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Mexico's Banking Crisis: Devaluation and Asset Concentration Effects

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MEXICO'S BANKING CRISIS:

DEVALUATION AND ASSET CONCENTRATION EFFECTS

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ABSTRACT

Wilson, Berry, Gerard Caprio and Anthony Saunders; *Mexico's Banking Crisis: Devaluation or Diversification Problems?*

The sharp 1994-95 Mexican peso devaluation was followed by a financial-sector crisis, forcing the Mexican government to retake control of several banks and to grant substantial assistance to many other banks. This paper uses daily stock price data to test several hypotheses concerning the impact of devaluation. First, we use event-study methodology to test whether some sectors of Mexican economy were "devaluation-gaining" while other sectors were "devaluation-losing." Second, we test the linkage between the devaluation and the financial-sector crisis that ensued. Specifically, we test whether devaluation shocks were transmitted through the liability side versus the asset side of bank balance sheets. Our results suggest that governments should consider putting minimum diversification guidelines on bank portfolios.

Introduction

In December 1994, Mexican authorities were forced to sharply devalue the peso, with consequences that included an economic downturn and a financial-sector crisis. This occurred at a time when Mexico's financial sector had just completed reprivatization and restructuring in July 1992. The crisis forced the Mexican government to institute a rescue program to retake control of some financial groups and to grant liberal assistance to most others.

Several recent papers have investigated aspects of the Mexican peso and financial-sector crisis. Masson and Agenor (1996) analyze whether price movements in the Mexican government debt market anticipated the December 20, 1994 devaluation. Their study focused on the interest-rate spread between short-term peso-denominated and dollar-linked debt as a measure of devaluation risk. They report finding little evidence that Mexican debt markets anticipated devaluation prior to the December 20, 1994 event.

Masson and Agenor (1996) argue that devaluation significantly weakened Mexico's financial sector by increasing the cost of servicing foreign-currency denominated debts. Similarly, Gruben and Welch (1996) pose a hypothesis that banks experienced a run by dollar-denominated bank deposits post devaluation, in anticipation that lender-of-last guarantees would apply only to peso-denominated deposits. A scramble by depositors to move funds may have then generated a liquidity crisis in the wake of the peso devaluation. We term these bank-liability explanations of the devaluation-risk exposure faced by Mexican financial groups as the "liability-

exposure" hypothesis.¹

Alternatively, our study tests the hypothesis that the transmission of the peso-devaluation shocks occurred through the asset-side of bank balance sheets. Currency devaluations may often generate a differential impact across sectors of an economy. "Devaluation-gaining" sectors such as those related to exports may show gains, while domestic import sectors tend to be "devaluation-losing" sectors. If financial intermediaries have a significant net exposure, e.g., through bank loan portfolios, to "devaluation-losing" sectors over "devaluation-gaining" sectors, then devaluation shocks can become indirectly transmitted through the real sector. We term this asset-side transmission mechanism as the "asset-exposure" hypothesis.

Our analysis is conducted in two phases. We first use event study methodology to investigate the impact of the December 20, 1994 devaluation and other ensuing events on six sectors of Mexico's real economy. In particular, we test the hypothesis that some economic sectors are "devaluation-gaining" while other sectors are "devaluation-losing." Like Masson and Agenor (1996), we test whether financial markets anticipated devaluation prior to the December 20 date. However, our analysis uses equity market data as opposed to their use of short-term Mexican debt-market data.

Our analysis then tests the two hypothesized transmission mechanisms using a multi-factor asset-pricing approach with daily

¹As well, Garber and Lall (1996) and Folkerts-Landau and Garber (1997) discuss the role of derivative securities in exchange rate crises and macroeconomic stability.

stock market data on Mexican financial-groups. Factors included in the analysis are the set of sectoral market indices, the IPC, a Mexican broad-market index, and the peso/dollar exchange rate.

Our analysis reveals that export sectors of Mexico's economy did indeed show strong economic gains post-devaluation, while construction and domestic retail sectors showed significant losses. These results appear to be important for explaining the financial-sector crisis that followed devaluation. Using an asset-pricing approach, we show that Mexican financial groups as a sector showed a strong sensitivity to "devaluation-losing" sectors, while virtually no sensitivity to "devaluation-gaining" sectors. Furthermore, the analysis found little evidence of a direct link between exchange-rate volatility and financial-sector performance, which would seem to contradict the "liability-exposure" hypothesis. The results indicate that greater diversification of asset risk across sectors of the economy would have significantly improved the post-devaluation performance of the financial-sector.²

Indeed, concentrated lending has often been linked to financial-sector crises. For example, insufficient diversification has been linked as a primary or contributing cause of bank failure.³ Regulation may impose limits on or disincentives to

²Note that the universal-banking powers of Mexican financial groups would have allowed them in principle to attain a significant degree of diversification through banking, brokerage, underwriting, insurance and leasing activities. Our analysis indicates that much of the peso-devaluation risk was diversifiable.

³ U.S. Office of the Comptroller of the Currency (1988).

diversify (e.g., U.S. S&L regulations), "connected" lending (Chile in the early 1980s), and the poor incentives for banks to plan and analyze their risk exposures with various banking systems. Although some developing countries might find it difficult to diversify due to their high output concentration in one or two sectors, Mexico would seem sufficiently large that this would not be the case. Finally, several other explanations have been offered for the banking crisis.⁴

The paper is organized as follows. Section I provides historical background on Mexico's financial sector. Section II discusses the post-devaluation financial-sector crisis and the government's rescue program. Section III discusses data sources and hypotheses to be tested. Section IV then presents the results of the study's empirical analysis, followed by our conclusions and lessons for other developing countries.

I. Historical Background

A. Financial Liberalization and Bank Privatization

During the latter-half of the 1980s and in the wake of nationalizing its banking sector, the Mexican government faced increasing pressure to initiate economic and financial reforms.⁵ Financial-sector reform was conducted in a series of stages,

⁴ Undercapitalization, poor supervision and inadequate banking expertise have also been offered as potential contributing factors to the financial-sector crisis.

⁵As part of the government's response to the 1982 crisis, 58 of 60 Mexican banks (with the exceptions including Citicorp's Mexican subsidiary) were nationalized.

starting in 1985 when banks were allowed brokerage functions such as offering money-market accounts, and minority private ownership of banks was allowed up to 34%. In 1989, the government eliminated interest rate and maturity limits on deposits and other instruments. In 1989, reserve requirements were reduced from highs of 80% to 90%, and eliminated all together in 1991 (Martinez, 1994).⁶

In May 1990, the Financial Groups Law was announced, and then passed on July 1, 1990. The law allowed private-sector majority ownership of Mexican banks and initiated the bank privatization process. Under the law, no single individual or institution was allowed to hold more than a 5% equity stake in a privatized institution (10% with government approval). Foreign investment was permitted up to 30% ownership of total equity, but again with a 5% cap on ownership by any single individual or institution. Industrial firms were legally excluded from ownership.⁷

The 1990 Financial Groups Law also laid the legal framework for reorganizing the financial sector within a universal banking framework. The law required financial groups to be headed by either a holding company, bank, or brokerage house. In fact, most were headed by brokerage houses. As well, each financial group was

⁶Along with nationalization, stock brokerage houses were permitted to perform some banking functions, creating a non-bank source of competition for deposits. Many investors reportedly preferred keeping funds in private-sector brokerages (LatinFinance, 1/1/93).

⁷Privatization was headed by the treasury ministry's (SHCP) bank privatization committee.

required to include at least 3 types of financial intermediaries, such as a bank, insurance company, leasing company, stock brokerage house, factoring or bonding concern, foreign exchange house, investment fund service, etc (LatinFinance, 1/1/1993). At the time, the newly-devised universal-banking framework was considered one of the most advanced in the world (Martinez, 1994).

Mexican financial groups began forming in 1991 to acquire newly-privatized and newly-formed banks. Most of the 18 reprivatized banks were acquired by financial groups sponsored by brokerage houses, and all newly issued banking licenses have been to newly-formed financial groups.

Bank privatization sales began June, 1991, using an auction process involving qualified bidders. The goal was to create diversification of ownership. However, because of limited and concentrated capital within Mexico and limits on foreign ownership, most banks were acquired by domestic brokerage houses. Bank auctions were completed by June 1992, except for some residual government minority holdings. This round of bank auctions raised US\$12.4 billion. Table I lists the results of the privatization process over 1991-2.

Critics have faulted the Mexican bank privatizations for two reasons. First, it has been suggested that high winning bid prices contributed to under-capitalizing the financial sector. Second, an adequate regulatory and supervisory framework was not put in place until several years post-privatization (Wall Street Journal, 1/25/96). Some sources also fault privatization for not placing

adequate controls on the knowledgeable-ness of bank acquirers. Institutional Investor (1993, "Land of the giants", v. 27, No. 2).

In January 1994, the government announced its intention to divest its remaining minority stock holdings, which included a 20.4% stake in Bancomer (estimated value at US\$1.8 billion), a 6.2% stake in Grupo Financiero Serfin (estimated value of US\$220 million), and a 21% stake (estimated at US\$400 million) in Banco Internacional. This then completed the process of financial-sector privatization.

B. The pre-devaluation banking sector

Early signs of weakness in Mexico's banking sector occurred as early as 1994. Many Mexican banks had trouble meeting capital requirements in 1992. Nine banks failed to meet the eight percent (BIS) capital requirement by the December 1992 deadline. This included 3 of Mexico's 6 largest banks (Serfin, Multibanco, Comermex and Banco Internacional) with capital levels below 6%, and smaller banks including Banco Mexicano, Banco BCH, and Banpais with capital ratios at 6% to 7%, and finally Banco de Oriente, Banca Cremi, and Banco del Atlantico with capital ratios above 7%. The Finance Ministry was forced to grant extensions until October 1993 (Institutional Investor, "Land of the giants", v. 27, No. 2, 1993).

Many financial groups were also reported to have suffered large trading losses in 1993 on ajustabonos (three- and five-year inflation-adjusted government bonds), with Probursa losing approximately one-third of the amount paid by its owners for its

bank, Multibanco Mercantil, in the privatization. Total financial-sector losses from ajustabonos were reported at \$1 billion. The losses were said to reflect the embryonic state of asset-liability management of Mexican banks (Institutional Investor, "Land of the giants", v. 27, No. 2, 1993).

Signs of weakness in Mexican bank loan portfolios occurred as early as 1994. Post-privatization, Mexican banks had issued thousands of credit cards, mortgages and car loans, partly in response to pentup demand from previous financial repression. In Mexico, past-due loans increased from 3.5% in 1991 to 8.5% in March, 1994, and then to 7.9% by year-end 1994, representing an increase from 35.1% to 97.5% of total banking-sector book capital (IMF, 1995).⁸

Overdue loans became a national epidemic after the sharp currency devaluation on December 20, 1994. Borrowers defaulted on loans because of high interest rates and the post-devaluation economic decline. Interest rates on consumer debt peaked as high as 120%, and then subsided to about 78% in 1995. At Bancomer, one-third of all customers had to reschedule loan payments, and a smaller percentage defaulted.

Mexican reporting standards may have contributed to an under-reporting of the severity of loan default rates, by requiring only past-due interest but not past-due principal amounts to be reported. Bad loan estimates in March, 1996 ranged from 15% to 40%

⁸De la Cuadra and Valdes-Prieto (1996) describe a similar history of events from financial repression to rapid loan expansion in Chile.

of the banking sector portfolio, with a bailout price tag ranging from \$10 billion to \$30 billion, or from 5% to 12% of GDP (LATINFIN, 3/1/96).⁹ New accounting standards for banks are currently being implemented (Garcia-Cantera and Burbridge, 1997).

C. The Post-Devaluation Bank Rescue Plan

In response to mounting bank loan losses, the state-owned deposit insurance agency, FOBAPROA (Fondo Nacional de Proteccion al Ahorro), developed a plan to recapitalize banks by purchasing non-performing loans, according to a "2 for 1 plan." FOBAPROA proposed to buy \$2 worth of non-performing loans for every \$1 of new capital injected. FOBAPROA has already bought \$10 billion in portfolios and expects to purchase another \$4 billion over 1995-6.

The government's loan purchase program has included the following transactions:

In September 1995, GF GBM-Atlantico and GF Promex-Finamex sold more than US\$1.06 billion in overdue loans to FOBAPROA (Sourcemex, 9/13/1995).

In June 1995, the Mexican government agreed to buy \$783 million of debts from Probursa and Serfin (The Banker, 7/5/1995). The Probursa sale facilitated a majority share sale of Probursa stock to Banco Bilbao Vizcaya. GF Serfin SA sold more \$700 MM in loans to the government in June 1995 and will try to sell \$1B more (Wall Street Journal, 1/25/96).

The Mexican government issued 10-year bonds to Banamex in exchange for US\$2 billion in Banamex loans, acquired by FOBAPROA. 43% of the loans were already past due (The Banker, 2/1/96).

Banco Mexicano sold US\$900 million in loans to Fobaproa in late 1995 (The Banker, 2/1/1996).

⁹In comparison, a U.S. bank is considered unhealthy if past due loans are more than 3% of total loans.

To September 1995, the Mexican government was reported to have spent US\$4.9 billion to help 19 financial institutions (SourceMEX, 9/13/1995). As well, the Procapte program provided assistance to some banks in the form of 5-year bonds (issued by the banks to FOBAPROA) that are included in banks' assets.

Mexican banking authorities also had to seize control of several banks and credit unions since September, 1994, beginning with the seizure of Grupo Financiero Cremi-Union SA.

In March 1995, authorities seized control of GF Asemex-Banpais and its banking arm, Banpais, the country's ninth largest bank (11/30/1995).

The government effectively took over GF Inverlat when it was unable to roll over short-term dollar debt in August, 1995. The Bank of Nova Scotia owns 8% of the financial group (The Wall Street Journal, 12/1/1995).

Fraud also played some role in the banking crisis, perhaps in response to incentives in place (Akerlof and Romer, 1993). American Banker (9/8/1994) reported that a growing banking scandal may have shaken confidence in Mexico's financial sector, and that similar investigations predated Venezuela's bank-sector collapse. In particular, the Mexican government seized Grupos Havre and GF Cremi-Union in 1994 before the December 20, 1994 peso devaluation.

In late May 1994 the SHCP took control of Grupo Havre, under accusations of \$350 million in fraudulent insider loans, acquired by the bank from the government's small business lender, Nacional Financiera (NAFINSA). and the Foreign Trade Bank (BANCOMEXT) (SourceMEX, 9/14/1994).

Mexican investigators uncovered a \$700 million insider-loan network with the Cremi-Union financial group. Ten insiders were arrested, and the bank's chairman, also linked to the BCCI scandal, is sought as a fugitive. Mexican regulators took control of the financial group on September 6, 1994, in the

first such takeover since privatization (9/7/1994, Houston Chronicle).

Bank regulators found that 60% of Banco Interestatal's loan portfolio consisted of internal loans to the bank's controlling group. Interestatal had formed out of Union Credito del Noroeste (Emerging Markets Report, 9/21/95).

In December 1994, government investigations found financial irregularities with Banpais-Asemex, resulting in a takeover of the group's bank, Banpais, and insurance firm, Asemex, in March, 1995.

The banking crisis has also attracted foreign-bank entry. In particular,

- o In May 1995, Banco Bilbao Vizcaya increased its stake in GF Probusa from 22% to 70%, paying \$390 million on condition that Fobraproa take on \$780 million of loans (LatinFinance, 3/1/1996).

In August 1995, Banco Central Hispanoamericano and Banco Comercial Portugues made similar deals with Banco Internacional (LatinFinance, 3/1/1996).

Bank of Montreal agreed to pay between \$426M and \$480M for a 16% stake in Bancomer (LatinFinance, 3/1/1996).

Scotiabank increased its stake in GF Inverlat to 55%, costing \$225M (LatinFinance, 3/1/1996).

III. Data and Econometric Tests

We divide our analysis into two logically-consecutive sections. First, we use standard event-study methodology to test whether sectors of the Mexican economy showed a differential response to the December 20, 1994 devaluation event. In particular, we test whether export-related sectors tended to be "devaluation-gaining," while domestic sectors tended to be "devaluation-losing," in response to devaluation. As well, the event analysis attempts to control for potentially contaminating events, including a Mexican-

market liquidity crisis and on-going peso/dollar volatility post-devaluation. A chronology of devaluation-related events is given in Table III and further discussed below.

Second, our analysis tests the two hypotheses raised above concerning the linkage mechanism between Mexico's financial-sector performance and the devaluation crisis. According to the "liability-exposure" hypothesis, peso devaluation shocks were transmitted directly to the financial sector through the impact of devaluation on dollar-denominated liabilities, in terms of servicing costs and potential liquidity effects. In contrast, the "asset-exposure" hypothesis states that devaluation effects are transmitted through the asset side of financial-group balance sheets. In effect, if financial groups show a net positive asset exposure to "devaluation-losing" sectors compared to "devaluation-gaining" sectors of the economy, then devaluation shocks would be transmitted indirectly through the real sector to the financial sector.

To test these hypotheses, we use the following approach. If the transmission of devaluation shocks is directly to financial-group balance sheets through the "liability-exposure" mechanism, then Mexican financial-group returns should show a direct sensitivity to movements in the peso/dollar exchange rates. In contrast, if transmission is through the "asset-exposure" mechanism then financial-group returns should show the greatest sensitivity to movements in the sectoral indices. We use an asset-pricing approach to test these alternatives.

Data series used in the analysis include daily stock price data on Mexican financial groups,¹⁰ daily data on Mexican sectoral indices constructed by the Mexican bolsa, and a daily series on the peso/dollar exchange rates. All data is drawn from *El Financiero*, a leading Mexican financial newspaper.

As a point of reference, Table II illustrates the subsidiary structure of the Mexican financial groups. As can be seen, most financial groups consist of 5 or more subsidiaries, comprising a full range of financial services.

Event Analysis

The focus of interest of our event analysis is the December 20, 1994 devaluation. Accordingly, we test for the impact of the devaluation event itself, as well as testing for pre-devaluation leakage of information to investors concerning the possibility of devaluation. Furthermore, the analysis also attempts to control for potential confounding events, such as market concerns over the ability of the Mexican government to repay maturing Tesobonos (short-term dollar-denominated Mexican debt). Table III presents an extended chronology of devaluation-related events collected from newspaper accounts of the time. We view the following as key events

¹⁰*El Financiero* does provide stock prices for listed insurance companies, banks, and brokerage houses individually. However, since these are mostly subsidiaries of the financial groups, and because they tend to be thinly traded relative to the financial groups, our analysis focuses on the daily stock price series of the financial groups. In addition, in cases where multiple classes of stock trade for a particular financial group, we chose that class that appears to be most actively traded.

for our analysis.

- o 12/20/94. The Mexican government was forced to widen the exchange rate band, which initiated a process where the peso was eventually allowed to float.
- o 1/12/95. Clinton proposes a U.S.-lead peso support package.
- o 1/31/95. Clinton proposes to use \$20 billion of the Exchange Stabilization Fund to support the peso after significant Congressional opposition develops.
- o 2/21/95. The U.S. and Mexico sign the \$20 billion economic package.
- o 2/24/95. Mexican business leaders call for a new emergency economic plan to replace the program announced 1/3/95.
- o 3/10/95. Mexico announces a stiff austerity program.
- o 3/11/95. The U.S. releases the first of \$20 billion in promised support.
- o 3/18/95. The Mexican Congress approves unpopular tax hikes.

IV. Results

Summary statistics for the study variables are presented in Table IV, both for the entire period 1993-96 and by individual year. We use the 1993-95 period as the study interval for the asset-pricing regressions, and then include the year 1996 as a robustness test of the results. In contrast, our event study analyzes the much narrower period from 11/20/94 through 4/30/95, which captures the period of most concern during the devaluation crisis.

Figures 1-4 plot the primary variables of interest to our event study. Figure 1 plots the course of the peso over this period. The sharp increase in the peso/dollar exchange rate on December 20, 1994 is the "devaluation event" of interest to this study. The event represents a regime shift from a pegged to a floating exchange rate, in part a consequence of the near-depletion of Mexico's foreign currency reserves at the time. Finally, note that the peso exchange rate continued to devalue post-event date, and became more volatile. Figures 2-4 plot the six Mexican-market sectoral indices of interest.

A. Impact of Devaluation on Mexico's Real Sectors

Table V presents the results from the event tests. The dependent variable is the daily return on the particular sectoral index. Parameter estimates in Table V are presented in percentage form, with standard errors listed below the estimate. The six sectoral indices are listed in Table V. One complication with the service index is that it contains both real and financial services. However, for completeness we analyze it here as well. Finally, we also include movements in the peso exchange rate in the analysis to control for exchange-rate volatility post-devaluation.

Event windows I-III are designed to test the differential sectoral response to the December 20, 1994 devaluation. First, results for the 3-day devaluation event window (Window II in Table V) indicate that the industrial/extractive and communication/transportation sectors showed strong positive devaluation "surprises" of

9.90% and 4.88%, respectively, while the service sector showed a strong negative surprise response of -3.90%. As well, the commercial and transformation sectors showed positive responses, while the construction sector showed a negative response, although these were not statistically significant.

The pre-devaluation event-window (Window I) is designed to capture pre-devaluation leakage of information to investors. Table V indicates that the coefficient estimates for this window are uniformly negative, but not significant. In particular, the coefficient estimates do not display the export/gain and import/loss pattern as with the three-day devaluation-event window. Therefore, the results appear to confirm the conclusion of Masson and Agenor (1996), that Mexican financial markets did not anticipate the devaluation event prior to December 20, 1994.

Window III in Table V is a post-devaluation window, constructed to test for residual devaluation effects over the period December 23, 1994 through January 9, 1995. This period appears to have been particularly free of contaminating events, since it precedes a period of uncertainty over Congressional support for the U.S. support package. The results for Window III indicate that the pattern of responses observed in Window II continued to hold over the course of this period.

The remaining event windows deal with announcement effects concerning the U.S. support package. Event window V is a three-day event window starting with the 1/12/95 announcement of the proposed Clinton bailout plan (see Table III). The Table V results indicate

that all sectors showed a strong positive response to the announcement. Event window IV captures the three days just prior to the Clinton announcement. The results indicate that the Mexican stock market was in a sharp decline just prior to the 1/12/95 announcement, with the decline then sharply reversing.

The second Clinton announcement was in response to growing Congressional opposition to his plan and declining likelihood of its passage. On 1/31/95 Clinton proposed using \$20 billion from the Exchange Stabilization Fund as the U.S. contribution to the peso support package. Window VII is a three-day window starting 1/31/95 that captures the market impact of this announcement, which tended to be insignificant. Window VI is a pre-Clinton announcement window that should reflect the impact of growing Congressional dissent. Indeed, market responses were uniformly negative during this period. Window VIII is a post-announcement window covering the period 2/3/95 through 3/6/95. Here again returns tended to be mostly negative. Finally, Window IX is constructed to capture the beginning of the economic recovery. Two key events occurred during this period. First, Mexico began drawing on funds from the finalized U.S. support package. Secondly, the Mexican government passed a tough fiscal and monetary austerity package.

To summarize the above results, the most important conclusion from our analysis is that sectors of the Mexican economy did show a differential response to devaluation. Export sectors, such as extractive and communication/transportation sectors were "devaluation-gaining" while domestic sectors such as construction

and service sectors were "devaluation-losing." These results hold during both the 12/20/94 devaluation window and through the post-devaluation window. As well, a pre-devaluation event window indicates that the Mexican stock market did not anticipate these devaluation-related effects prior to the devaluation. Our results therefore confirm those of Masson and Agenor (1996) that Mexican debt markets did not anticipate devaluation. Finally, looking at the entire period covered by the event analysis from 11/20/94 through 4/30/95 (see figures 2-4), the pattern of differential returns can be seen to hold over this entire period.

B. Asset-Pricing Analysis of Mexico's Financial Groups

Given the preceding analysis of Mexico's sectoral economic response to devaluation, we next investigate the link between devaluation and Mexico's financial-sector. In particular, we test the hypotheses raised above concerning the transmission mechanism of devaluation shocks to the financial sector. The "liability-exposure" hypothesis posits a direct link between devaluation and the holdings of dollar-denominated liabilities by Mexican banks, in that devaluation would have increased the cost of servicing these debts and may have sparked a "run" by such deposits. In contrast, the "asset-exposure" hypothesis posits that the devaluation-shock transmission occurred through the asset-side of financial-group balance sheets, e.g., in terms of concentrated lending to "devaluation-losing" as opposed to "devaluation-gaining" sectors of the Mexican economy.

We test these alternative hypotheses using daily data on ten Mexican financial groups covering the four-year period 1993-96, but hold 1996 out initially to perform a sensitivity test. Our approach is to use "asset-pricing" regressions to test the potential influence of various factors on financial-group returns. For example, in the case of the "liability-exposure" hypothesis, we include the peso/dollar exchange rate in the analysis to test for a direct link between devaluation and financial-sector performance. In contrast, to test the "asset-exposure" hypothesis, the analysis includes the Mexican-market sectoral indices to test whether devaluation effects flowed through the real sectors. All factors included in the analysis are expressed in terms of percentage change.

To account for the ten financial groups that comprise our sample, the analysis uses a "fixed-effects" framework to estimate all parameters simultaneously for a particular factor. For example, five sectoral indices and 10 financial groups would yield 50 factor sensitivities to be estimated in a "full" model regression. Furthermore, to test the significance of any particular factor, partial F-statistics are calculated from a "full" model that includes the ten fixed-effects terms for that particular factor, and a "reduced" model regression that excludes these terms. A partial F-statistic is then calculated and compared with its critical value. Using this approach, factors can be selected which have a significant impact on the financial-group sector as a whole. The procedure is also designed to minimize the possibility of

spuriously-generated results. The results of our model investigations are presented in Tables VI and VII.

Panel A of Table VI reports a decomposition of financial-group stock returns among the five sectoral indices.¹¹ At this stage, our interest is to isolate those economic sectors that appear to have significantly influenced financial-group returns. Therefore, panel A just presents the partial F-statistics that allow the significance of each factor to be evaluated.

The column labeled "Round 1" gives the partial F-statistics from eliminating each sectoral index in turn, and comparing the results with the "full" model which includes all 5 sectoral indices. Those factors with F-statistics exceeding the critical value are denoted by a "*". On the first round, the commercial-sector index produces the smallest (non-significant) F-statistic, and it is therefore eliminated from future rounds. In turn, three additional sectoral indices are eliminated in this fashion, namely the industrial/extractive, transformation and communication-transportation sectors. Therefore, of the five sectoral indices, the financial-groups appear to show sensitivity only to the construction sector.

In Panel B of Table VI, an alternative factor structure is investigated, which includes the IPC (a broad Mexican-market index), the peso factor and a set of fixed-effect intercepts which

¹¹This decomposition can be thought of deriving a set of "weights" that represent a financial-group's exposure across each sector of the economy. Within the universal-banking framework, the financial groups would have in theory the ability to take equity-like and debt-like positions in different sectors.

allow separate "alphas" to be estimated for each financial group. The results reported in panel B indicate that none of the factors in this alternative factor structure are significant.

In panel C of Table VI, two additional "sectoral" indices are introduced into the analysis. As noted above, the service-sector index is comprised of both real services and financial services, and therefore already includes financial group performance. To construct a purely "real-sector" index of Mexico's domestic consumer economy, we attempt two approaches. First, we construct a sectoral index from daily stock-market data on Mexican retail companies, which is labeled "Consumer-Index" in Table VI. However, many of these tend to be "high end" retail outlets that may not well represent the impact of devaluation on middle-class Mexican consumers. Therefore, we construct a separate index of daily stock returns from just the Sears Mexican subsidiary, labeled "Sears Index" in Table VI. As in the U.S., this retail company appears to better reflect Mexico's middle-class than the other retail outlets. The results listed in panel C demonstrate that both the consumer index and the "Sears" index show large positive relationships to the financial-group performance. However, only the "Sears" partial F-statistic exceeds the critical value.

Finally, panel D of Table VI investigates the "event" impact of devaluation within the context of the present analysis, i.e., here covering the period 1993-95. Three "windows" are constructed. First, a three-day window around the devaluation event itself is denoted as "Deval Window." Second, to test for potential leakage of

information, a thirty-day pre-devaluation window is included, denoted "Pre-Deval Fixed Effects." Finally, a separate set of effects are estimated for a post-devaluation window, labeled "Post-Deval Fixed Effects." Note that none of these factors proved significant.

The results presented in Table VI indicate that the construction sectoral index and the specially-constructed "Sears" index are the most promising factors. Therefore, Table VIIA pursues a two-factor model that includes these two factors. Panel A of Table VII lists the results of the analysis. The overall R^2 is 14.3%. The column labeled " α " gives the estimated alphas for each financial group, estimated as fixed-effect intercepts. The alpha estimates are generally negative but not statistically significant. The columns labeled "Construction Index" and "Sears Index" give the factor-sensitivity estimates of the two factors, respectively. The factor-sensitivity estimates are always positive when significant.

Panel B of Table VIIA investigates a further issue with the estimated factor sensitivities. Investors may have anticipated that the Mexican government would give considerable financial support to this sector in terms of recapitalization aid for the poorest performing financial groups. This support would tend to diminish the sensitivity of financial-group returns to sectoral economic movements, particularly when these movements were negative. Accordingly, Panel B of Table VIIA reports separate "up beta" and "down beta" construction-sector sensitivity estimates for each financial group, while continuing to include the Sears index. The

resulting estimates suggest that the financial group returns were generally equally sensitive to both up and down movements in the construction-sector index.

Finally, as a sensitivity test for the sample period used in the preceding analysis, results are presented in Table VIIB which updates the regression analysis to include the year 1996. In general, only small changes are observed to occur in the parameter estimates, indicating that the previous results are robust and that a similar return generating process continues to hold when the 1996 data are included.

In summary, the asset-pricing regressions give reasonably strong evidence in favor of the "asset-exposure" hypothesis. Little evidence was found of a direct link between devaluation and financial-sector performance. Inclusion of factors such as the peso/dollar exchange-rate and the devaluation event window did not prove significant. In contrast, the financial groups did show significant factor sensitivities to the construction-sector index and the "Sears" index, but no sensitivity to the export-related sectors. These results are further corroborated by the aggregate sectoral loan statistics presented in Table VIII, where loan percentages are high for domestic sectors such as commercial and construction, while low for export sectors such as mining. The implication is that the financial-sector problems in Mexico have dragged on so long, and have been so difficult to reverse, because the sectors of the economy they are most involved in have shown the slowest recoveries.

V. Conclusions

Our analysis yields the following tentative conclusions. First, various sectors of the Mexican economy showed significant differential responses to devaluation. Export sectors tended to gain, while domestic consumer-related companies tended to decline in value. The significant "surprise" effects at devaluation indicate that the impact of devaluation was not anticipated by investors prior to the devaluation event.

Second, our analysis tests whether Mexico's universally-organized financial groups were able to diversify across sectors that showed differential valuation effects post-devaluation. Our results demonstrate that their performance was strongly tied to the domestic consumer-sector, which showed the largest losses and slowest recoveries post-devaluation. This conclusion appears to be consistent with both the depth and longevity of the financial sector crisis. Our results indicate that a lack of diversification was a contributing factor to the banking crisis.

Third, one implication of our results for Mexico is that the banking sector will not recover from the crisis until, among other things, the consumer-loan exposures of financial groups are reduced, or the consumer sector shows a strong recovery. The Mexican government has taken steps to reduce loan exposures by purchasing non-performing loans from banks in an attempt to help them recapitalize. Although the consumer sector has shown some signs of recovery, it has still lagged far behind the other sectors.

Finally, it is interesting that following privatization, financial groups expanded their loan portfolios mostly along the dimension of the consumer sector. However, this may have been a consequence of several factors. First, export-sector (and perhaps many other public) companies may have traditionally relied on domestic and foreign stock and bond markets for raising capital, particularly during the period when the banking sector was nationalized. Second, consumers may have responded to liberalization and the movement away from financial repression with a great deal of pent-up demand. Relatedly, profit margins with the consumer sector may have been large in comparison with other sectors of the economy, although obviously ex post not sufficiently high to offset the increased risk.

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Table I: Mexican Bank Privatizations

BANK	DATE SOLD	PRICE	ACQUIRER	SALE VALUE TO BOOK - EARNINGS
(1) Mercantil	6/10/91	237M 77.2%	GF Probursa	2.66 12.73
(2) Banpais	6/17/91	181M 100.%	GF Mexival	3.03 17.73
(3) Cremi	6/24/91	248M 66.7%	Empresarios de Jalisco	3.40 21.86
(4) Confia	8/5/91	294M 78.7%	GF Abaco	3.73 12.85
(5) Banorie	8/11/91	74M 60.0%	GF Margen	4.00 23.46
(6) Bancreser	8/19/91	140M 100.%	Alcantara	2.53 12.12
(7) Banamex	8/26/91	4430M 70.7%	GF Accival	2.62 11.14
(8) Bancomer	10/5/91	2798M 56.0%	GF Monterrey	2.99 15.67
(9) BCH	11/8/91	287M 100.%	G Del Sureste	2.68 22.31
(10) Serfin	1/26/92	1272M 51.0%	GF Obsa	2.69 14.77
(11) Comermex	2/9/92	884M 66.5%	GF Inverlat	3.73 20.61
(12) Somex	3/1/92	613M 81.6%	GF InverMexico	4.15 21.22
(13) Atlantico	3/29/92	480M 68.5%	GF Bursatil	5.30 17.85
(14) Promex	4/5/92	351M 66.0%	Finamex	4.231 6.45
(15) Banoro	4/12/92	372M 66.0%	Estrategia-Bursatil	3.95 11.28
(16) Banorte	6/15/92	570M 66.0%	Maseca	4.25 12.62
(17) Internacional	6/29/92	295M 51.0%	Prime	2.95 12.32
(18) Bancen	7/6/92	279M 66.3%	GF Multiva	4.65 10.85

Source: (8/1/92 Privatisation International)

Table II: Structure of Mexican Financial-Groups**GF BANCOMER Subsidiaries**

Bancomer (commercial banking)
 Casa de Bolsa Bancomer (securities)
 Casa de Cambio Bancomer (exchange)
 Arrendadora Financiera Monterrey
 Almacenadora Bancomer
 Factoraje Bancomer
 Arrendadora Bancomer

GF BANAMEX-ACCIVAL Subsidiaries

Banco Nacional de Mexico
 Seguros Banamex
 Operadora de Sociedades de Inversion Banacci
 Acciones y Valores de Mexico
 Casa de Cambio Euromex
 Arrendadora Banamex
 Banamex Factoraje

GF INVERLAT Subsidiaries

Multibanco Comermex (commercial banking)
 Casa de Bolsa Inverlat (securities)
 Casa de Cambio Inverlat (exchange)
 Arrendadora Inverlat
 Factoring Inverlat
 Servicios Inverlat

GF INVERMEXICO Subsidiaries

Banco Mexicano
 InverMexico Casa de Bolsa
 Aseguradora InverMexico (investments)
 Arrendadora Financiera InverMexico (leasing)
 Factoring InverMexico
 Almacenadora InverMexico-USCO (51%) (warehousing)
 Afianzadora InverMexico (bonding)
 InverMexico Household Tarjeta de Credito, Sociedad
 Financiero de Objeto Limitado (credit card)
 LatInvest Securities, LTD (UK)
 LatInvest Securities, LTD (US)

GF PROBURSA Subsidiaries

Multibanco Mercantil Probursa
 Seguros Probursa
 Probursa
 Casa de Cambio Probursa
 Fianzas Probursa
 Factoraje Probursa
 Almacenadora Probursa
 Arrendadora Probursa

Promotora Probursa

GF SERFIN Subsidiaries

Banca Serfin (commercial banking)
Operadora de Bolsa Serfin (brokerage)
Factoraje Serfin (factoring)
Arrendadora Serfin (leasing)
Almacenadora Serfin (warehousing)
Afinazadora Insurgentes (bond operations)
Seguros Serfin (insurance)
Servicios Corporativos Serfin

MULTIVA GF subsidiaries

Banco del Centro, S.A.
MultiValores Casa de Bolsa
MultiVa Factoring
MultiVa Arrendadora
Casa de Cambio Amercam

Source: Moody's International Manual

Table III: A Chronology of the Mexican Peso-Crisis Events

- 12/22/94 The loan agreement under the North America Loan Agreement, was expanded by the U.S. and Canada to \$10 billion.
- 1/3/95 Mexico announced an emergency economic plan.
- 1/9/95 Mexico drew on its international rescue package for the first time to replenish its foreign currency reserves.
- 1/10/95 It was reported that almost \$29 B of tesobonos will fall due in 1995, compared to about \$6 B of foreign exchange reserves and \$18 B of an international stabilization fund.
- 1/11/97 The Mexican central bank cut off sale of tesobonos after selling only \$64 M worth of a \$100 M offering.
- 1/12/95 The Clinton administration proposed an offer of between \$25B and \$40B of U.S. loan guarantees to Mexico.
- 1/15/95 Congress will approve President Clinton's proposal to provide \$40 B in U.S. loan guarantees.
- 1/17/95 The Mexican central bank was able to sell all of the combined \$400 M of Tesobonos offered today.
- 1/17/95 Bonor emerges as a roadblock on Capital Hill to the Clinton plan.
- 1/18/95 Senator Hollings declares his opposition to the Clinton plan.
- 1/20/95 Rubin disclosed for the first time that revenues from Mexican oil exports will be paid to the U.S. if Mexico defaults.
- 1/23/95 The anti-bailout coalition swamps GOP leaders.
- 1/24/95 The Mexican government sold only \$275 MM of \$400 MM of dollar-linked tesobonos, and had to pay a higher interest rate to attract interest in those.
- 1/31/95 Clinton moves to bypass Congress and to use the Exchange Stabilization Fund. The aid would be backed by Mexican oil revenues. Clinton's 3-part \$47.5 B Mexican loan guarantee plan would consist of \$20 B from the U.S. Exchange Equalization Fund, an additional \$10 B from the IMF and \$10 B from the Bank for International Settlement.

- 2/3/95 Several European countries, including Britain, Germany, Denmark, the Netherlands, Belgium and Switzerland will withhold support from the Clinton/IMF plan.
- 2/16/95 Grupo Sidek, a steel and real estate conglomerate, would default on \$19.5 MM in short-term debt
- 2/19/95 Grupo Sidek reversed its default decision
- 2/21/95 The U.S. and Mexico signed Washington's \$20 B economic bailout package. Mexico pledged to make fundamental reforms in its economy, including raising interest rates and tightening monetary policy. The U.S. will receive Mexican oil revenues if Mexico defaults. \$3 B in loans and loan guarantees are available immediately and some \$70 B accessible by the end of June.
- 2/24/95 Mexican business leaders call for a new emergency economic plan to replace the program announced on 1/3/95, in the face of steeply rising business failures.
- 2/27/95 Mexican President Ernesto Zedillo is expected to announce this week a new economic recovery plan
- 3/10/95 Treasury Secretary Guillermo Ortiz announces a stiff austerity program.
- 3/11/95 U.S. released the first of \$20 B in promised U.S. support.
- 3/18/95 Mexican Congress approves unpopular tax hikes.
- 3/25/95 The Mexican govt released trade figures showing Mexico had exported \$452 M more in goods than it had imported in February.
- 4/1/95 Mexico's exports grew by 35.4% during Jan 1995.

TABLE IV: Daily Rate of Return Statistics - Daily %

<u>Variable</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>'93-6</u>
Peso Return	-.01	0.40	0.25	0.00	0.14
Broad-Market Returns	0.21	0.03	0.34	0.18	0.21
Sample GF Returns	0.40	0.30	-.52	0.01	0.07
Sectoral-Index Returns					
Commercial	0.21	-.10	0.02	0.14	0.07
Communication/ Transportation	0.23	0.00	0.13	0.02	0.09
Construction	0.35	-.06	0.13	0.09	0.12
Industrial/ Extractive	0.24	0.48	0.54	-.06	0.62
Service	0.12	-.32	-.08	0.08	-.04
Transformation	0.31	-.11	0.22	0.12	0.14

**Table V: IMPACT OF DEVALUATION ON MEXICO'S REAL SECTOR
EVENT-WINDOW ESTIMATES**

Event Model for Sectoral-Index i Returns at Time t

$$R_{i,t} = \beta_{iI}W_{iI,t} + \beta_{iII}W_{iII,t} + \dots + \beta_{iIX}W_{iIX,t} + \epsilon_t,$$

where

β_{ij} is the sectoral index i and event window j coefficient, and $W_{ij,t} = 1$ if time t is in event window j, and is zero otherwise.

EVENT-WINDOW ESTIMATES:

SECTORAL INDEX/R²	I	II	III	IV	V	VI	VII	VIII	IX	Peso
InEx 35.3	-.75 (0.58)	9.90 (1.79)	2.05 (0.98)	-3.4 (1.79)	9.14 (1.80)	-.08 (1.03)	0.15 (1.80)	0.25 (0.80)	1.49 (0.73)	-.03 (.076)
CmTr 19.0	-.03 (0.44)	4.88 (1.35)	0.65 (0.74)	-1.3 (1.35)	-.94 (1.36)	-.10 (0.77)	-1.7 (1.36)	-.09 (0.60)	0.16 (0.55)	-.17 (0.06)
Tran 15.4	-.22 (0.45)	0.96 (1.40)	0.36 (0.77)	-1.9 (1.41)	3.95 (1.41)	-1.0 (0.81)	1.31 (1.42)	-.41 (0.63)	0.81 (0.58)	-.02 (0.06)
Comm 15.5	-.26 (0.56)	1.39 (1.74)	0.15 (0.95)	-2.9 (1.74)	3.46 (1.75)	-1.5 (1.00)	1.57 (1.75)	-.26 (0.78)	1.13 (0.71)	-.09 (0.07)
Cons 14.0	-.14 (0.85)	-.67 (2.63)	-.84 (1.44)	-4.7 (2.63)	5.47 (2.65)	-2.2 (1.51)	2.92 (2.65)	-.94 (1.17)	1.07 (1.08)	-.05 (0.11)
Serv 29.9	-.18 (0.47)	-3.9 (1.47)	-.63 (0.80)	-4.1 (1.47)	5.33 (1.48)	-1.6 (0.84)	1.78 (1.48)	-1.4 (0.66)	0.98 (0.60)	0.11 (0.06)

where

InEx is Industrial/Extractive, CmTr is Communication/Transportation, Tran is Transformation, Comm is Commercial, Cons is Construction, and Serv is Service.

EVENT WINDOWS:

- I** Pre-devaluation event window. Thirty day window prior to 12/20/94.
- II** Devaluation event window. A three-day window including 12/20/94-12/22/94.
- III** Post-devaluation window. A window capturing post-devaluation effects over 12/23/94-1/9/95.
- IV** Pre-Clinton I. A three-day window covering 1/9/95-1/11/95.
- V** Clinton Proposal I. A three-day window capturing announcement effects over 1/12/95-1/16/95. Clinton proposes a U.S.-lead support package.
- VI** Post-devaluation window. A window capturing post-announcement effects over 1/17/95-1/30/95.
- VII** Clinton Proposal II. A three-day window including 1/31/95-2/3/95. Clinton proposes \$20 billion from the Exchange Stabilization Package to bypass Congressional opposition.
- VIII** Post-Clinton II. A post-announcement window covering 2/4/95-3/6/95.
- IX** Mexican Austerity Package. A window over 3/7/95-4/30/95 covering two announcement effects: implementation of the U.S. support plan and passage of tough Mexican fiscal and monetary reforms.

TABLE VI: PORTFOLIO DECOMPOSITION RESULTS**A. SECTORAL-INDEX ELIMINATION ROUNDS**

<u>SECTORAL INDEX</u>	ROUND - ELIMINATION F-STATISTICS			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
(1) Commercial	1.31	-	-	-
(2) Communication/ Transportation	5.87*	5.51*	5.36*	4.33
(3) Construction	8.33*	10.14*	10.32*	44.01*
(4) Industrial/ Extractive	2.48	2.49	-	-
(5) Transformation	3.31	4.36	4.24	-

B. MEXICAN MARKET-INDEX AND PESO RETURN ELIMINATION ROUNDS

<u>INDEX</u>	ROUND - ELIMINATION F-STATISTICS			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
(1) Mex.Index: IPC	0.58	-	-	-
(2) Peso Return	2.47	2.51	2.47	-
(3) Fixed-Effect Intercepts	1.96	1.94	-	-

C. CONSUMER-INDEX & SEARS-INDEX ELIMINATION ROUNDS

<u>INDEX</u>	ROUND - ELIMINATION F-STATISTICS	
	<u>1</u>	<u>2</u>
(1) Consumer Index	3.89	-
(2) Sears Index	9.40*	-

D. ELIMINATION ROUNDS

<u>INDEX</u>	ROUND - ELIMINATION F-STATISTICS	
	<u>1</u>	<u>2</u>
(1) Pre-Deval Fixed Effects	0.68	-
(2) Deval Window	1.27	-
(3) Post-Deval Fixed Effects	2.44	-

TABLE VIIA: MULTI-INDEX REGRESSIONS - 1993-95:

Mexican Financial Groups

Panel A: Two-Index Fixed-Effects Model

Financial Group	$\alpha\%$	$R^2 = 14.3\%$	
		Construction Index	Sears Index
BANACCI A	-.029	0.408***	0.263***
GBMATLA A	-.100	0.051	0.022
GFB A	-.185	0.671***	0.194***
GFINBUR A	0.252	0.191***	0.082*
GFINLAT A	-.360**	-.010	-.032
GFINVER A	-.189	0.024	-.037
GFNORTE B	-.254	0.263***	0.153***
GFPROBU B	-.294**	0.094**	0.375***
GPROFIN B	-.059	-.046	0.051
GSERFIN A	-.201	-.007	0.103**

Panel B: Up/Down Construction Index Betas

Financial Group	$\alpha\%$	$R^2 = 14.8\%$		
		Construction Index		Sears Index
		Down Beta	Up Beta	
BANACCI A	-.112	0.40***	0.40***	0.271***
GBMATLA A	-.234	0.14*	-.02	0.038
GFB A	0.104	0.68***	0.66***	0.198***
GFINBUR A	0.069	0.16*	0.21***	0.080*
GFINLAT A	0.182	0.33***	-.24***	-.026
GFINVER A	-.013	0.15*	-.07	-.026
GFNORTE B	-.696**	0.11	0.35***	0.157***
GFPROBU B	-.058	0.31***	-.04	0.367***
GPROFIN B	-.075	0.02	-.09	0.051
GSERFIN A	-.022	0.12	-.10	0.115**

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level

TABLE VIIB: MULTI-INDEX REGRESSIONS - 1993-96:
Mexican Financial Groups

Financial Group	α %	R ² = 12.1%	
		Construction Index	Sears Index
BANACCI A	-.006	0.403***	0.233***
GBMATLA A	-.057	0.047	-.003
GFB A	-.101	0.701***	0.167***
GFINBUR A	0.204*	0.191***	0.074**
GFINLAT A	-.306**	-.010	-.030
GFINVER A	-.244**	0.029	-.063*
GFNORTE B	-.254	0.263***	0.153***
GFPROBU B	-.116	0.131***	0.352***
GPROFIN B	0.018	-.063	0.061*
GSERFIN A	-.204*	0.018	0.081**

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level

TABLE VIII: MEXICAN BANK'S AGGREGATE SECTORAL-LOAN STATISTICS

<u>SECTOR</u>	<u>MILLION PESOS</u>			<u>PERCENTAGES</u>		
	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
(1) Agriculture	31,713.7	29,963.6	35,980.5	6.21	4.65	5.08
(2) Mining	3,041.5	2,347	2,395	0.60	0.36	0.34
(3) Manufacturing	90,608	108,848.3	196,583.5	17.74	16.89	27.73
(4) Construction	77,450.8	93,632.6	107,228.9	15.17	14.53	15.12
(5) Commercial, restaurants and hotels	192,685.4	231,196.1	213,240.3	37.73	35.88	30.08
(6) Real services, communications, transportation	58,851.3	68,555	74,277.9	11.52	10.64	10.48
(7) Financial Service	19,985.6	20,694.3	13,640.2	3.91	3.21	1.92
(8) Government	17,375.4	32,076.6	35,874.3	3.40	4.98	5.06
(9) External	8,273.2	11,033	12,818.6	1.62	1.71	1.81
(10) Other	0	35,620.5	0	0.00	5.53	0.00
(11) Interbank Credit	10,726.9	20,475.6	16,935.9	2.10	3.18	2.39

Source: Central Bank of Mexico

FIGURE 1: PESO/DOLLAR EXCHANGE RATES OVER THE EVENT PERIOD

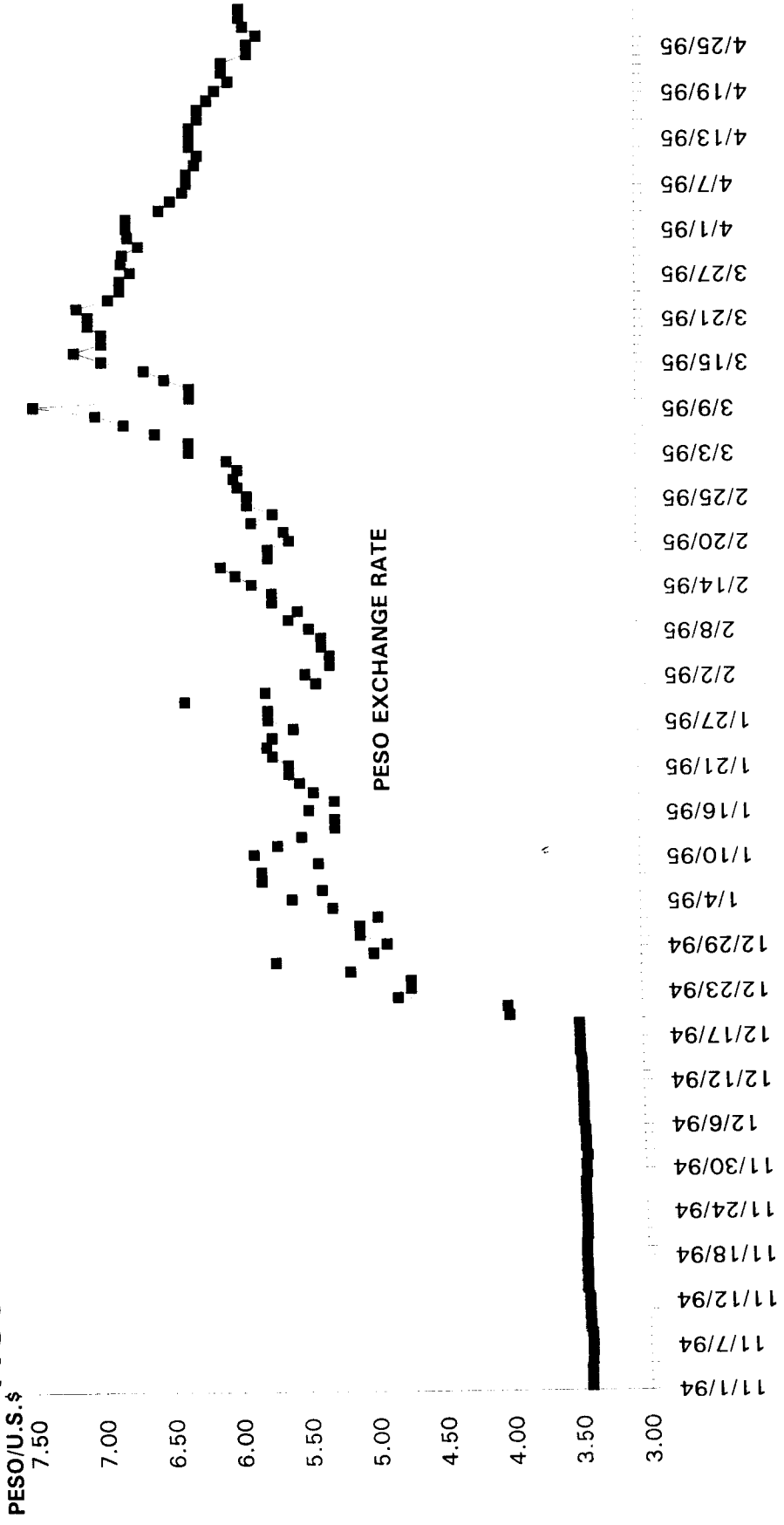


FIGURE 2: MINING AND COMMUNICATION/TRANSPORTATION INDICES

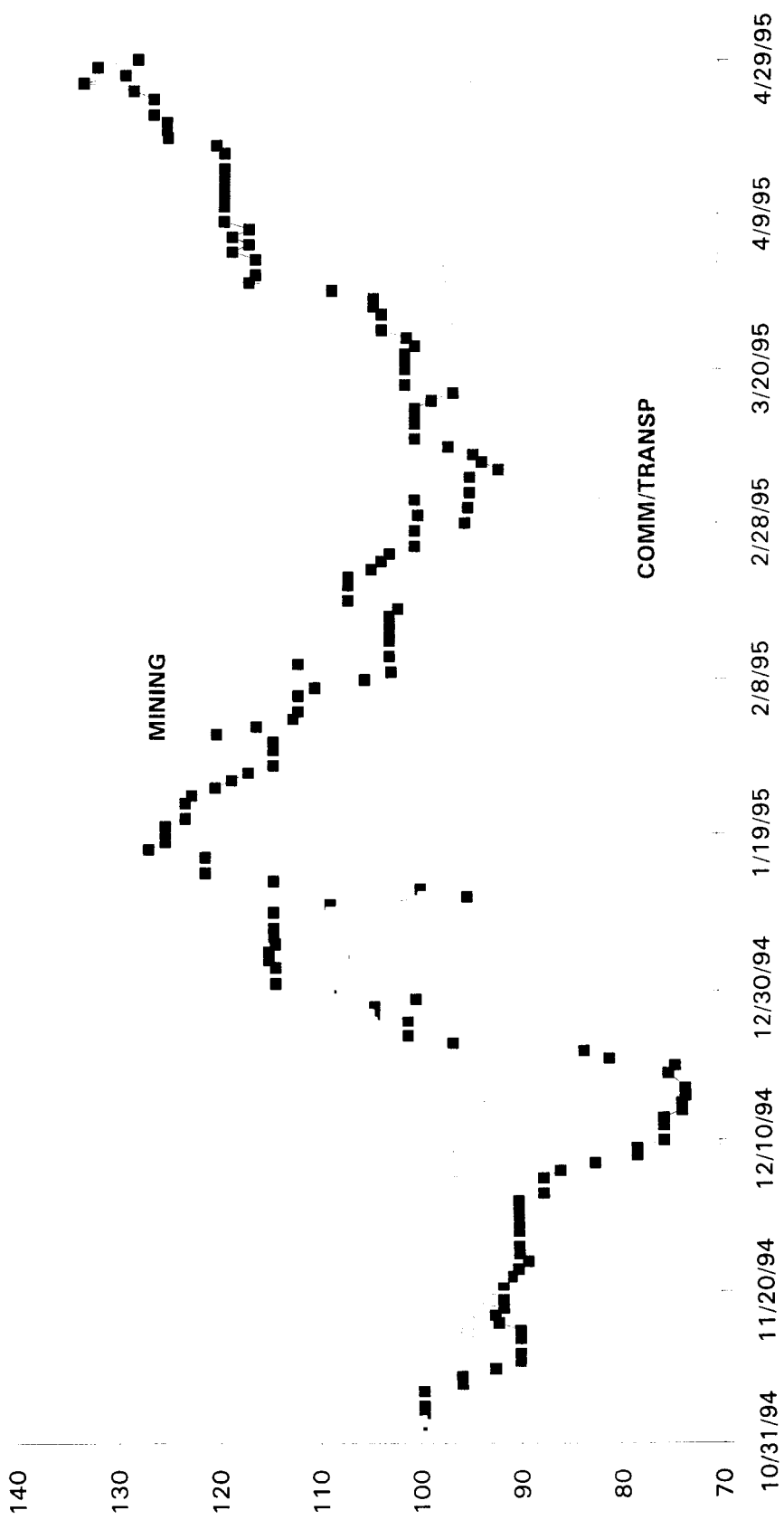


FIGURE 3: MANUFACTURING AND COMMERCIAL SECTOR INDICES

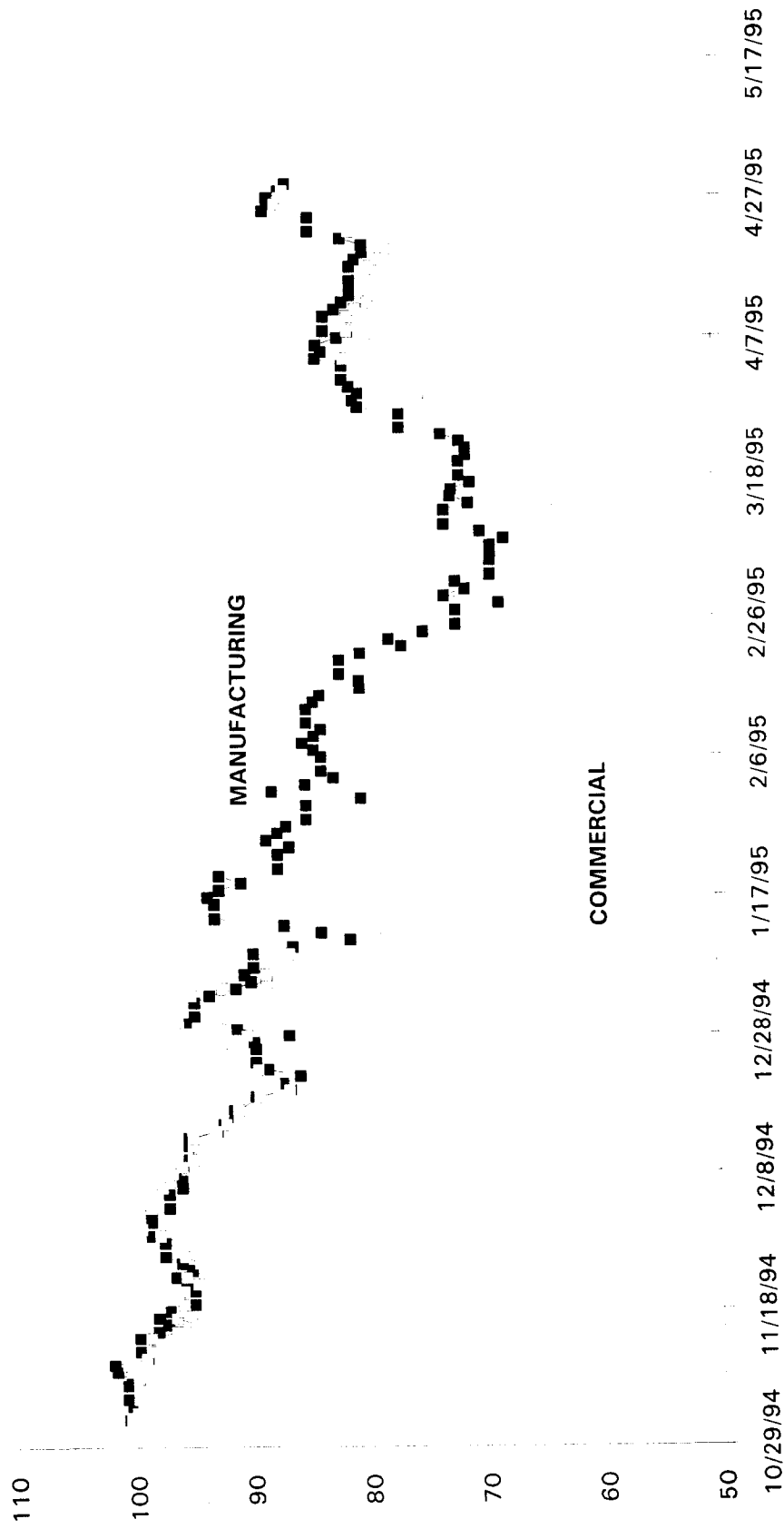


FIGURE 4: CONSTRUCTION AND SERVICE SECTOR INDICES

