts.

The last three columns in Table 3 present results on bank credit derivatives. Credit derivatives were first offered in 1993 and have since become an important and fast growing OTC product. It was originally thought that credit derivatives might become an important vehicle for banks to hedge their asset credit risk. While the percentage of banking institutions with credit derivatives has doubled since 1997, Table 3 indicates only .4 percent or 26 banks held credit derivatives in 2002. The last two columns further indicate that most banks with credit derivatives are both guarantors and beneficiaries. Credit derivatives also are highly concentrated. Among the 26 users, 20 are in the largest 1 percentile by asset size and 18 also engage in trading (not shown). The top 3 banks account for 91 percent of notional amount (not shown).

2. Derivatives Held by Banks Not Engaged in Derivatives Trading

A total of 273 non-trading banks held derivatives in December 2002, where a non-trading bank is defined here as a bank with zero notional amounts reported in trading categories for interest rate, foreign exchange, equity, and commodity derivatives.[5] A classification by asset size and type of derivatives is presented in Table 4. The percentages in the second column are relative to the total number of banks in the asset size class. Of the top 1-percentile banks by asset size, 32 percent are non-trading banks with derivatives (almost two-thirds of the top 1 percentile banks trade derivatives). For the second largest asset class, more than one third of non-trading banks have derivatives (7 percent trade derivatives). Most of the banks in the lower asset size categories that hold derivatives do so only for non-trading purposes.

[5] Credit derivatives are not broken down between in trading or non-trading accounts. Among banks identified as non-trading, 6 held credit derivatives (see below for more information).

Table 4. Derivatives held by Non-Trading Banks: December 2002[1]

	Non-Trading Banks with Derivatives		Derivatives Type as Percent of Non-Trading Banks with Derivatives					
Asset Size	num-ber	percent of asset class	OTC	exch-traded	interest rate	foreign exch	equity	credit
Top 1%	21	31.8	100	4.8	100	47.6	4.8	9.5
2 to 5%	90	34.5	98.8	7.8	92.2	12.2	5.6	1.1
6 to 10%	47	14.4	100	2.0	83.0	6.4	14.9	0.0
11 to 25%	61	6.2	98.4	1.6	80.3	3.3	18.0	0.0
below 25%	54	1.1	90.9	9.3	51.9	1.9	48.1	5.6
all banks	273	4.2	97.6	5.5	80.6	9.9	18.3	2.2

1. Banks reporting zero notional amounts in trading categories for interest rate, foreign exchange, equity, and commodity derivatives. Credit derivatives are not broken down by trading and non-trading.

Percentages shown in the remaining six columns are with respect to the number of non-trading banks using derivatives. As shown in the last row of the third and fourth columns, almost all non-trading banks with derivatives hold OTC contracts (97.6 percent), while very few hold exchange-traded contracts (5.5 percent). The relative importance of OTC derivatives holds for trading as well as for non-trading banks. However, banks trading derivatives are more likely to use exchange-traded derivatives than non-trading banks (even among the largest banks).[6]

The next four columns show the relative frequencies of banks using derivatives associated with different market risks. Interest rate derivatives are the most frequently held derivative. Interest rate swaps are included in interest rate derivatives. While not shown here, 29 percent of non-trading banks with derivatives held interest rate swaps, with the percentage of users being highest for the top 1-percentile banks (71 percent) and lowest for banks below the 25th percentile (13 percent).

The relative frequency of holding foreign exchange and equity derivatives depends on the asset size of the bank. Within the higher asset size classes, foreign exchange derivatives are more popular but, within the lower asset sizes, equity derivatives are more popular. Six banks reported having credit derivatives (last column)

[6] As of Dec. 2002, 47 percent of the banks that held derivatives for trading held exchange-traded derivatives versus only 5.5 percent of the banks that held derivatives exclusively for non-trading purposes. If we limit the comparison to banks in the top 1 percentile by asset size, 58 percent of trading banks held exchange-traded derivatives versus only 4.8 percent of non-trading banks that held derivatives.

with 2 in the top 1-percentile, 1 in the next percentile, and 3 below the 25th percentile. Also, 3 banks were guarantors and 3 banks were beneficiaries. No banks held commodity-related derivatives for non-trading purposes.

3. Derivatives Fair Values and Notional Amounts

Banks report both fair values and notional amounts for their derivatives contracts. Notional amounts represent a measure of contractual payment obligations on outstanding contracts or are used to scale payment obligations, while fair values represent the market values of outstanding contracts at the reporting date.

Table 5 provides a breakdown of fair values of derivatives related to different market risks and trading versus non-trading, with banks' holding derivatives exclusively for non-trading being singled out. Trading and non-trading panels are mutually exclusive categories. As can be seen in the Table, fair values are small relative to notional amounts. Primarily this is because derivatives involve a future exchange of payments and fair value is the *net* present value of the exchange (for forwards, futures, and swaps, contracts are set so that values are initially zero). In contrast, notional amounts relate to payment obligations based on one side of the contract.

Table 5. Bank Notional Amounts and Fair Values: December 2002
(billions)

	interest rate	foreign exchange	equity	com-modity	credit deriv
Derivatives Held for Trading[1]					total[3]
notional amount	46,309.9	6,012.5	779.9	226.3	641.5
positive fair value	942.1	141.9	38.0	12.6	11.6
negative fair value	920.6	147.8	36.9	13.0	7.6
net fair value	21.5	-5.9	1.1	-0.4	4.0
Derivatives Held for Non-Trading[1]					
notional amount	2,032.7	63.1	2.4	0.0	
positive fair value	35.1	0.9	0.2	0.0	
negative fair value	24.1	1.2	0.2	0.0	
net fair value	11.0	-0.3	0.0	-0.0	
Derivatives held by Non-Trading Banks[2]					
notional amount	117.6	13.7	0.1	0.0	1.8
positive fair value	1.9	0.1	0.0	0.0	0.0
negative fair value	1.8	0.3	0.0	0.0	0.0
net fair value	0.1	-0.2	-0.0	0.0	0.0

1. Trading and non-trading panels are mutually exclusive. 2. Institutions reporting zero notional amounts in trading categories for interest rate, foreign exchange, equity, and commodity derivatives. 3. For credit derivatives, there is no breakdown between trading and non-trading.

The Table also shows that net fair values are generally much smaller than either positive or negative fair values. Small net fair value can occur for several reasons. One is that institutions substantially hedge their derivatives exposures, holding long and short positions on the same market exposures. This would be expected to be typical of bank dealers in derivatives whose income is generated mainly from market-making activity. A second hedging reason is that undertaking a hedge on an outstanding derivatives position provides the bank with a way of closing out a market exposure without having to sell the instrument. Also, different derivatives will have exposures to different markets, which may move in different directions and thus create both positive and negative market values among different exposures.

Appendix

1. Call Report Derivatives Information

Bank reporting of derivatives in call reports goes back to December 1983. A historical list of reporting forms can be found in Micro Statistics (MS) web page (Micro Data reference manual (MDRM), reporting forms RCFD FFIEC 041 and RCON/RCFD FFIEC 031). Derivatives information for banks is reported in schedule RC-L. Instructions to banks in filling out reporting forms are can be obtained from the MS website (Databases, Commercial Banks Reports of Condition and Income). Description of individual items by name or item number also are in the MS website (Databases, MDRM, data dictionary). [7]

The scope of derivatives information reported has increased over time. In the early years, there was not a clean separation between formal derivative contracts and other commitments. From 1985 through 1989, notional amounts are reported for futures and forward contracts combined (excluding foreign exchange), commitments to purchase currencies (spot and forward combined), standby and option contracts, and (in a memorandum item) interest rate swaps. Futures and forwards and standby and option contracts are distinguished by written versus purchased.

Between 1990 and 1994, contracts are distinguished by interest rate, foreign exchange rate, and commodity and equity contracts. Within each of the three market categories, notional amounts are reported separately for swaps, forwards and futures, and options (written and purchased reported separately). Options no longer include standby commitments.

Beginning in 1995 and continuing to the present, significant detail has been added. In 1995, futures and forward are separately reported, as are exchange-traded and OTC derivatives. Spot exchange rate contracts also are separately reported. Aggregations of derivatives held for trading and held for non-trading are separately reported. Fair values, as well as notional amounts, are also reported. Beginning in 1997, notional amounts of credit derivatives are reported (and fair values beginning in 2002), broken down by guarantor and beneficiary. Also, beginning in June 1997, the notional amount of interest rate swaps where the bank pays a fixed rate is reported.

2. Comparisons with Other Sources of Bank and Derivatives Information

A selective comparison is made between the bank and derivatives numbers we calculated and numbers reported in two other sources for Dec. 2002, 2001, and 2000. These are Bank Supervision and Regulation ("Summary Data for All Insured Commercial Banks") and the Office of the Comptroller of the Currency (OCC Bank Derivatives Report). Results for (individual) banks appear in the following table.

[7] Bank holding companies (BHCs) are not considered in the present report. However, BHCs with at least $150 million in assets or more than one subsidiary bank file consolidated reports that include bank and non-bank subsidiaries. Forms go back to June 1986 (see MDRM reporting forms BHCK FRY-9C). Derivatives information is currently reported for the consolidated holding company in schedule HC-L (HC-F prior to 2000).

Bank Derivatives Comparisons Between TRA, BS&R and OCC

	Dec. 2002			Dec. 2001			Dec. 2000		
	TRA	BS&R[1]	OCC[2]	TRA	BS&R	OCC	TRA	BS&R	OCC
banks[3]	7867	7882	na[4]	8057	8075	na	8290	8306	na
deriv no amt[5]	56068	56270	56074	45051	45169	45386	40566	40760	40543
deriv users	429	446	427	361	380	369	393	408	400
IR no amt	48342	48348	48347	37956	37963	38305	32961	32966	32938
FX no amt	6076	6272	6076	5734	5845	5736	6099	6288	6099
com+eq no amt	1009	1009	1016[6]	949	950	950	1080	1078	1080
credit no amt	642	642	635	411	411	395	426	426	426
credit users	27	28	na	30	31	na	28	28	na
pos fair value[7]	1171	1171	1171	ne[4]	643	643	ne	517	517
neg fair value[7]	1144	1144	1144	ne	612	612	ne	513	521

1. Source: BS&R, "Summary Data for All Insured Banks." 2. Source: OCC Bank Derivatives Reports. 3. Number of insured commercial banks in the U.S. For TRA, banks here are defined as "individual" banks, as reported in the first column in Table 1. 4. na = not available, ne = not estimated. 5. Dollar amounts are in billions. 6. Reported as "other contracts." 7. Excludes credit derivatives.

For every single category, our numbers closely correspond to those reported by BS&R and the OCC. However, there are usually slight differences in the numbers, not only between us and the banking agencies but also between the agencies themselves. Presently, we are unsure as to the exact reason(s) for the small differences.

3. Data Source and Programming[8]

a. Data Access

Bank call report data are part of the NIC databases and are on the RSMA network. The bank call report database includes a variety of types of banks (see Micro Statistics (MS) webpage (NIC structure) for further detail). A standard criterion for identifying U.S. commercial banks and that used here is insured commercial banks domiciled in the United States. The code used to identify insured commercial banks domiciled in the U.S. is as follows:

RSSD9331 = 1 (this identifies the bank as a commercial bank)
RSSD9424 = 1, 2, or 6 (this identifies an insured bank)
RSSD9210 < 57 (this identifies banks that are located in one of the states in the U.S.)

A small number of banks are subsidiaries of other banks, where the parent bank files its call report on a consolidated basis (e.g., 4 banks in Dec. 2002, 8 in Dec. 2001). In this report, individual banks are defined to include only the parent bank, with its consolidated call report. The code that identifies the subsidiary banks is provided below. The first SQL procedure identifies banks that are subsidiaries of any type of parent bank (commercial or non-commercial). Since some of these parent banks are not included in the dataset, we only want to identify those subsidiaries that are associated with parent

[8] Hank Leddon and Linda Powell provided code used here to access and identify the banks and bank holding companies used in the programs and assistance in the programming.

banks that are in the dataset. Hence the second SQL procedure identifies all insured commercial banks domiciled in the US and the third SQL procedure identifies only those banks that are consolidated on a parent bank's call report that is in the dataset. The dataset, **consul_elim** is merged with the complete dataset and these banks are dropped to avoid double counting.

```
PROC SQL;
  CREATE TABLE consol AS
  SELECT RCONA545, entity
  FROM ms.&callid
  WHERE RSSD9424 in (1,2,6)
    AND RSSD9331 = 1
    AND RSSD9210 < 57
    AND RCONA545 > 0;
QUIT;

PROC SQL;
  CREATE TABLE bull AS
  SELECT RSSD9050
  FROM ms.&callid
  WHERE RSSD9424 in (1,2,6)
    AND RSSD9331 = 1
    AND RSSD9210 < 57;
QUIT;

PROC SQL;
  CREATE TABLE consul_elim AS
  SELECT c2.entity
  FROM bull c1, consol c2
  WHERE c1.RSSD9050 = c2.RCONA545;
QUIT;
```

b. Programming

The following SAS code generates derivatives data for the first set of years (2001-2002). This code assumes a dataset has been created containing call report data for insured commercial banks domiciled in the US with subsidiaries removed. Other years have slightly different code to produce the desired output due to changes in the call reports submitted by banks, but the general technique is consistent.

The entire SAS code is within a macro so we can call it several times for each year we have data. A final dataset is created which contains the results from all the years combined. The programming is set up as follows:

1. Read in call report data and merge with bank holding company information.
2. Create banking institution level data that aggregates banks within a holding company.
3. Generate derivatives results for banking institutions.

4. Create aggregated totals and frequencies of institutions participating in derivatives activity.
5. Output.
6. Location of SAS code.

The following outlines the details in each of these sections though does NOT contain the complete SAS code required to produce our results. Locations of complete files are provided below.

1. *Data Access*

A macro is called with positional parameters used to read in the required files for the analysis.

```
%mymacro(callreport0212, 20021231);
%mymacro(callreport0112, 20011231);
```

The first step in accessing the data is a SQL procedure that creates a SAS dataset/SQL table with a list of bank entity numbers for banks that are part of a bank holding company and the corresponding entity number of the holding company to which they belong. The SQL procedure works by matching the entity numbers from the call report with those from the National Information Center (NIC) for banks whose top holder is a bank holding company. The entity number of the bank holding company is saved in a new variable called *BHC_entity_num*. The resulting SAS dataset is called **bhc_bnks** and is sorted by bank entity number. Note that *&callid* and *&dateid* are macro variable parameters that change from year to year. Individual bank names are also extracted.

```
PROC SQL;
  CREATE TABLE bhc_bnks as
  SELECT c.*, t.id_rssd_top as BHC_entity_num
  FROM tr.&callid c, nic.toph t
  WHERE (c.entity = t.id_rssd and
       (&dateid between t.dt_start and t.dt_end) and
       t.holder_type="BHC")
  ORDER by entity;

  CREATE TABLE bhc_bnks as
  SELECT b.entity, b.BHC_entity_num, a.nm_short AS bankname
  FROM work.bhc_bnks b, nic.attr a
  WHERE (b.entity = a.id_rssd) and
    (&dateid between a.dt_start and a.dt_end);
QUIT;
```

The call report data is then merged with the **bhc_bnks** dataset to create **all**, a dataset containing the complete list of banks with derivatives information needed for our analysis. Some banks may be part of more than one holding company (22 in the 2002

dataset) so in order to count those banks only once, we keep the first occurrence of each entity number. Note that *tr.&callid* is a reference to the location of the call report data.

```
DATA all;
  MERGE tr.&callid bhc_bnks;
  BY entity;
  IF first.entity;
RUN;
```

2. Institution Level Data

The following code creates a complete list of banking institutions. The banking institutions consist of independent banks and banks in a bank holding company, with individual banks in a multi-bank holding company aggregated into a single banking institution. The resulting dataset called **Institutions** will be used in the rest of the analysis. A means procedure is run to determine the number of institutions in the dataset.

```
PROC MEANS DATA = all NOPRINT;
  CLASS BHC_entity_num;
  OUTPUT OUT = temp1 SUM=;
RUN;

DATA temp1;
  SET temp1;
  IF BHC_entity_num > 0;
RUN;

DATA temp2;
  SET all;
  IF BHC_entity_num = 0 OR BHC_entity_num = ".";
RUN;

DATA Institutions;
  SET temp1 temp2;
RUN;

PROC MEANS DATA = Institutions NOPRINT;
  VAR entity;
  OUTPUT OUT = one   N(entity) = Institutions_Freq;
RUN;
```

3. Derivatives Calculation

The next section of the program computes some of the statistics that we are interested in. A new dataset is created called **Institutions_d** from the **Institutions** dataset and contains summarized derivatives data for each banking institution. Each *RCFD* variable refers to a separate entry on the call report. Only those institutions that hold derivatives are copied into this new dataset.

```
DATA Institutions_d;
 SET Institutions;
 S1             = SUM(RCFD8693,RCFD8694,RCFD8695,RCFD8696,
                      RCFD8697,RCFD8698,RCFD8699,RCFD8700,
                      RCFD8701,RCFD8702,RCFD8703,RCFD8704,
                      RCFD8705,RCFD8706,RCFD8707,RCFD8708,
                      RCFD8709,RCFD8710,RCFD8711,RCFD8712,
                      RCFD8713,RCFD8714,RCFD8715,RCFD8716,
                      RCFD3450,RCFD3826,RCFD8719,RCFD8720,
                      RCFDA534,RCFDA535);
 S1p            = SUM(RCFD8693,RCFD8694,RCFD8695,RCFD8696,
                      RCFD8697,RCFD8698,RCFD8699,RCFD8700,
                      RCFD8701,RCFD8702,RCFD8703,RCFD8704,
                      RCFD8705,RCFD8706,RCFD8707,RCFD8708,
                      RCFD8709,RCFD8710,RCFD8711,RCFD8712,
                      RCFD8713,RCFD8714,RCFD8715,RCFD8716,
                      RCFD3450,RCFD3826,RCFD8719,RCFD8720);
 S2             = SUM(RCFDA126,RCFDA127,RCFD8723,RCFD8724,
                      RCFD8725,RCFD8726,RCFD8727,RCFD8728,
                      RCFDA534,RCFDA535);
 S2p            = SUM(RCFDA126,RCFDA127,RCFD8723,RCFD8724,
                      RCFD8725,RCFD8726,RCFD8727,RCFD8728);
 TotalOTC       = SUM(RCFD8697,RCFD8698,RCFD8699,RCFD8700,
                      RCFD8709,RCFD8710,RCFD8711,RCFD8712,
                      RCFD8713,RCFD8714,RCFD8715,RCFD8716,
                      RCFD3450,RCFD3826,RCFD8719,RCFD8720,
                      RCFDA534,RCFDA535);
 CreditDeriv    = SUM(RCFDA534,RCFDA535);
 ExTradeDeriv= SUM(RCFD8693,RCFD8694,RCFD8695,RCFD8696,
                      RCFD8701,RCFD8702,RCFD8703,RCFD8704,
                      RCFD8705,RCFD8706,RCFD8707,RCFD8708);
 TotalDeriv     = MAX(S1,S2);
 TotalHFT       = SUM(RCFDA126,RCFDA127,RCFD8723,RCFD8724);
 TotalNoHFT = SUM(RCFD8725,RCFD8726,RCFD8727,RCFD8728);
 IF (TotalHFT  =  0) OR (TotalHFT = ".") THEN
 TotalNoHFT_Exc =SUM(RCFD8725,RCFD8726,RCFD8727,RCFD8728);
 TotalAssets   =  RCFD2170;
 IF (TotalDeriv =  0) OR (TotalDeriv = ".")  THEN DELETE;
  KEEP          date entity S1 S1p S2 S2p TotalDeriv TotalHFT
                TotalNoHFT TotalNoHFT_Exc TotalAssets CreditDeriv
                ExTradeDeriv TotalOTC BHC_entity_num bankname;
 RUN;
```

4. Sums and Frequency Calculation

In the following two sections, a means procedure followed by a data step create all the summary statistics needed for the report. While the previous data step created sums for the individual institutions, the following means procedure will aggregate the data across institutions. Then the data step will determine the number of banking institutions who hold the various types of derivatives (over the counter, exchange traded, etc). Finally a means procedure determines the total number of banks in the call report dataset.

```
PROC MEANS DATA = Institutions_d NOPRINT;
  VAR  TotalDeriv S1 S1p S2 S2p CreditDeriv ExTradeDeriv TotalOTC
               TotalHFT TotalNoHFT TotalAssets TotalNoHFT_Exc date;
  OUTPUT OUT = two
               SUM(TotalDeriv)          = Derivatives_Tot
               N(TotalDeriv)            = Derivatives_Freq
               MIN(date)                = Date_Out
               SUM(TotalHFT)            = HFT_Tot
               SUM(TotalNoHFT)          = NoHFT_Tot
               SUM(TotalNoHFT_Exc)      = NoHFT_Exc_Tot
               SUM(S1)                  = S1_Tot
               SUM(S1p)                 = S1p_Tot
               SUM(S2)                  = S2_Tot
               SUM(S2p)                 = S2p_Tot
               SUM(CreditDeriv)         = CreditDeriv_Tot
               SUM(TotalOTC)            = OTC_Tot
               SUM(ExTradeDeriv)        = ExTrade_Tot
               SUM(TotalAssets)         = Assets_Tot;
RUN;

DATA three;
        SET Institutions_d END = Final;
        IF S1                 > 0 THEN S1_Freq + 1;
        IF S1p                > 0 THEN S1p_Freq + 1;
        IF S2                 > 0 THEN S2_Freq + 1;
        IF S2p                > 0 THEN S2p_Freq + 1;
        IF TotalHFT           > 0 THEN HFT_Freq + 1;
        IF TotalNoHFT         > 0 THEN NoHFT_Freq + 1;
        IF TotalNoHFT_Exc     > 0 THEN NoHFT_Exc_Freq + 1;
        IF TotalOTC           > 0 THEN OTC_Freq + 1;
        IF CreditDeriv        > 0 THEN CreditDeriv_Freq + 1;
        IF ExTradeDeriv       > 0 THEN ExTrade_Freq + 1;
        IF Final THEN OUTPUT;
        KEEP &FreqVars;
RUN;

PROC MEANS DATA = all NOPRINT;
        OUTPUT OUT = four   N(entity) = Banks_Freq;
RUN;
```

5. Output

Each means procedure and data step above created a summary dataset with both the sum of the notional amounts and the number of banking institutions with positions in the different derivatives categories. These four datasets are merged into **Final**. Then **Final** is updated for each year that the program is run and outputted to a flat file once complete.

```
DATA Final;
  MERGE one two three four;
RUN;
```

Output is located in the following directory:

/tr/temp/m1mwc01/projects/james/Derivatives/saswork/output/

6. Location of SAS Code

The SAS programs required to create this report are located in:

/tr/temp/m1mwc01/projects/james/Derivatives/saswork/

The code is divided into 5 files reflecting changes in the format of the call reports from year to year. They are organized as follows:

Bank1.sas	2001-2002
Bank2.sas	1997-2000
Bank3.sas	1995-1996
Bank4.sas	1990-1994
Bank5.sas	1985-1989

4. Contact Persons

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