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Bank Stock Performance Since The 1970s

Jack Beebe*

Since 1979, a turbulent economy and an environment of deregulation have raised concern over bank risk. In the last two years, the proliferation of problem loans has heightened this concern. The following study presents empirical evidence on risk and returns of the stocks of 82 U. S. bank holding companies with assets over $1 billion each. Judging from stock performance, the post-1979 economic and deregulatory environment, at least until 1982, was not unfavorable to bank holding companies with assets over $1 billion and was favorable overall to those with assets ranging from $1 billion to $10 billion. Since 1982, there has been a sharp downward valuation on average in the equities of the very large bank holding companies—those with assets over $10 billion. Statistical analysis suggests that domestic energy losses and Latin American debt exposures may be largely responsible.

Since 1979, turbulence in financial markets and changes in the regulatory environment have raised concern over bank risk. The five-year span saw two recessions and wide variations in real growth, inflation, and interest rates. Uncertainty also has extended well beyond U. S. markets, as high interest rates, dramatic changes in exchange rates and relative commodity prices, and worldwide economic slumps have helped to bring on potential foreign debt crises.

At the same time that the external economic environment has been volatile, the deregulation of U. S. banking has proceeded at a rapid pace. Beginning with the money market certificate in 1978 and proceeding through the Depository Institution Deregulation and Monetary Control Act of 1980 and the Depository Institutions Deregulation Act of 1982, deposit rate ceilings have been all but eliminated for banks and thrifts while other nonbanking institutions have taken on bank-like powers.

In an earlier paper (Beebe, 1983), the author addressed the question of whether or not the equity risk of large bank holding companies (hereafter, "banks") had increased in the 1979–82 period as a result of the change in the economic and deregulatory environment.[1] That study found that neither the risk nor returns of the stocks of banks with assets over $1 billion seemed to have been affected adversely by the post-1979 monetary and deregulatory environment, at least through mid-1982. On the contrary, the study found some evidence of a decline in risk-sensitivity for the group consisting of the largest banks, those with assets over $10 billion.

Since 1982, bank risk has received renewed notice. Problem domestic loans have prolifer-

*Vice President and Associate Director of Research, Federal Reserve Bank of San Francisco. The author thanks Tom Iben and Maureen O'Byrne for their excellent research assistance and Fred Furlong for many helpful comments and suggestions.

ated, particularly within sectors suffering significant declines in relative prices, such as energy, construction, real estate, agriculture, and timber. Moreover, defaults and reschedulings of loans to foreign corporations and governments have become realities in some cases and sobering possibilities in others. Financial markets weathered the failures of Drysdale Government Securities in May 1982, Penn Square Bank less than two months later, the purchase of Seafirst Corporation by BankAmerica Corporation, and the "failure" of Continental Illinois Bank. During 1984 alone, an estimated seventy-nine commercial banks failed, the largest number in any year since 1938.

In light of these recent developments, the present study looks again at bank equities in the post-1979 environment with an emphasis on the period since 1982. In this study, the equities of 82 major U.S. bank holding companies ("banks") with year-end 1981 assets of over $1 billion are analyzed to determine whether or not the period through September 1984 depicts abnormal risk or returns. For the largest 24 banks, stock returns since 1982 are related statistically to total debt exposures to the Latin American countries of Argentina, Brazil, Mexico and Venezuela.

In the sections that follow, there is first a brief description of the major events that could have affected bank stocks since 1979, then a description of the statistical procedures employed, and finally a presentation of the empirical results and conclusions.

I. Events Since 1979

Since 1979, a number of important developments have unfolded that could have had dramatic effects on the equity risk and returns of large banks. Table 1 gives a chronological list of a number of such events. However, the changing environment of banking is better understood in the context of broader developments. Several such developments have occurred since 1979: (1) From October 6, 1979 through approximately October 1982, the Federal Reserve's short-run operating procedures targeted nonborrowed reserves rather than the federal funds rate or borrowed reserves; (2) the 1979–82 period was characterized by considerable interest-rate volatility; (3) in March 1980, Congress passed the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) which, among other changes, extended NOW accounts to banks and thrifts on a nationwide basis and called for the phase-out of deposit rate ceilings; (4) since 1979, the economic environment has been one of volatile inflation (on the downside as well as the upside) and relative prices (particularly in world commodity markets such as oil), recessions in the U.S. and abroad, and high real interest rates worldwide; (5) the financial environment has seen an increased number of defaults and failures among thrifts, government securities dealers, and banks.

It would have been difficult to say *a priori* how this complex combination of events would affect the equities of large U.S. banks either in absolute terms or in relation to the stock market as a whole. The outcome would have depended not only on how the events actually unfolded, but also on the extent to which banks had anticipated or hedged against them, through *ex ante* portfolio and operational policies, and the degree to which intervention and protection by the regulators was perceived as important by the market. It would have been a plausible belief that turbulence within the economy would have increased the risk and depressed the prices of bank stocks held at the time. However there was no reason to presuppose that bank stocks would have been affected more adversely than the stock market in general. The impact of deregulation on the equities of large banks might have been expected to be positive, because of some combination of reduced risk and/or increased returns (see Beebe, 1983). Whether on balance regulatory protection was perceived to have increased cannot be

TABLE 1
Events Affecting U.S. Banks

October 1979	The Federal Reserve adopted a short-run operating procedure allowing greater short-run variability in the federal funds rate.
March 1980	The Depository Institution Deregulation and Monetary Control Act was signed. Credit controls were imposed through July.
February 1981	Fears of Polish rescheduling began to appear in the press.
April 1981	Polish rescheduling sessions were set for May and June.
June 1981	Agreement was reached on Polish rescheduling.
July 1981	Accounts of problems with the debt of Mexico, Venezuela, and Argentina began to appear in the press.
Late 1981	Problem energy loans became an increasing concern.
May 1982	Drysdale Government Securities defaulted on its interest payments and its parent company, Drysdale Securities, ceased public business in June. Comark (government securities) announced liquidation in June and Lombard-Wall filed for bankruptcy in August.
July 1982	Penn Square Bank in Oklahoma failed.
	Short-term interest rates declined sharply. The market apparently interpreted the decline as easier monetary policy.
August 1982	Mexico declared that it was unable to service its obligations.
October 1982	The market interpreted the Federal Reserve as having eased monetary policy again and having reverted to a short-run operating procedure emphasizing short-run federal funds rate stability.
	The Depository Institutions Deregulation Act (Garn-St Germain Bill) was signed. Among other things, the Act paved the way for the Money Market Deposit Account (MMDA) at banks and thrifts, ultimately approved for December 14, 1982.
November 1982	A tentative IMF proposal to lend $3.8 billion to Mexico was approved. Mexico would require $6.5 billion in new loans over next 13 months, according to an official IMF report.
December 1982	Banks and thrifts were allowed to begin offering MMDAs.
	$5 billion in private credit and $5 billion in IMF loans were approved for Mexico.
January 1983	A lending package was agreed upon for Brazil by private bankers and the IMF.
April 1983	A strong economy and bank earnings were reported for the first quarter. The MMDA appeared to be a positive factor for bank growth and earnings.
May 1983	Brazil did not meet IMF standards, and IMF support of the lending package was withdrawn.
July 1983	Seafirst Corp. shareholders approved the proposed acquisition of Seafirst by BankAmerica Corp.
October 1983	The first indication appeared in the press that Argentina might default by year-end.
November 1983	The IMF approved Brazil's new austerity program.
March 1984	Argentine debt was rescheduled and classified as nonperforming.
May 1984	The first run occurred on Continental Illinois Bank. The FDIC announced that it would guarantee all Continental Illinois deposits.
July 1984	The FDIC announced a proposal to purchase and restructure Continental Illinois Bank.
September 1984	Continental Illinois shareholders approved the FDIC proposal.

determined for sure, but the 1980 rise in the deposit insurance limit from $40,000 to $100,000 certainly was one corroborating factor.[2]

Given the many collinear impacts of questionable direction and degree, the strategy employed below to gauge any change in bank capital risk is to examine the behavior of bank equity risk and returns without offering a full model that explains risk and returns with exogenous variables. As a partial explanation, however, a model is estimated that relates stock returns since 1982 to Latin American debt exposures for the largest 24 banks.

II. Tests for Equity Risk and Return

In the empirical section that follows, bank stock prices are analyzed first in an absolute sense to point out the degree of actual price variation in critical periods. Then, bank stock returns are compared with returns on the S&P 500, which serves as a proxy of the "stock market." The empirics employ the single-index market model from the finance literature. This model postulates that capital risk *sensitivity* can be represented by the equity "beta" or the measured sensitivity of the firm's (or portfolio's) equity return with respect to the return on the market bundle of risky assets (originally, Sharpe, 1963).[3] Precisely because it is measured in relation to an index of risky assets, beta represents sensitivity to commonly experienced, or nondiversifiable (often called "systematic") risk. According to the capital asset pricing interpretation of the single-index market model, assets with a high beta should have a high expected return because such assets have a high degree of nondiversifiable risk (originally, Sharpe, 1964).

In its simplest form, the single-index model is:

$$BK_t = \alpha + \beta\, SP_t + e_t \qquad (1)$$

where

BK_t = percentage return for the individual bank stock over the period t in excess of the risk-free rate of interest. For this study, time periods are monthly intervals and returns are price returns calculated from month-end closing prices, exclusive of dividends and the risk-free rate of interest—that is,

$$\frac{(P_t - P_{t-1})}{P_{t-1}} - R_{\text{risk-free}}\,.^{4}$$

SP_t = percentage return on the S&P 500 in excess of the risk-free rate of interest. Again, returns are monthly price returns using month-end closing prices exclusive of dividends and the risk-free rate of interest. (Calculated as described above for BK.)

α = "excess" or "risk-adjusted" return for the sample period—i.e., in excess of the return earned for taking on nondiversifiable risk, as measured through beta.

β = the elasticity of the bank stock price with respect to the S&P 500 (interpreted as the sensitivity to nondiversifiable or "systematic" risk).

e_t = error term (interpreted as non-market-related, or residual, risk).

For the "average" stock in the S&P 500, the value of beta will be 1.0 by definition. Stocks with true betas above 1.0 carry above average nondiversifiable risk and, according to the capital asset pricing model, will have above average *ex ante* expected returns. Since the model predicts that only nondiversifiable risk will yield positive *expected* returns, the *ex ante* expected value of alpha in the model is zero.[5] However, the *ex post* measured value of alpha may differ from zero because it will reflect the impact of new information (surprises) on the stock's price during the period of estimation.

Several questions can be addressed using the above model. Questions relevant here are: (1) whether the price of bank equity is more or less sensitive to nondiversifiable (or "systematic") risk than the average equity in the S&P 500 (that is, what is the extent to which bank betas are greater than, equal to, or less than one?); (2) whether there are significant shifts in beta;

and (3) whether, during turbulent periods, bank stocks actually have significant *ex post* positive or negative alpha (that is, whether new information leaves positive or negative effects on bank stock prices after adjustments are made for the stock's normal co-movements with the stock market).

Beta gives a measure of *risk* or co-movement with the overall stock market while alpha gives a measure of *return* in excess of that associated with beta. If the market perceives bank equities to be hedged (or protected by government) against systematic risk, bank betas will be low. If the market interprets new information received during the estimation period to be adverse to banks, the estimate of alpha will be negative. New information conceivably could affect both the stock's beta (systematic risk sensitivity) and alpha (value beyond that risk sensitivity). The following analysis focuses primarily on whether or not developments since 1979 have affected these parameters.

III. Empirical Evidence

The data consist of month-end closing common equity prices for 82 bank holding companies ("banks") with total assets over $1 billion as of year-end 1981. Twenty-two of these banks have assets over $10 billion, 17 have assets of $5–10 billion and 43, assets of $1–5 billion.[6] Figure 1 depicts stock-price levels for the S&P 500 and for equally weighted indices of the three bank groups. For the full period of over 12 years, the price returns of equities for the three groups of banks generally have kept up with those of the S&P 500, although there were some subperiods that were marked exceptions.[7]

Some of the most noteworthy of the trends in bank stock prices in Figure 1 are worth highlighting and examining here:

1. All bank stocks and the S&P 500 experienced significant declines in value during 1974. The S&P 500 declined by 34 percent between January and September of 1974, while the bank stocks declined by even more. Moreover, the $1–5 billion and $5–10 billion banks suffered severe and long-lasting downward adjustments in value relative to the S&P 500 and the $10+ billion banks. It is difficult to pinpoint the cause of the long-lasting effect. It could have been due to interest-rate exposures from mortgage holdings, although this conclusion is contradicted by the relatively low betas for these two bank groups (shown later). Disintermediation attributable to consumer deposit-rate ceilings and loan defaults in nondiversified lending portfolios are other possible explanations.
2. From their depressed levels in 1975, the two groups of smaller banks generally performed strongly over the 1976–84 period. This strong performance may have been due to the fact that regional banks benefitted from anticipated and actual deregulation, particularly of consumer deposit rate ceilings.
3. Since early 1983, the group of $10+ billion banks has had a widely different price performance from that of the other two groups. Since May 1983, stocks in the group of $10+ billion banks have declined in price an average of 8 percent, while average stock prices in the $5–10 billion and $1–5 billion groups each have risen 16 percent. It is plausible that the poor performance of the largest banks since early 1983 resulted from increasing investor concern over foreign loans.

Although the indices in Figure 1 give an overall picture of the performance of large bank equities over the 12-year period, it is possible to use the market model to separate the risk and return measures of bank-stock performance. Table 2 gives estimates of bank stock betas for the full twelve-year period and for subperiods of approximately three years in length. Despite uncertainty as to a representative estimate of beta in the 1979–81 period (see the footnote to the table), it is apparent that the $10 billion and $5–10 billion banks tend to have average betas above one and the $1–5 billion banks, below one. Moreover, beta tended on average to decline in the middle of the period for all three groups and then to rise again for the two groups of largest banks.

As described in the introduction, bank stock prices did not seem to reflect increased bank risk until about 1982, when domestic and international lending risks became paramount. To test for more than one shift in the post-1979 environment relative to the 1972–79 period, the following variation of the market model [Equation (1)] allows both alpha and beta to shift at 1979:10 and again at 1982:01:

$$BK_t = \alpha_0 D_0 + \alpha_1 D_1 + \alpha_2 D_2 + \beta_0 (SP_t) + \beta_{S1} (SP_t \times D_1) + \beta_{S2} (SP_t \times D_2) + e_t \qquad (2)$$

where

D_0 = one for 1972:08 – 1979:09 and zero thereafter.

D_1 = one for 1979:10 – 1981:12 and zero otherwise.

D_2 = one for 1982:01 – 1984:09 and zero otherwise.

$\alpha_0, \alpha_1, \alpha_2$ = the estimates of alpha for the 1972:08–1979:09, 1979:10–1981:12, and 1982:01–1984:09 periods, respectively.

β_0 = the estimate of beta for the 1972:08–1979:09 period.

Figure 1

Monthly Stock Levels 1972.07 To 1984.09
(month-end price levels, excluding dividends)

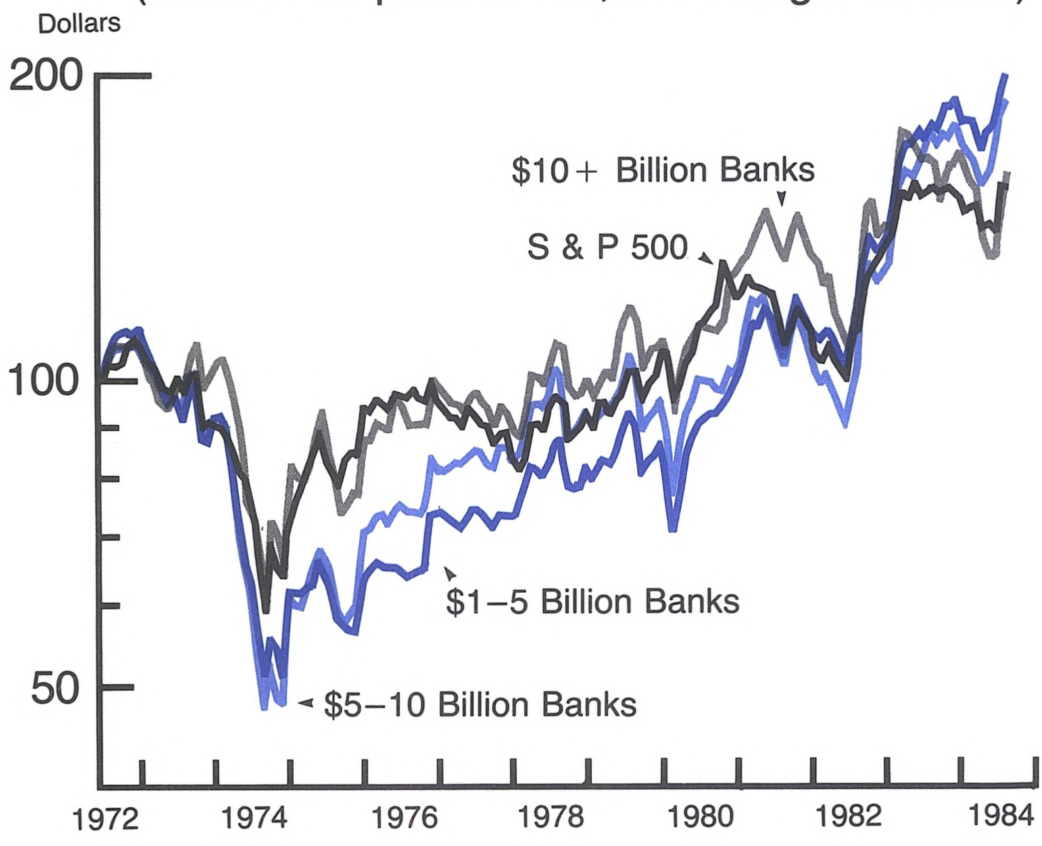


TABLE 2
Betas for Bank Stocks, 1972:08–1984:09
Mean Estimates from Individual Bank Regressions

	72:08–84:09	72:08–75:12	76:01–78:12	79:01–81:12	79:01–81:12[1]	82:01–84:09
All Banks	.93	1.00	.88	.78	1.13	.98
$10+ Billion	1.06	1.19	1.07	.64	1.00	1.23
$5–10 Billion	1.03	1.06	1.01	.87	1.22	1.14
$1–5 Billion	.83	.87	.73	.81	1.16	.78

[1]Beta for the boxed-in period is estimated for the 36 months, 1979:01–81:12, excluding the 12 months 1980:07–81:06. During the excluded 12-month period, bank stocks moved contrary to the S&P 500 in a way that gives spurious and misleadingly low estimates of the bank stock betas. For the excluded 12-month period, mean betas were −.07, −.22, .01, and −.02 for the four groups, respectively, and median $\bar{R}^2$ values were zero or negative. Median $\bar{R}^2$ values for all estimates shown in the table ranged between .20 and .54.

TABLE 3
Risk and Returns of Bank Stocks
Mean Coefficient Values and Median Test Statistics
From Individual Bank Regressions
1972:08–1984:09 with Shifts at 1979:10 and 1982:01

	α_0	α_1	α_2	β_0	β_{S1}	β'_{S1}[1]	β_{S2}	$\bar{R}^2$	σ_e
All Banks	0.0%	0.3%	0.4%	.97	−.20	.22	.01	.30	6.8%
	(.02)	(.30)	(.60)	(6.22)*[2]	(−.45)	(.61)	(.04)		
$10+ bil	0.3	0.1	−0.4	1.15	−.57	−.17	.08	.39	6.4
	(.47)	(.18)	(−.25)	(8.04)*	(−2.13)*	(−.63)	(.12)		
$5–10 bil	0.1	−0.1	0.7	1.05	−.18	.25	.09	.33	6.9
	(.01)	(.00)	(.72)	(5.89)*	(−.45)	(.86)	(.17)		
$1–5 bil	−0.2	0.5	0.8	.84	−.02	.40	−.06	.26	7.1
	(−.29)	(.41)	(.77)	(5.38)*	(.07)	(1.15)	(−.17)		

Coefficient values reported are means of the estimated values for the individual bank regressions in the group. Other statistics reported are median values. Figures in parentheses are median t-statistics from the individual bank regressions in the group. Asterisks denote significance of the median t-statistic at the 90% confidence level (one-tailed test for β_0 and two-tailed test for alphas and for β_{shifts}). β_{shift} values and their t-statistics are relative to the base period β_0 value. Alpha values and t-statistics are relative to zero. Alpha values and the standard error of the estimate are expressed as monthly percentage rates of change at monthly rates.

[1]Beta shift for the boxed-in period is estimated for the 1979:10–1981:12 period, excluding 1980:07–1981:06. See the note to Table 2.

[2]Median t-statistics for β_0 using H_0: $\beta_0 = 1.0$ are −.31, .73, −.09, and −.71 for the four groups, respectively. Therefore, median β_0 estimates do not differ significantly from 1.0, the (weighted) average beta for the S&P 500.

β_{S1} = the estimate of beta for 1979:10–1981:12 relative to β_0 (that is, beta shift for the second period).

β_{S2} = the estimate of beta for 1982:01–1984:09 relative to β_0 (that is, beta shift for the third period relative to the first period).

Equation (2) was estimated separately for each of the 82 bank holding companies. Table 3 presents mean estimates of the coefficients in Equation (2) and median estimates of the test statistics for the groups of individual banks.[8] For the $10+ billion banks, the mean beta was 1.15 in the pre-October-1979 period, a figure that is well above the weighted average beta of 1.0 in the S&P 500.[9] For the $10+ billion banks, beta declined in the period between 1979:10 and 1981:12 (the decline being significant if the 12-month 1980:07–1981:06 period is included), but then rose again in the post-1981 subperiod. For the other two groups, there is no evidence of a significant shift in beta. Even for the $10+ billion banks, it is hard to conclude that beta shifted significantly given the uncertainty inherent in the 1979:10–1981:12 estimate of beta.[10]

New information received about a bank could affect the estimates of both beta and alpha. However, if a bank were to announce that some of its loans had just become subject to certain default, it is possible that beta might be largely unaffected while alpha would be affected negatively because the market value of the bank's capital would decline by the present value of the default.[11] As predicted by the efficient market hypothesis and the capital asset pricing model, investors' *ex ante* expectations of alpha are that it will be zero over any future period. However, *ex post* observations could exhibit positive or negative alpha depending on new information received during the holding (estimation) period.

Estimates of alpha are reported in Table 3. As expected for fairly long periods, median t-statistics for the alpha estimates indicate that alpha is insignificant.[12] However, even though alpha is insignificant, a value that differs from zero can have a large cumulative effect. In Figure 2, the cumulative effect of alpha (and the error term) is plotted over the 1982:01–1984:09 period. In the table, the actual stock price for each index is plotted against a "market-related" price, where the latter is that price that would compensate stockholders for market-related risk, as hypothesized by the capital asset pricing model. The "market-related" returns are calculated as follows:[13]

$$\hat{BMR}_{tj} = \hat{\beta}_j \times SP_t \qquad (3)$$

where

$\hat{BMR}_{tj}$ = estimated "market-related" return at month t for the jth individual bank (or bank group)

$\hat{\beta}_j$ = estimated beta for the jth bank (or bank group) over the 1982:01–1984:09 period (β_0 plus β_{S2} in Equation (2))

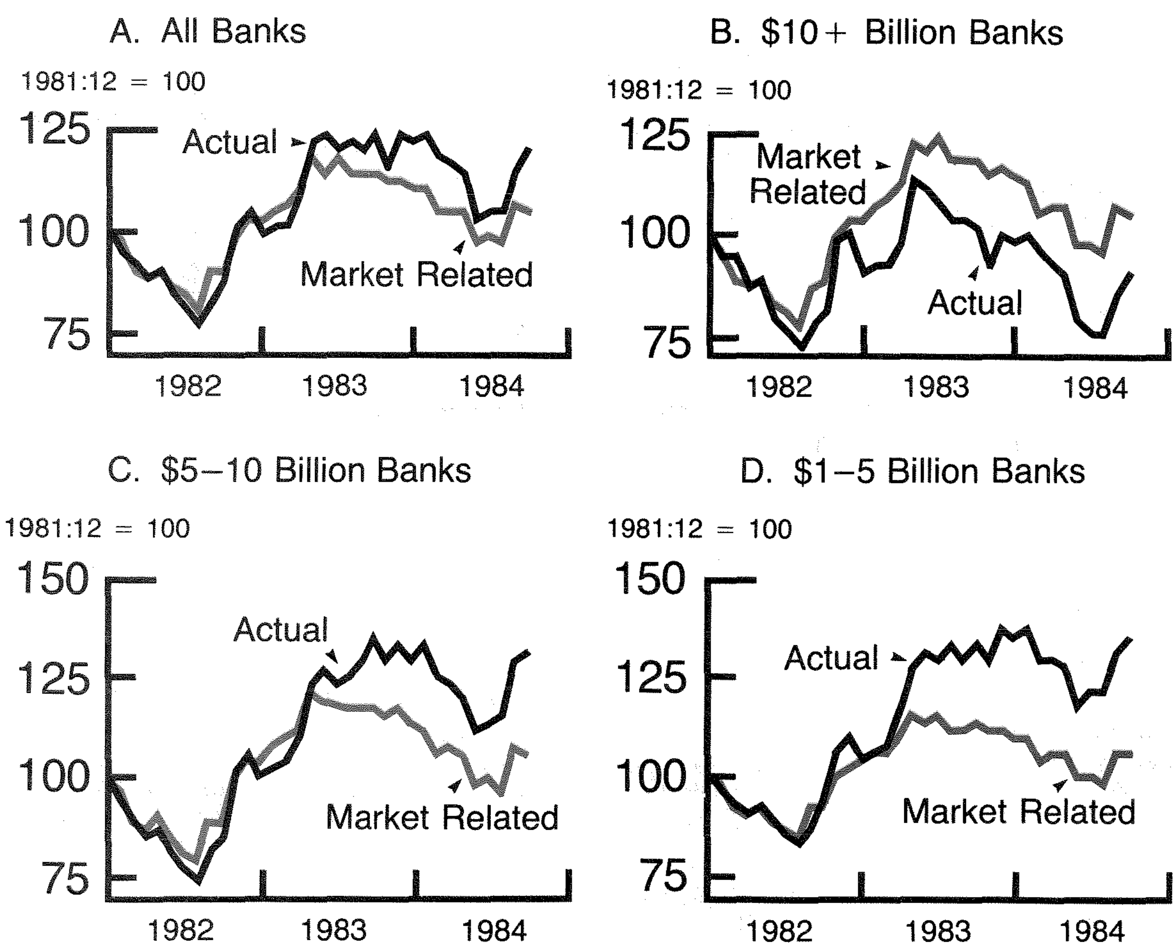
SP_t = the actual return for the S&P 500 at month t

The vertical spread at a point in time between the two series in each frame of Figure 2 is interpreted as the cumulative effect of new information unrelated to beta from 1981:12 up to that point. The group of $10+ billion banks performed worse than would have been required to compensate for their beta and movements in the S&P 500, while the other two groups performed better than their betas and S&P 500 movements would have suggested. Much of the differentials in performances occurred in early 1983.

The strong performances within the $1–5 billion and $5–10 billion groups suggest that the sharp decline in interest rates between July and November 1982 and/or further deregulation of consumer deposits (the money market deposit account, MMDA, of December 1982) may have been instrumental in raising the market's valuations of these banks. When the MMDA was first implemented, regional banks that did not have access to the prime national CD market maintained that the new account would lower their marginal costs of funds. Many of these banks normally had paid well above the national rates for jumbo CD's, holding company paper, and other marginal funds, and the MMDA would attract marginal funds at a substantially lower rate. (In contrast, many small banks and thrifts claimed that, although the MMDA might lower their marginal cost of funds, it might also raise the average cost of funds since they still had considerable amounts of 5½ percent passbook savings accounts on the books. Thus, for small banks and thrifts not included in this study, the MMDA might have resulted in a negative alpha.)

The fact that the $10+ billion banks had a negative alpha over the 1982:01–1984:09 period while the other two groups had positive average alphas suggests that there is some factor distinguishing the group of largest banks from the other two groups. One possibility is that foreign loan exposures of the largest banks may have affected their stock prices significantly since 1982. As a test of this hypothesis, the following regression was run on a cross-section of the largest 24 banks—the 22 banks in the $10+ billion group plus the two largest banks in the $5–10 billion group.[14]

Figure 2
Bank Stock Price Levels —Actual vs. Market-Related



$$\hat{\alpha}_2 = a + b \frac{\text{Latin loans}}{\text{Capital}} + e \qquad (4)$$

where

$\hat{\alpha}_2$ = the individual bank alpha for 1982:01–1984:09 as estimated by Equation (2) (see Appendix Table A1 for data across the top 22 individual banks).

$\frac{\text{Latin loans}}{\text{Capital}}$ = total loan exposures to Argentina, Brazil, Mexico, and Venezuela for March 31, 1984, divided by primary bank capital for the same date (see Appendix Table A1 for the data).

The results of the cross-section fit for Equation (4) appear in the first line of Table 4. The ratio is insignificant and the $\bar{R}^2$ is about zero. However, two banks of the twenty four were extreme outliers in the pattern of residuals, both with heavy domestic energy loan exposures. When the aberrant residuals of these two banks were "explained" by a single zero-one dummy, the Latin American loan exposure ratio became significant and the $\bar{R}^2$ rose to .65 (the second line in Table 4).

The value of the Latin American loan coefficient in the second line of Table 4 indicates that a Latin loan/capital ratio of 1.0 instead of zero would have lowered the average monthly stock price return over the 1982:01–1984:09 period by 1.03 percent per month. For the full 33-month period, the overall compounded effect would have been a 40-percent negative impact on a bank's stock price. Equally important, the dummy for the two banks with heavy energy loan exposure is also large and highly significant— −3.2 percent per month. This result, together with significant negative α_2 values for Seafirst and Continental Illinois of −5.1 percent and −5.8 percent per month (in Appendix Table A1), suggests strongly that the problems of banks with the largest negative performances were related to energy loans rather than to Latin American debt exposure. This conclusion is not surprising, since the energy loan problem resulted in a sizeable number of actual defaults and chargeoffs while the foreign lending problem up to this point has resulted primarily in reschedulings and fears of default. Moreover, because the foreign loan problem affects almost all large banks, the market might expect more government protection in the event of a crisis than with the energy loan problem.

Table 4
Latin Loan Exposure Related To Alpha for 1982:01–1984:09
Estimated Across the Largest Twenty-Four Banks for March 31, 1984

Constant	Latin Loans / Capital	Dummy	$\bar{R}^2$	σ_e
-.01	−.33	—	−.02	1.06
(.01)	(−.72)			
.94	−1.03	−3.22	.65	0.62
2.88	(−3.53)	(−6.61)		

The Latin loan exposure ratio consists of total non-local-currency loans to Argentina, Brazil, Mexico and Venezuela as reported in the March 31, 1984, country exposure report (FFIEC-009(a)) divided by primary bank capital as of March 31, 1984 (FDIC Call Report). (See Appendix Table A1 for the data.) The dependent variable is α_2 in Appendix Table A1.

The dummy is one for InterFirst, Dallas, and First City, Houston, and zero otherwise. It is used to capture major energy-loan exposure.

In addition to the 22 banks in the \$10+ billion size group (Appendix Table A1), the two largest banks in the \$5–10 billion group were included—North Carolina National Bank Corp. and Republic New York Corp. They had α_2 values of 1.3 percent and −0.6 percent and Latin loan/capital ratios of .19 and .55, respectively (lead-bank loan exposure divided by lead-bank primary capital).

It is illuminating to estimate how the stocks of the 22 banks in the \$10+ billion size group might have performed had they had no Latin American loans. For the 22 largest banks, the average Latin loan/capital ratio is 1.02. This suggests that Latin American loans had an impact on the average α_2 for the \$10+ billion size group of -1.1 percent per month (-1.03×1.02). The average estimated α_2 for the \$10+ billion banks in Table 3 was -0.4 percent per month. Without Latin American loans, therefore, α_2 might have been 0.7 percent per month ($-0.4\% + 1.1\%$), or exactly in line with the estimates of α_2 of 0.7 and 0.8 percent per month for the other two bank groups.

These crude estimates imply that once the major energy lenders are omitted, the estimate of the effect of Latin American loan exposures (obtained from a cross-section estimate within the \$10+ billion size group) explains the α_2 differential between this group and the other two groups. (Banks within the other two groups tend to have little or no Latin American exposure.)

IV. Conclusions

In the early post-1979 period (1979:10–1981:12), considerable uncertainty was found in the estimated values of beta—a measure of the sensitivity of equity returns to systematic, or nondiversifiable, bank risk. By the latter part of the post-1979 period (1982:01–1984:09), average beta values were close to the values that prevailed over the 1972:08–1979:09 period. We can conclude that the post-1979 period of economic and monetary uncertainty and financial deregulation has had no significant impact on average on the betas of bank holding companies with assets over \$1 billion. The largest banks (\$10+ billion) still have betas that average well over 1.0, while the smaller banks (\$1–5 billion) have betas that average well below 1.0.

Judging from stock price performance, we can conclude that, at least until 1982, the post-1979 economic, monetary, and deregulatory environment was not unfavorable on average to banks with assets over \$1 billion, and may have been favorable overall to bank holding companies with assets ranging from \$1 billion to \$10 billion. However, since 1982 there has been a sharp downward valuation, on average, in the equities of the very large bank holding companies, those with assets over \$10 billion. Crude statistical analysis suggests that the negative performance of the \$10+ billion bank holding companies is explained by domestic energy loan losses and Latin American debt exposures.

Once the banks with very heavy loan losses are removed from the sample of largest banks, a highly significant relationship across banks appears between negative stock performance (negative alphas) in the post-1981 period and total debt exposures to the Latin American countries of Argentina, Brazil, Mexico, and Venezuela. On average, this negative relationship is enough to account for the poor stock performance of the 22 bank holding companies with assets over \$10 billion, taken as a group, as compared to the 60 other bank holding companies with assets of \$1 billion to \$10 billion, which tend to have little Latin American debt exposure.

There are two caveats to keep in mind regarding the evidence in this study. First, it might be very misleading to extrapolate the results to smaller bank holding companies (say, with assets under \$500 million) or to thrifts. These institutions normally have very different portfolios and markets than do the large bank holding companies. Second, it is plausible that an increase in implicit regulation or government protection has affected the stock prices of large bank holding companies since 1979. Certainly, the increase in the deposit insurance limit from \$40,000 to \$100,000 in March of 1980 had a favorable impact. But we cannot be sure of the market's perception, on balance, of other changes in regulatory protection, such as the explicit policy changes of the FDIC, first to a partial payout on large deposits and then to *de facto* protection of all deposits and even nondeposit liabilities in the case of Continental Illinois.[15]

APPENDIX Table A1
Risk and Returns of Bank Stocks, $10+ Billion Banks, Reported Individually 1972:08–1984:09 with Shifts at 1979:10 and 1982:01

Bank Holding Company	α_0	α_1	α_2	β_0	β_{S1}	β'_{S1}[1]	β_{S2}	$\bar{R}^2$	σ_e	Latin Loans[2] / Capital (3/31/84)
BankAmerica Corp.	0.5%	-1.7%	-1.2%	1.19*	-1.13*	-1.09*	.02	.35	6.7%	1.21
Citicorp	-0.1	-0.2	0.4	1.26*#	-.55*	-.30	.32	.47	6.1	1.11
Chase Manhattan	-0.3	0.5	-1.3	.88*	-.26	-.07	.60*	.29	7.0	1.39
Manufacturers Hanover	0.3	-0.6	-1.0	1.20*	-1.00*	-.60	-.03	.32	7.1	2.05
J. P. Morgan	0.2	-0.6	0.1	1.16*	-1.21*	-.84*	-.04	.41	5.7	1.08
Chemical New York	0.0	0.6	0.1	1.18*	-.72*	-.25	-.13	.34	6.6	1.31
First Interstate	0.9	0.0	-0.4	1.38*#	-.73*	-.29	-.25	.38	7.0	.51
Bankers Trust	-0.1	1.2	0.5	1.11*	-.32	.35	.28	.41	6.2	1.25
First Chicago	0.2	-0.1	0.2	1.43*#	-.67*	-.13	.06	.40	7.4	.93
Security Pacific	0.4	0.4	0.5	.97*	-.66*	-.02	.56*	.31	6.9	.57
Wells Fargo	0.6	-1.1	0.9	1.51*#	-1.08*	-.49	-.28	.44	6.8	1.14
Crocker National	0.4	-0.5	-1.3	1.39*#	-.87*	-1.07*	-.52	.34	7.4	1.78
Marine Midland Banks	-0.5	1.2	-0.1	.61*#	1.34*	1.60*	.54	.27	8.1	1.16
Mellon National	0.6	0.1	-0.3	1.15*	-.48*	-.20	.09	.40	6.1	.80
Irving Bank Corp.	0.1	0.7	-0.4	.89*	-.51*	-.14	.01	.36	4.9	1.55
InterFirst, Dallas	0.4	0.6	-2.7*	1.26*#	-.87*	-.34	-.13	.38	6.6	.52
Northwest Bancorp., Minn.	0.4	-1.1	-0.3	1.32*#	-.89*	-.57*	.23	.46	6.1	.86
Texas Commerce, Houston	0.6	1.5	-0.2	.89*	-.29	.20	.08	.30	5.8	.85
Republic of Texas, Dallas	0.8	1.3	-1.2	1.62*#	-1.12*	-.39	-.44	.43	7.3	1.19
First City Bancorp, Houston	0.4	1.6	-2.7*	1.18*	-.27	.20	.60*	.43	6.9	.31
NBD Bancorp., Detroit	0.4	-2.0*	1.2	.87*	-.46*	-.06	.31	.45	4.6	.25
Bank of New York Co.	-0.1	0.4	0.6	.87*	.19	.69*	-.14	.33	5.7	.72
Addendum (excluded from $10+ billion bank index)										
Seafirst Corp. (through 6/83)	0.7	-0.6	-5.8*	.94*	-.50	-.14	.45	.27	7.4	—
Continental Illinois (through 9/26/84)	0.4	-0.2	-5.1*	1.30*	-1.16*	-.87*	.78*	.38	8.4	.72

Alpha values and the standard error of the estimate are expressed as monthly percentage rates of change at monthly rates. Asterisks denote significance at the 90-percent confidence level (one-tailed test for β_0 and two-tailed tests for alphas and for β_{shifts}). β_{shift} values and t-statistics are relative to the base period β_0 value. Alpha values and t-statistics are relative to zero. #Denotes that β_0 is statistically different from 1.0 at the 90-percent confidence level (two-tailed test).

[1]Estimates of beta in the boxed-in area are for 1979:10–81:12, excluding 1980:07–81:06 (see the note to Table 2).

[2]The ratio for First Interstate was supplied directly to the author by the holding company and it represents holding company Latin American loans divided by holding company capital. The other ratios in the column must be read with caution. Latin American loan figures are from the country loan exposure report; all of the institutions reported on a lead-bank basis except Citicorp, Bankers Trust, NBD Bancorp, and Continental Illinois which reported loans on a holding company basis. The denominator for all ratios in the final column, except that of First Interstate, is primary capital of the lead bank. The proper ratio in all cases would treat both loans and capital on a holding company basis. BankAmerica owns Seattle First Bank. First Interstate, InterFirst, Northwest, Texas Commerce, Republic of Texas, First City and NBD are all multibank holding companies.

Source: Equation (2) in the text. Latin American loan exposure is total non-local-currency loans to Argentina, Brazil, Mexico, and Venezuela as of March 31, 1984 (country loan exposure report, FFIEC-009(a)). Capital is primary bank capital from the March 31, 1984, FDIC Call Report.

FOOTNOTES

1. From October 6, 1979, through mid- to late-1982, the Federal Reserve's operating procedures were directed explicitly toward controlling nonborrowed reserves over the short-run while allowing the federal funds rate to fluctuate over a relatively wide range. In other periods, the Fed has tended to hold the short-run variability of the federal funds rate to within a narrow band.

The deregulation of banking, particularly deposit-rate deregulation and the extension of checkable deposits to thrifts, was greatly accelerated by passage of the Depository Institutions Deregulation and Monetary Control Act of March 1980 (DIDMCA). Passage of such a bill became anticipated by the market as early as late-1979. Over the 1980–83 period, deposit rate ceilings on consumer accounts at banks and thrifts were effectively eliminated. The Depository Institutions Deregulation Act of October 1982 (Garn-St Germain Act) furthered deposit rate deregulation by requiring that the Depository Institutions Deregulation Committee create an account at banks and thrifts that would be competitive with money market mutual funds. The Act also gave the regulators more leeway in arranging takeovers of failing banks and thrifts, and put into legislation much of the deregulation of thrift holding company powers that had been implemented by the Federal Home Loan Bank during 1982.

2. For evidence on the effect of regulatory protection, see Brickley and James, 1984.

3. In theory, the market bundle of risky assets should include bonds, real estate, and other forms of wealth. However, empirical tests of the market model almost always use a broad stock market index such as the S&P 500 because reliable market-value indices of other risky assets are not available.

4. Dividends paid out during a particular month should be included with price returns to obtain total returns. Because of data limitations, dividends are omitted from the bank stock returns throughout the study. For consistency, they also are omitted from S&P 500. The exclusion of dividends affects average returns and estimates of alpha, but it has little effect on the estimated betas because almost all of the monthly variations in total stock returns are in the prices.

The capital asset pricing model specifies that the relationship between returns in Equation (1) will be linear as long as returns are specified in excess of the "risk free" rate. Thus, all returns of the bank stocks and the S&P 500 in the empirical analysis are net of the return from holding to maturity Treasury bills which, at the beginning of the month, have only one month left to maturity. The Treasury bill with one month to maturity gives the purest risk-free one-month rate of interest because it is free of default and interest-rate risk. Data for the one-month risk free rate through 1982 are from the CRSP database, University of Chicago, with 1983–84 updates constructed by the author.

5. Where dividends are ignored, the *ex ante* expected value of alpha will be the dividend differential between the bank stock and the S&P 500.

6. The $10+ billion group includes the population of bank holding companies within that size class, with the exceptions of Seafirst Corp., which was acquired by BankAmerica Corp. in July 1983, and Continental Illinois which failed in the Summer of 1984 and was re-formed in September 1984. (BankAmerica Corp. equity excludes Seafirst prior to July 1983 and includes it thereafter.) Separate results are reported in Table A1 for Seafirst (through July 1983) and for Continental Illinois through September 26, 1984.

The $5–10 billion and $1–5 billion groups are samples of the populations in those size classes, where the choice of bank holding companies in each group depended on data availability. Data are from the Data Resources DRI-SEC database. They were screened by the author to correct errors and to exclude bank holding companies for which trading appeared to be infrequent.

7. Because dividends of the bank stocks were not available, returns throughout (including the S&P 500) exclude dividends. To the extent that bank stock dividends differed from those of the S&P 500, total return differentials would differ from those implied by Figure 1. The author can only infer the possible bias introduced by omitting dividends from the fact that the estimated alphas for the three bank groups over the full period are very close to zero. This fact suggests that the omission of dividends does not affect average return differentials significantly. See Footnote 5. Estimated mean alpha values over the full 1972:08–1984:09 period for the three bank groups are 0.1 ($10+ billion banks), 0.2 ($5–10 billion banks), and 0.1 ($1–5 billion banks), with median t-statistics of .27, .30, and .30 respectively.

8. Since the paper focuses on the average results of *individual* banks, the regressions are run on individual bank data and the mean coefficients of the individual bank regressions are reported for each group. Grouping the banks into portfolios and then running one regression for each group would seriously overstate the t-statistics because grouped data would reduce the standard errors by diversifying away much of the variance in individual bank data. Median test statistics ($\bar{R}^2$, σ_e, and t-statistics) are reported for the same groups of individual bank regressions. Medians are used for test statistics because mean test statistics are not appropriate for confidence tests such as the t-test.

9. As noted in the footnote to Table 3, the median beta value is insignificantly different from 1.0.

10. For earlier hypotheses and tests of the beta for large money center banks, see Beebe, 1977 and 1983.

11. Beta would rise if the default changed the systematic risk-sensitivity of the remaining portfolio. It also would rise somewhat because the market value of capital would decline and hence capital leverage would rise. For a given systematic risk of bank assets and liabilities, beta of the bank's equity is sensitive to equity leverage.

12. The longer the estimation period for alpha, the more likely the estimate is to be zero. There are two reasons for

this result: (1) any mispricing of securities (that is, market inefficiency) is likely to be very short-lived; and (2) the longer the time period, the less likely it would be for new information to be serially correlated. For isolated banks, alpha estimates in Table 3 are significant in some cases. See Appendix Table A1.

13. The "market-related" price levels for the indices in Figure 2 are calculated by setting the price level in 1981:12 equal to 100 and then cumulating the monthly market-related returns that are derived from Equation (3).

14. The 24 banks in the cross-section sample include the 22 banks in the $10+ billion size group (Appendix Table A1) plus North Carolina Bank Corporation and Republic New York Corporation, which are the two largest banks in the $5–10 billion group. Seafirst and Continental Illinois are excluded from the sample.

15. For an analysis of the market's perception of spillover effects from Continental Illinois, see Furlong, 1984.

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Current Fiscal Policy: Is it Stimulating Investment or Consumption?

Adrian W. Throop*

Although a major objective of current fiscal policy is to stimulate capital formation and productivity growth, the policy is internally inconsistent for this purpose. On the one hand, investment in plant and equipment has been promoted by accelerated depreciation allowances and liberalized investment tax credits. On the other, the cost of capital is being raised by the impact of large federal demands for credit on interest rates. Econometric simulations of the effects of alternative fiscal policies indicate that the net effect of current fiscal policy is actually to stimulate consumption rather than investment.

In 1981, the Reagan Administration embarked upon a bold program for dealing with the problems of high inflation and stagnant economic growth. Over the two previous decades, the inflation rate in the U.S. economy had risen from near zero to double digit levels, and the rate of growth of labor productivity had fallen from an average of around 2.5 percent per year in the 1950s and early 1960s to about 0.5 percent in the late 1970s. The Administration's program consisted of tax and spending reductions as well as regulatory reform to stimulate saving, investment and work effort, and a commitment to monetary stability to bring the rate of inflation down.

A main feature of the Administration's fiscal policy was the set of tax incentives for business investment provided in the Economic Recovery and Tax Act of 1981. However, these tax incentives alone could not stimulate more capital formation in plant and equipment without reducing other kinds of investment unless greater saving were forthcoming. The Economic Recovery and Tax Act of 1981 therefore also contained a reduction of personal income tax rates by a cumulative 23 percent over three years, partly on the theory that the resulting decline in marginal tax rates would stimulate a large increase in the private saving rate.

The actual outcome has been quite different, however. "Bracket creep," caused by rising nominal incomes, made the actual cut in marginal tax rates for households considerably less than 23 percent. Also, a rise in the after-tax return to saving due to tax cuts may theoretically either increase or decrease the saving rate; and since 1981 the private saving rate (personal plus business) has been relatively stable.[1] Finally, the large budget deficits resulting from tax cuts and spending increases has meant a fall, rather than a rise, in the national saving rate (private plus government). As a result, real interest rates have been bid up, and capital has been attracted from abroad. Although foreign capital inflows reduce the pressure on domestic real interest rates, the fact remains that these higher real rates have tended to offset the stimulatory effect of the tax incentives for business investment.

*Senior Economist, Federal Reserve Bank of San Francisco. Research assistance was provided by Sharon Tamor and Roger Weatherford.

To provide a perspective on the net impact that the Reagan Administration's fiscal policy is actually having, this article measures the permanent effect of fiscal policy on investment and consumption by simulating its effects with an econometric model. The simulation results indicate that current fiscal policy is actually "pro-consumption" rather than "pro-investment." Because the private saving rate is estimated to be only modestly affected by the tax cuts, the net effect of the tax cuts has been to stimulate consumption. The expansion in consumption is being financed largely by borrowing from abroad, with the counterpart of this being a decline in net exports. The effect on business investment in plant and equipment is about neutral, as increases in real interest rates almost exactly offset the stimulus to investment. Current fiscal policy, however, is not neutral in its effects on other types of investment as it is tending to reduce residential and inventory investment.

The article is organized as follows. Section I describes a procedure for estimating the permanent effect of fiscal policy on the consumption-investment mix. In Section II, the change in fiscal policy occurring since 1981 is measured in terms of changes in average tax rates, marginal tax rates, and expenditures of the federal government. In Section III, we provide a thumbnail sketch of the econometric model that is used for simulating the effect of this change in fiscal policy. This description stresses the responses of various sectors to real after-tax interest rates. A more detailed description of the model can be found in the Appendix. Although this model is relatively small, its key relationships are similar to those embodied in most large-scale structural econometric models. In Section IV, we perform two experiments in counterfactual history, corresponding to two alternative fiscal policies that might have been followed. The first of these shows the effect on the consumption-investment mix of a continuation of fiscal policy as it existed at the beginning of 1981. In addition, we consider the consumption-investment mix resulting from the same tax cuts for business, but with no change in the aspects of fiscal policy that affect federal spending on goods and services and personal taxes and transfer payments. Lastly, in Section V we present a summary of the results and some policy conclusions.

I. Theoretical Analysis of the Effect of Fiscal Policy

When analyzing the effects of fiscal policy on the consumption-investment mix of the economy, it is important to distinguish between possible temporary impacts and permanent ones. The temporary effects of an increase in the fiscal deficit depend upon the policy response of the Federal Reserve. Increased demands for credit flowing from a larger fiscal deficit put upward pressure on real interest rates. The Federal Reserve can temporarily alleviate this pressure by supplying more funds to the credit markets through the creation of a larger stock of money. At some point, however, the expansion of aggregate demand resulting from the monetary accommodation of fiscal deficits generates a higher level of prices, which then reduces the real stock of money and pushes real interest rates back up. Given the economy's capacity to produce, the level of real activity will ultimately be no different, but real interest rates will be permanently higher. Alternatively, the inflationary effects of the fiscal deficit can be avoided if the Federal Reserve immediately reduces the stock of money by enough to move real interest rates to their equilibrium level.

Over a longer span of time, the economy's capacity to produce will be altered by the effect of fiscal policy on supplies of capital and labor. Of particular importance is the supply of capital per worker, and hence real income per capita. To enhance growth in the stock of capital per worker, fiscal policy must raise investment relative to consumption.

The problem can be analyzed more precisely within the context of an explicit macroeconomic model. For this purpose, we utilize the well-known IS-LM framework. The IS curve defines the equilibrium conditions that deter-

Box 1
Origins of the Current Budget Deficit

In early 1981, the newly elected Reagan Administration made public its "Program for Economic Recovery" for dealing with the twin problems of rising inflation and a stagnant economy. The four major planks of this program were: 1) reductions in personal tax rates and business taxes; 2) spending cuts to reduce the budget deficit; 3) reductions in the burden and the intrusion of federal regulations; and 4) a new commitment to a stable monetary policy. The implications of this program for the federal budget were spelled out in considerable detail by the Administration.[2]

Despite a commitment to increased spending for defense, this program called for a reduction in total federal outlays as a share of GNP from 23.0 to 19.3 percent between 1981 and 1984. Very substantial reductions in non-defense spending were implied. The planned reduction in total federal spending as a share of GNP was large enough that a balanced budget was projected for 1984, even with large reductions in personal and business taxes. Total federal tax receipts as a share of GNP were to decline from 21.1 to 19.3 percent between fiscal 1981 and 1984, falling to the same percentage of GNP as outlays.

As shown in the table, the size of the reduction in tax receipts turned out to be about in line with what was originally projected. However, total federal outlays as a share of GNP, rather than declining, actually increased substantially. The Council of Economic Advisers estimated that these outlays rose to 24.0 percent of GNP by fiscal 1984 from 22.8 percent in fiscal 1981, resulting in a deficit equal to 5.3 percent of GNP.

The Administration got most of the increase in defense spending that it wanted. However, the Congress resisted proposed cuts in non-defense spending. Public sentiment generally supported the President's position on taxes, but opposed cutting back on entitlement programs where the largest part of the growth of non-defense spending had occurred. Some significant cuts in federal non-defense spending were achieved in areas other than interest costs, agricultural programs, Social Security, Medicare, and civil service and military retirement systems, but these were simply not large enough to offset the growth of spending in other areas. The resulting increase in the federal budget deficit is exerting a major influence on the composition of economic activity through its impact on real interest rates and the real exchange value of the dollar.

Planned vs. Actual Federal Outlays and Receipts
(as a Percent of GNP)

	1981	1982	1983	1984
Expenditures				
Planned	23.0	21.8	20.4	19.3
Actual	22.8	23.8	24.7	24.0
Receipts				
Planned	21.1	20.4	19.7	19.3
Actual	20.8	20.2	18.6	18.7
Deficit				
Planned	1.9	1.4	0.7	0.0
Actual	2.0	3.6	6.1	5.3

Sources: **America's New Beginning: A Program for Economic Recovery**, Executive Office of the President, February 18, 1981 and **Annual Report** of the Council of Economic Advisers, February 1984.

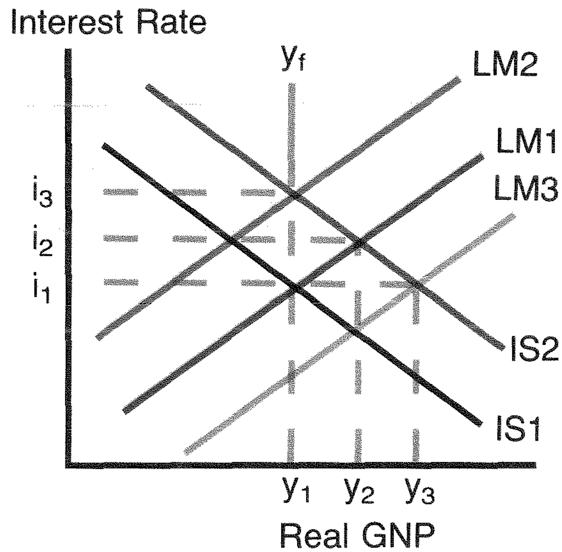
mine the demand for goods, and the LM curve shows the conditions corresponding to equilibrium between the supply and demand for money. By Walras' law, equilibrium in the markets for goods and money implies equilibrium in the market for credit. Although inflation is allowed to vary in this analysis, for simplicity and without loss of generality we abstract from the effects of changing inflationary expectations and, hence, changing inflation premiums in interest rates.[3]

Real rather than nominal interest rates drive real aggregate spending. But since movements in real and nominal interest rates are assumed to be the same in this analysis, the equilibrium level of real GNP depicted by the IS curve depends only upon the nominal interest rate. Also, the IS curve includes the adverse effect of higher interest rates on net exports, and hence aggregate spending, that operates indirectly through an appreciation of the exchange rate.

With respect to the LM curve, the demand for real money balances depends upon the nominal interest rate and real GNP. Given the nominal stock of money determined by the monetary authority, the real stock of money varies inversely with the price level. The LM curve assumes a given stock of real money balances and shows combinations of the nominal interest rate and real GNP that generate an equilibrium between the supply and demand for real money balances.

The permanent effect of fiscal policy depends upon what happens to the consumption-investment mix at the full employment level of real GNP. In Figure 1, we focus on an economy initially operating at a full employment level of GNP, denoted by y_f. Suppose that cuts in personal and business taxes similar to those undertaken by the Reagan Administration result in a larger budget deficit. The higher level of consumption and investment spending at any interest rate shifts the IS curve to the right, from IS1 to IS2. If the nominal stock of money is unchanged, the economy will move to a higher interest rate and real GNP at i_2 and y_2. But that is only a temporary adjustment. Because the economy is operating beyond full em-

Figure 1



ployment, an excess demand for labor drives up wages and prices until the excess demand is eliminated. As wages and prices rise, the real stock of money declines, and the LM curve shifts to the left, from LM1 to LM2. Thus, the permanent equilibrium generated by the new fiscal policy is at the same level of real GNP and a higher interest rate, or y_1 and i_3.[4] In this equilibrium, the decrease in expenditures produced by higher interest rates exactly offsets the original stimulus to expenditures from the tax cuts.[5]

The net effect on the composition of aggregate demand depends upon the interest-sensitivity of various types of expenditures in comparison to the size of the stimulus that they received from the tax cuts. For example, if consumption benefits from the tax cuts but is not at all sensitive to interest rates, various types of investment would have to contract even if they had been stimulated by the tax cuts. Or if only one type of investment spending benefited, the major burden of rising interest rates would have to fall on other types of investment.

The Federal Reserve can do nothing to change the permanent effect of fiscal policy on the real economy. If it tries to peg the interest rate at i_1 to prevent a decline in interest-sensitive expenditures, it only generates a greater amount of inflation. At LM3, the nominal stock of money would initially be higher than it was at LM1. The process of inflation would then proceed until the real stock of money falls to its long-run equilibrium level corresponding to LM2. Although the increase in the price level would be greater than before, the permanent level and composition of GNP would be unaffected. Alternatively, inflation can be avoided altogether if the Fed reduces the nominal stock of money to shift the LM curve to LM2 immediately. Whatever the monetary action, the permanent effect of a change in fiscal policy on the composition of GNP is found at the level of interest rates that generates the same level of real GNP as before.

This analysis points the way to a procedure for measuring the permanent effect of fiscal policy on the economy. The permanent effect of a larger fiscal deficit is to raise the level of real interest rates and impact upon interest-sensitive components of aggregate expenditure at the full employment level of real GNP. This permanent effect of a change in fiscal policy is associated with the impact on expenditures of the difference in real interest rates between the IS1 and IS2 curves. The resulting change in the composition of expenditures at full employment is approximately the same as that which would occur at neighboring values of GNP.

To simulate the permanent effects of alternative fiscal policies that might have been followed in the 1981–84 period, we therefore allowed changes in fiscal policy to alter the composition, but not the level, of real GNP at each point in time. Real interest rates and the exchange rate are allowed to adjust to generate unchanged levels of total real spending and real GNP. The resulting changes in the consumption-investment mix, at historical levels of real GNP, then become an approximate measure of the permanent effect of fiscal policy on the economy.

II. Measuring the Permanent Effect of a Change in Fiscal Policy

This article looks at fiscal policy in terms of its effects, as opposed to the specific instruments of policy in the form of laws. Fiscal policy defined in terms of its effects may be altered even when there are no legislated changes. The increase in taxes as a proportion of GNP that occurs as a result of normal economic growth, and also from inflation in the absence of tax indexing, are examples. Conversely, legislative changes may be required just to keep the effects of fiscal policy from changing as, for example, when taxes have to be cut in order to keep revenues from rising as a fraction of GNP. In this context, an unchanged policy is one with an unchanged impact on the composition of economic activity at a high level of employment. From a macroeconomic point of view, an unchanged fiscal policy has two dimensions.

First, there should be no change in *effective* marginal tax rates that would alter economic incentives. In the structural model of aggregate demand that we use for the policy simulations, the average marginal tax rate for households is a component of their real after-tax interest rates and, therefore, affects expenditures on consumer durables and housing. Similarly, corporate taxes influence the real cost of capital in the business sector and, hence, expenditures on inventories and nonresidential fixed investment. An unchanged fiscal policy would not alter the marginal tax rates that affect these expenditures, and would not shift the IS curve for this reason.

Second, an unchanged fiscal policy requires federal outlays and receipts not to change as a fraction of GNP at a high level of employment. With unchanged government receipts and expenditures, as well as unchanged effective marginal tax rates, there would be no shift in the IS curve. Thus, the composition of aggregate demand and output would not be affected by fiscal policy.

It might appear that there could be inconsistencies in this dual criteria for an unchanged fiscal policy. For example, if marginal tax rates are higher than average rates, as in fact they generally are, normal growth in the economy with fixed marginal rates would tend to raise tax receipts as a proportion of GNP. However, an unchanged fiscal policy—one with a neutral effect on the composition of GNP over time—could be maintained by reducing average tax rates without changing marginal rates. In the case of personal income taxes, this could be done by increasing the standard deduction. The extent of progressivity in the tax structure is much less for corporations, but here too, the average tax rate could be reduced without changing the marginal tax rate on the cost of new investment.

Marginal Tax Rates

The first dimension of fiscal policy that we consider is changes in marginal tax rates. As shown in Table 1, rising nominal incomes combined with a progressive tax system raised the average marginal personal tax rate from 21.2 percent to 30.4 percent between 1965 and 1980. The Economic Recovery Tax Act of 1981 reduced personal income tax rates by a cumulative 23 percent over three years. In addition, top marginal individual income tax rate was reduced from 70 percent to 50 percent. However, the resulting change in the average marginal tax rate for individuals was smaller because of the bracket creep caused by rising nominal incomes over the three-year period. The tax cuts and bracket creep combined to reduce the average marginal tax rate for individuals from 30.4 percent to 27.1 percent by 1984.[6] In the experiments in counter-factual history described in Section III, an unchanged fiscal policy is simulated by holding the average marginal tax rate for households at the 30.4-percent level from 1981 through 1984.

The Tax Act of 1981 also contained substantial reductions in effective tax rates on the cost of business fixed investment without, however, changing the corporate tax rate on net income. These tax cuts applied not only to business plant and equipment, but also to rental housing. First, the Accelerated Cost Recovery System (ACRS) was introduced, which replaced the previous system of basing tax lives on expected useful lives.[7] For most assets, the new tax lives are considerably shorter than their

TABLE 1
First Dimension of Fiscal Policy

	Average Marginal Tax Rate for the Individual Income Tax	Effective Corporate Tax Rate on Cost of Equity Financed Investment[1]		
		Equipment	Structures	Rental Housing
1955	.228	.238	.358	.301
1960	.234	.287	.420	.346
1965	.212	.099	.353	.290
1970	.243	.307	.531	.384
1975	.263	.116	.522	.380
1980	.304	.126	.577	.443
1981	.304	.071	.483	.415
1982	.292	.065	.449	.409
1983	.278	.062	.398	.372
1984	.271	.064	.384	.386

[1]This effective tax rate equals $\frac{1-uz-k}{1-u} - 1$, as discussed in Box 2.

Sources: Barro and Shahasakul (1983), Board of Governors of the Federal Reserve System, and Data Resouces, Inc.

Box 2
Effective Tax Rate on the Cost of Capital Investment

The combined effect of taxes, real interest rates, and other factors on the cost of business investment are summarized in a measure known as the "rental," or "user" cost of capital. This is simply the required payment per period for the use of a capital good, analogous to the wage rate for labor. The formula for the rental cost of business fixed capital is:[10]

$$c = q\frac{(1 - k - u\,z)}{(1 - u)}$$

$$x[b\,(1 - u)\,i + (1 - b)\,e - \dot{p} + d]$$

where:

c = rental cost;
q = price of the capital good:
k = investment tax credit;
u = corporate tax rate;
z = present value of one dollar's worth of depreciation allowance;
b = proportion of debt finance;
i = nominal bond rate;
$1 - b$ = proportion of equity finance;
e = required nominal return to equity;
$\dot{p}$ = expected long-term inflation rate;
d = exponential rate at which the capital good decays.

As is evident from this formula, the rental cost of business fixed capital is equal to some fraction of the price of the capital good. This fraction is determined by the real cost of debt and equity capital and, central to our inquiry, a multiplicative factor that depends upon the corporate tax rate, the present value of depreciation, and the investment tax credit. (The investment tax credit has a positive value for equipment but is zero for commercial and industrial structures and rental housing.) This multiplicative factor equals one plus the effective tax rate on the cost of equity-financed investment.[11] The Reagan program reduced the cost of business fixed investment by increasing the present value of depreciation (z) and the investment tax credit (k), and thereby reducing this multiplicative factor.

economic lives. Second, the 1981 Tax Act increased tax credits on investment in equipment.[8] The Tax Equity and Fiscal Responsibility Act of 1982 took back part, but by no means all, of these tax cuts for business as part of a package to reduce the size of the federal budget deficit.

The extent of the changes in the effective tax rate on the cost of business fixed investment before and after the Reagan tax cuts are shown in Table 1 for equipment, commercial and industrial structures, and rental housing.[9] In the 1950s, the effective tax rates on different types of business fixed investment were fairly similar. However, in the 1960s and 1970s, large disparities developed. The effective tax rate on investment in equipment dropped as a result of legislated changes, while tax rates on investment in commercial and industrial structures and rental housing went up due to reductions in the present value of depreciation caused by the higher nominal interest rates accompanying higher inflation. The Tax Act of 1981 reduced effective tax rates on the cost of equity-financed capital investments by 6 to 20 percentage points, though it did little to remove the large disparities between rates on different classes. In Section III, an unchanged fiscal policy for the 1981–84 period is simulated by keeping effective tax rates on the various classes of business fixed investment the same as they were at the end of 1980.

Government Spending and Disposable Income

When simulating the effects of fiscal policy changes, it is necessary to consider that observed movements in federal outlays and receipts are partly due to changes in the level of economic activity and partly due to other factors. The federal budget measured on a high employment basis removes the cyclical variations in outlays and receipts caused by deviations from a specified high employment rate of unemployment.[12] The changes in outlays and receipts that are left are attributable to normal growth in the economy, inflation, or legislated changes. The changes in high employment outlays and receipts that deviate from those required to maintain a constant proportion to high employment GNP constitute the second dimension of fiscal policy.

The federal government's high employment deficit rose from 0.9 percent of high employment GNP in 1981 to 1.7 percent in 1982, and to 2.5 and 3.0 percent in 1983 and the first half of 1984, respectively. However, for an unchanged fiscal policy, federal spending on goods and services, transfer payments, and taxes should be kept at unchanged proportions of GNP measured on a high employment basis. Thus, in simulating an unchanged fiscal policy for 1981–84, federal spending on goods and services was reduced by the difference between actual spending and what spending would have been if its ratio to high employment GNP at the beginning of 1981 had been maintained. As shown in Table 2 the required adjustment is small—less than $5 billion, in 1972 dollars, in all but one quarter.[13]

A similar procedure was used for adjusting the level of personal taxes and transfer payments, and consequently disposable personal income. Items in the federal budget that affect the difference between personal disposable income and GNP are separated into two com-

TABLE 2
Second Dimension of Fiscal Policy

	Adjustments for Unchanged Fiscal Policy and Tax Cuts for Business Only				Adjustment for Unchanged Fiscal Policy		Adjustment for Tax Cuts For Business Only	
	Federal Government Spending on Goods and Services		State and Local Spending on Goods and Services		Disposable Personal Income		Disposable Personal Income	
	1972$	Percent of High Employment GNP	1972$	Percent of High Employment GNP	1972$	Percent of High Employment GNP	1972$	Percent of High Employment GNP
1981/Q1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q2	0.0	0.0	0.7	0.0	3.9	0.3	6.1	0.4
Q3	−2.6	−0.2	2.5	0.2	−2.6	−0.2	−0.8	−0.1
Q4	−3.9	−0.2	5.3	0.3	−5.8	−0.4	−2.8	−0.2
1982/Q1	−4.0	−0.3	6.2	0.4	0.5	0.0	5.3	0.3
Q2	0.7	0.0	6.2	0.4	−1.4	−0.1	3.7	0.2
Q3	−4.7	−0.3	7.2	0.4	−15.8	−1.0	−10.5	−0.6
Q4	−11.4	−0.7	8.1	0.5	−25.8	−1.6	−18.6	−1.1
1983/Q1	−4.7	−0.3	8.3	0.5	−20.6	−1.3	−14.5	−0.9
Q2	−2.0	−0.1	8.6	0.5	−22.6	−1.4	−18.4	−1.1
Q3	0.5	0.0	9.1	0.5	−38.4	−2.8	−35.0	−2.1
Q4	4.0	0.2	9.6	0.6	−45.1	−2.7	−41.1	−2.4
1984/Q1	5.6	0.3	9.3	0.5	−45.0	−2.6	−41.2	−2.4
Q2	−4.7	−0.3	8.7	0.5	−39.1	−2.3	−35.0	−2.0

ponents—corporate profits taxes and everything else. Corporate profits taxes must be treated separately because of the interaction between them and dividend payments, which feed back to personal income. Lower corporate profits taxes increase disposable personal income dollar-for-dollar if the resulting increase in after-tax corporate profits is all paid out in dividends, but have no impact on disposable personal income if it all goes into retained earnings.

In recent years, dividends have averaged one-half of after-tax corporate profits. Ordinarily, an increase in profits must be sustained for several years for this 50-percent payout ratio to be fully realized. However, if firms believe an increase in profits is permanent because it has been caused by a change in the tax law, then the speed of adjustment would be quicker. Statistical analysis reveals that the Reagan tax cuts have, in fact, operated in this way. The ratio of dividends to after-tax profits was not significantly depressed in the 1981–84 period even though profits soared.

As one component of an unchanged fiscal policy, the ratio of corporate profits taxes to GNP on a high employment basis should remain the same. To simulate this part of an unchanged fiscal policy, we reduced the historical series for disposable personal income by 50 percent of the difference between historical corporate profits taxes and what they would have been if their ratio to GNP in 1981 had been maintained on a high employment basis. This procedure is consistent with the observation that the payment of dividends actually adjusted fairly quickly to maintain the desired long-run payout ratio.

The remaining items in the federal budget that contribute to the difference between disposable personal income and GNP tend to alter disposable income dollar-for-dollar. These aggregate to the sum of personal income taxes, contributions to social security, and federal indirect business taxes less federal government transfer payments to persons (including interest payments) and net subsidies to federal government enterprises. To simulate an unchanged fiscal policy, the historical series on disposable personal income is, therefore, reduced further by the difference between this aggregate and what it would have been if its ratio to GNP at the beginning of 1981 had been maintained on a high employment basis.

As shown in Table 2, the adjustment to disposable personal income becomes very large by 1984. In fact, except for the earlier part of the 1981-84 period, the entire stimulus to aggregate demand from the Reagan economic program has come from its impact on taxes and transfer payments, as opposed to federal spending on goods and services. With an unchanged fiscal policy, disposable personal income would have been $39.1 billion lower, in 1972 dollars, by the second quarter of 1984; this difference equals 2.3 percent of GNP.

An additional adjustment is required for federal grants-in-aid to state and local governments. Whereas, for an unchanged fiscal policy they would stay at the same ratio to GNP as at the beginning of 1981, by the second quarter of 1984 actual grants-in-aid were $11.2 billion, in 1972 dollars, less than this measure. About 20 percent of this reduction took the form of a decline in payments to persons, while the remainder was for spending on goods and services. It is assumed that during the time period studied, other spending and taxes at the state and local level were not affected. Therefore, for stimulation of an unchanged fiscal policy the portion of the adjustment for grants-in-aid going to persons is added back into personal disposable income, and the remaining portion is added to state and local spending on goods and services. Table 2 shows this adjustment to state and local government spending on goods and services and also includes the effect of federal grants-in-aid in the adjustment to disposable personal income.

III. A Structural Model of Real Aggregate Demand

In this section, we provide a thumbnail sketch of the econometric model that is used for simulating the permanent effects of fiscal policy, stressing responses of the various sectors to real interest rates. A more detailed presentation is provided in the Appendix.[14] The theory underlying the model follows the mainline neo-Keynesian view embodied in most large-scale structural econometric models, with particular attention being paid to the way that real interest rates enter into the cost of capital for specific types of investment. In the short run, the slow speed of adjustment of wages and prices allows monetary policy to influence real interest rates, which, in turn, are a prime mover of aggregate demand through their impact on various types of investment expenditures. Further effects on demand occur through changes in consumption spending induced by changes in income and accelerator effects on investment expenditure. However, in the long-run real interest rates are determined by the balance between saving and investment.

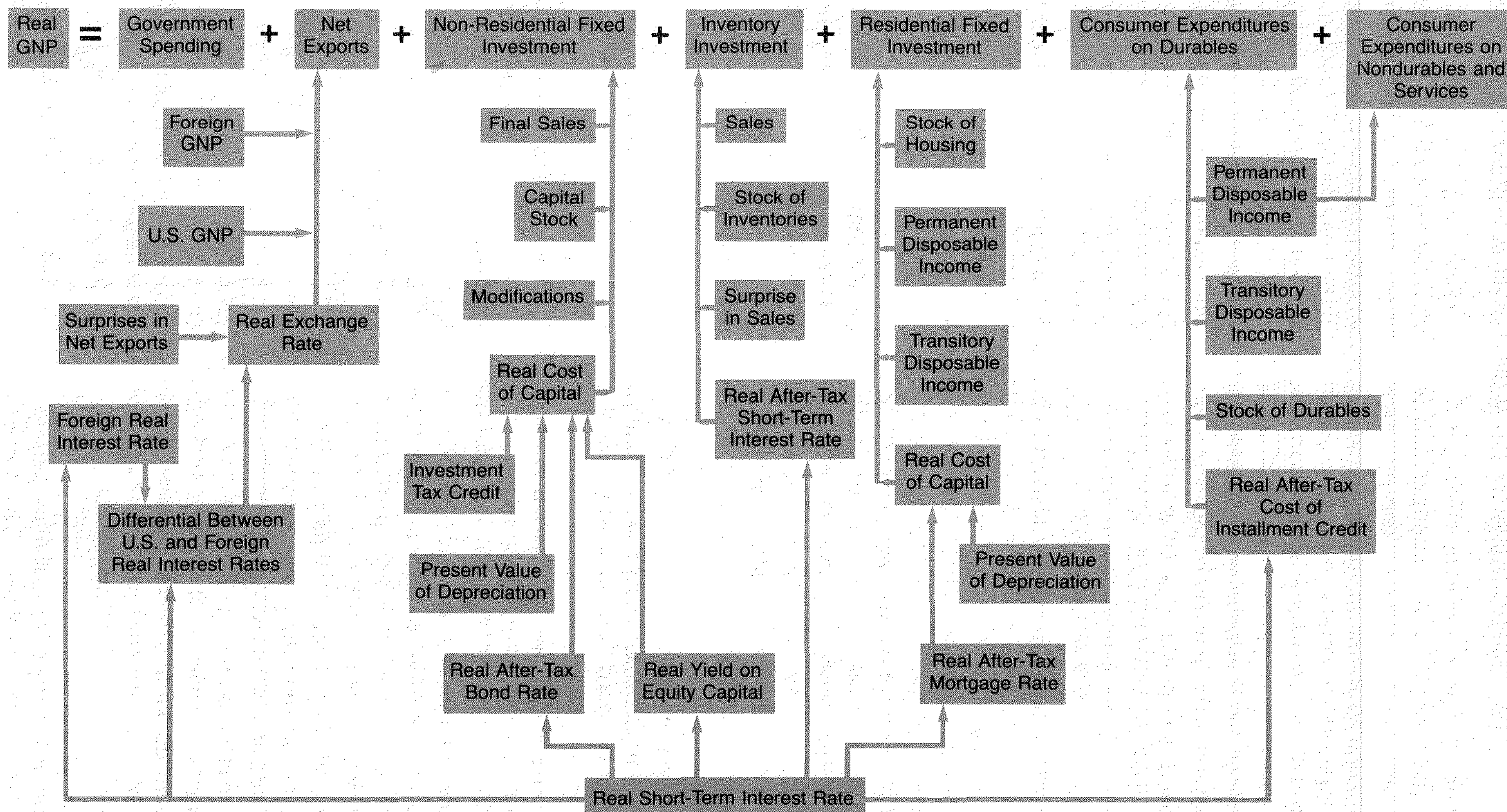
The model can be solved for an equilibrium level of real aggregate demand and output, given the level of real interest rates and other exogenous variables. Used in this way, it can forecast real GNP and its components on the basis of a projected path for real interest rates. Alternatively, it can be used with a separate aggregative forecast of real GNP and prices to make forecasts of sectoral activity and the level of real and nominal interest rates.[16] For this second purpose, one solves for the path of nominal and real interest rates that produces the projected path of real GNP. Our exercises in counterfactual fiscal history employ the latter approach. We assume the path of real GNP to be unaffected by alternative fiscal policies since we are interested only in permanent effects.

A schematic overview of the structural model of aggregate demand is provided in Figure 2. The components of expenditure that are affected directly by real interest rates include inventory investment, consumer expenditures on durable goods, residential construction, and nonresidential fixed investment. Net exports are influenced indirectly through the impact of the differential between U.S. and foreign real interest rates on the real exchange rate. The components of expenditure that are not affected by real interest rates are government spending on goods and services and consumer expenditures on nondurables and services. The latter depends only on permanent disposable income, and the former is an exogenous policy variable.

An increase in the fiscal deficit is associated with increases in government spending, consumption (through personal tax cuts), or investment (through business tax cuts), or some combination of these. With a given level of real GNP, an amount of interest-sensitive private spending equal to the spending generated by the increase in the fiscal deficit must be "crowded out" by a rise in interest rates. Interest rates rise because of the government's extra borrowing in the credit market. The sectors of domestic investment that get "crowded out" the most by a fiscal deficit are those that are most sensitive to interest rates. And whether crowding out falls more heavily on domestic investment or foreign investment depends upon the response of the international value of the dollar to real interest differentials between the United States and other countries.

In the Appendix, we discuss the estimated responses of the various sectors of aggregate demand to real interest rates and the real exchange value of the dollar. An understanding of the model will help in following the results of alternative fiscal policy simulations. However, those who are not interested in further details at this point can skip the Appendix.

Figure 2
Overview of Structural Model of Real Aggregate Demand



IV. Simulations of Alternative Fiscal Policies

Simulations of the permanent effects of alternative fiscal policies are summarized in graphical form in this section. The historical errors in each equation of the econometric model of aggregate demand were first added back in to allow a simulation of the model to replicate history exactly. Then, simulations of two alternative fiscal policies were performed, allowing interest rates and the foreign exchange value of the dollar to adjust in such a way that real GNP would be unaffected in each period.[17]

The first of these simulations is for an unchanged fiscal policy. It holds marginal tax rates constant at their values at the end of 1980, corresponding to the data in Table 1, and also makes the adjustments to government spending on goods and services and disposable personal income shown in Table 2. Spending of state and local governments on goods and services increases about $9 billion, in 1972 dollars, by the first half of 1984 because of increased federal grants-in-aid. But there is virtually no change in federal spending on goods and services. Disposable personal income is reduced by over $40 billion, in 1972 dollars.

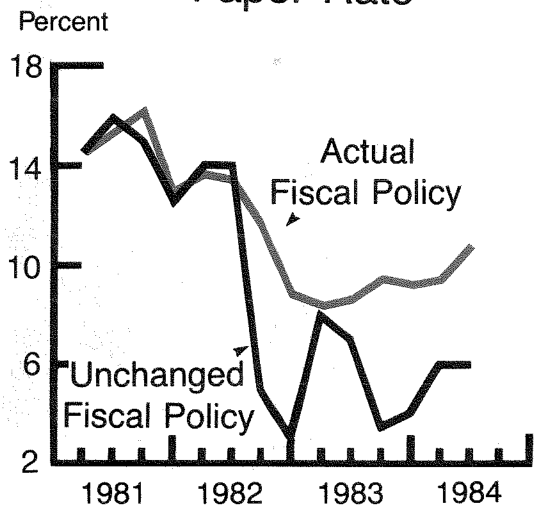
The second of the simulations considers the degree to which investment spending on plant and equipment would have been stimulated if the 1981 tax cuts had been limited to the business sector only. For this simulation, the marginal tax rate for households is held constant at its value for the end of 1980, but marginal tax rates on investment in equipment, structures, and rental housing take on their actual values. The adjustment to government spending on goods and services is the same as in the first simulation; and, as in that simulation, disposable personal income is adjusted downward by the amount of the tax cut that households otherwise would have received. However, the downward adjustment to disposable personal income is less than in the first simulation because business tax cuts raise after-tax corporate profits, and hence dividend payments.

We focus particularly on the effects of these changes on four financial variables and four real variables in the economy. The financial variables are the 6-month commercial paper rate, the average yield on newly issued AA corporate bonds, the S&P earnings to price ratio on common stocks, and the real exchange value of the U.S. dollar. The real variables of interest include total personal consumption expenditures, residential fixed investment, nonresidential fixed investment, and net exports. These real variables are all measured in 1972 dollars. The 6-month commercial paper rate directly affects spending on consumer durables and residential construction, and indirectly affects nonresidential fixed investment through the yield on bonds and the return to equity. In addition, the real short-term interest differential between U.S. and foreign markets drives the real exchange value of the dollar, which, in turn, affects net exports.

An Unchanged Fiscal Policy

During 1981, there was little difference between the effects of the Reagan Administration's fiscal policy and those of an unchanged fiscal policy. The 5-percent cut in personal taxes

Chart 1A
6-Month Commercial Paper Rate



in October was largely offset by bracket creep, and the business tax cuts had not yet begun to stimulate business investment spending. Consequently, as shown in Chart 1A, the commercial paper rate corresponding to an unchanged fiscal policy is little different from the actual rate during the initial period. After the middle of 1982, however, the effects of the Reagan Administration's fiscal policy became more evident. Personal income tax rates were cut by 10 percent in July of 1982 and again in July of 1983. And the liberalization of depreciation rules and the investment tax credit began to affect business investment. With an unchanged fiscal policy, the 6-month commercial paper rate in the simulation falls 6½ percentage points below its historical value by the third quarter of 1982. The effects of interest rates on expenditure build over time, however, so that the difference between the simulated commercial paper rate and its actual value then shrinks. By the first half of 1984, the simulated commercial paper rate corresponding to an unchanged fiscal policy averages about 4 percentage points less than the actual—at around 6 percent instead of 10 percent (on a discount basis).

Chart 1B
Yield on Corporate Bonds (AA)

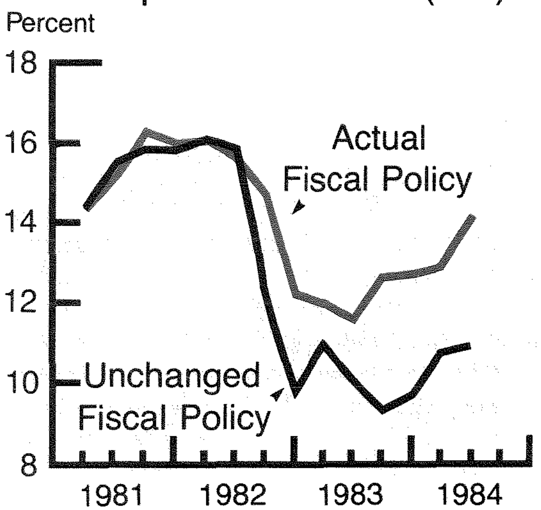
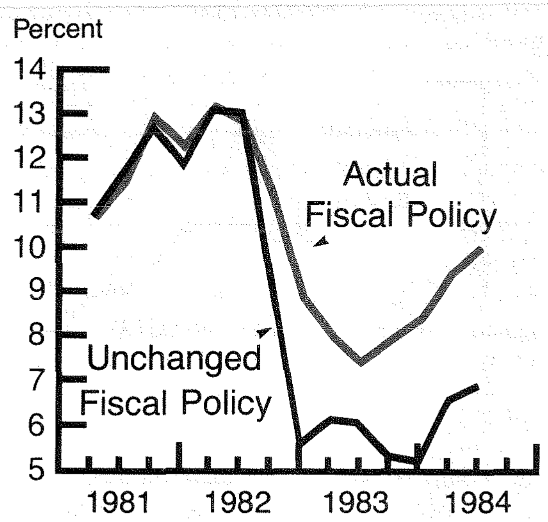
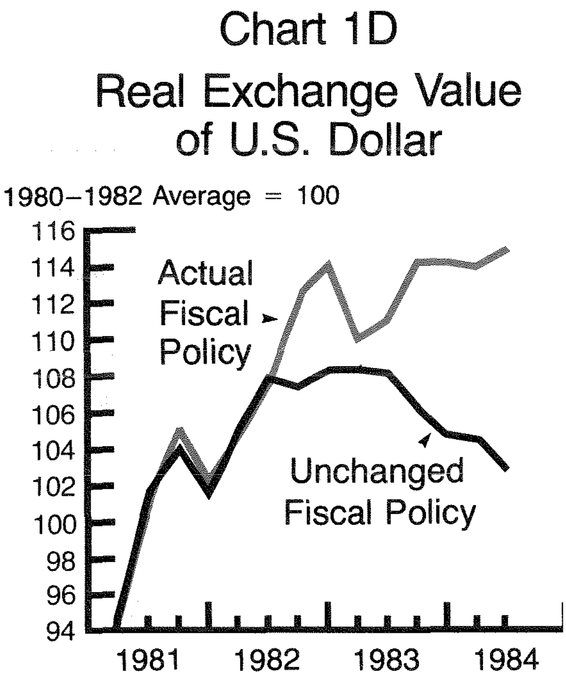


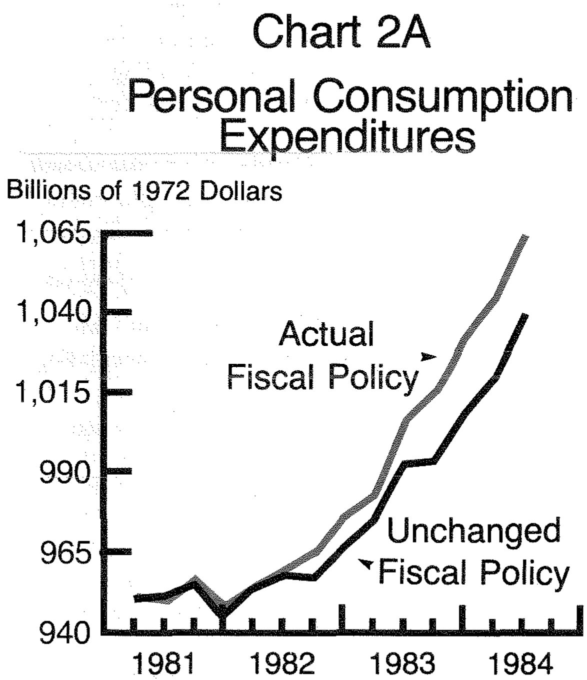
Chart 1C
Earnings-Price Ratio on Common Stock



In this simulation, real after-tax interest rates are reduced to about the same level as in earlier business cycle expansions. For example, using the real after-tax 6-month commercial paper rate as a gauge, its nominal level on a discount basis would be 6 percent rather than 10 percent by the first-half of 1984. On an annual yield basis, and after taking into account the deductibility of interest costs from personal income taxes, its nominal level would be 4.5 percent instead of 8.1 percent. Subtracting an expected inflation of around 4.5 percent gives a real after-tax commercial paper rate close to zero instead of its actual value of 3.6 percent. A year into prior postwar business cycle expansions, the real after-tax 6-month commercial paper rate was also near zero, averaging 0.1 percent.

Thus, current fiscal policy is having a marked effect upon real after-tax interest rates. Furthermore, if fiscal policy had not been changed in 1981, the permanent effect of this would have been to reduce real interest rates to historically normal levels. This fact suggests that the Federal Reserve has not allowed the fiscal stimulus to generate much more of an increase in real GNP than would otherwise have occurred, consistent with a policy of offsetting the





inflationary effects of the fiscal stimulus.[18]

In the model, arbitrage in financial markets transmits the reduction in the commercial paper rate to the yield on corporate bonds and the required return on equity. By the first half of 1984, an unchanged fiscal policy would have reduced the AA corporate bond rate by 2.7 percentage points (Chart 1B) and the earnings-to-price ratio on common stocks by 3 percentage points (Chart 1C). Because prices are unchanged, the reduction in short- and long-term interest rates corresponds to a decline in the differential between U.S. and foreign real interest rates. This produces a substantial reduction in the real exchange value of the dollar, even though the effect on the interest differential is diminished by the tendency, included in the simulation, of foreign central banks to match part of the movement in U.S. real interest rates. By the first half of 1984, with an unchanged fiscal policy, the real exchange value of the dollar in the simulation would be nearly 15 percent lower than it otherwise would have been, bringing it back to the levels of late 1981 (Chart 1D).

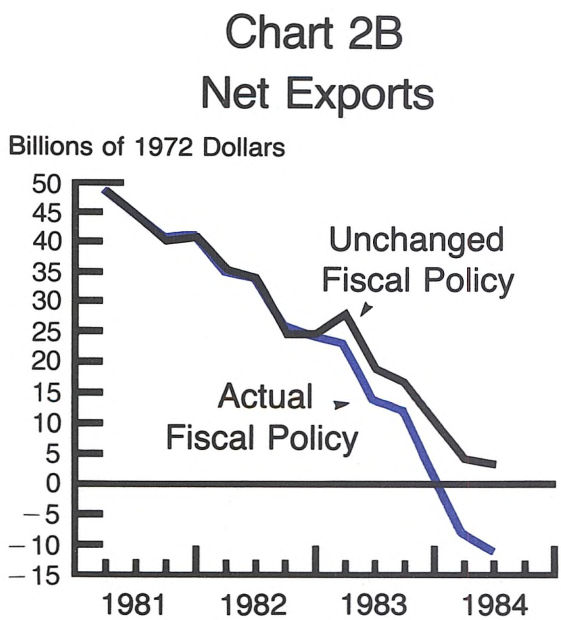
The effects of these changes in financial variables on the real variables of interest are shown in Chart 2A-D. According to the simulation, an unchanged fiscal policy reduces personal consumption expenditures by about $24 billion by the first half of 1984 (Chart 2A).[19] This result is due to the effect of lower disposable income under an unchanged fiscal policy, which strongly dominates the effect of lower interest rates on spending for consumer durables.

By far, the largest offset to the reduction in total consumption expenditures with unchanged fiscal policy is net exports; they are about $14 billion higher by 1984 (Chart 2B). The higher net exports are produced by the effect of lower interest rates in depreciating the exchange value of the dollar. It is important to recognize, however, that for reasons unrelated to fiscal policy (for instance, expectations by foreign investors of greater monetary stability in the U.S.), the dollar appreciated by twice as much between 1980 and 1981 as it did from 1981 and 1984. The lagged effects of this earlier appreciation plus other factors, such as the cyclical position of the U.S. and the effect of LDC debt burdens in reducing the demand for U.S.

exports, also depressed net exports. As a result, even with an unchanged fiscal policy, net exports would have fallen by $40 billion—or nearly 3 percent of GNP from the beginning of 1981 to the first half of 1984. Thus, although fiscal policy has had a significant effect on net exports, we estimate that it accounts for only one-third of the decline in this sector since the beginning of 1981.

We turn next to residential fixed investment (Chart 2C). The increase in personal tax rates associated with an unchanged fiscal policy directly reduces the real after-tax interest cost of mortgage finance, but at the same time, also reduces personal disposable incomes. Besides these direct effects, an unchanged fiscal policy lowers the cost of mortgage credit still further through its indirect effect in lowering interest rates in general. The initial effects of an unchanged fiscal policy on interest rates are larger than the ultimate effects because of the lagged response of investment spending and net exports to interest rates. The relatively large initial reductions in interest rates stimulate residential investment to the extent of $5 billion at first—about a 12-percent increase. However, tending to offset this interest rate effect is the reduction in disposable income associated with an unchanged fiscal policy. Over time, the reduction in disposable income grows, and the impact on interest rates weakens. By the first half of 1984, the stimulus to residential investment from an unchanged fiscal policy is only $2 billion.

Offsetting forces are also at work in the case of nonresidential fixed investment (Chart 2D). The real cost of capital investment in this sector is equal to a weighted average of real debt and equity costs plus the physical rate of depreciation, all multiplied by one plus the effective tax rate. The average effective tax rate on the cost of capital for nonresidential fixed investment was reduced from 27 to 16 percent by the 1981 Tax Act. An unchanged fiscal policy would have rescinded this tax cut. But offsetting the effect of higher business taxes is a lower yield on corporate bonds and a lower required return to equity due to the generally lower levels of interest rates. This offset is nearly complete throughout the simulation period. By the first



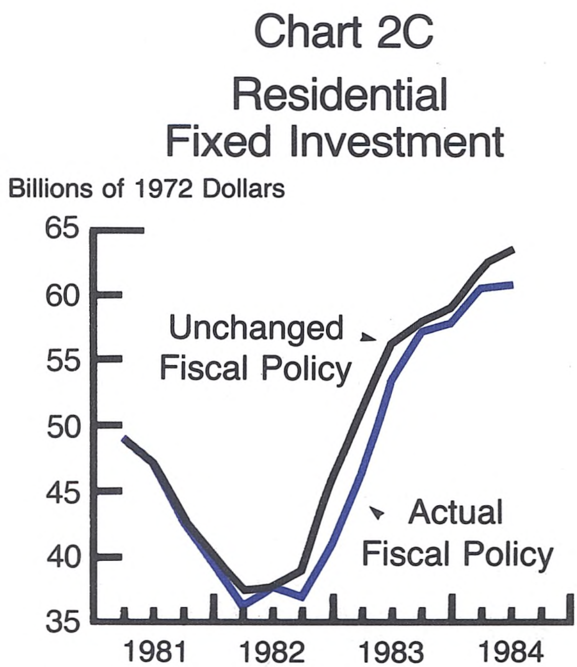
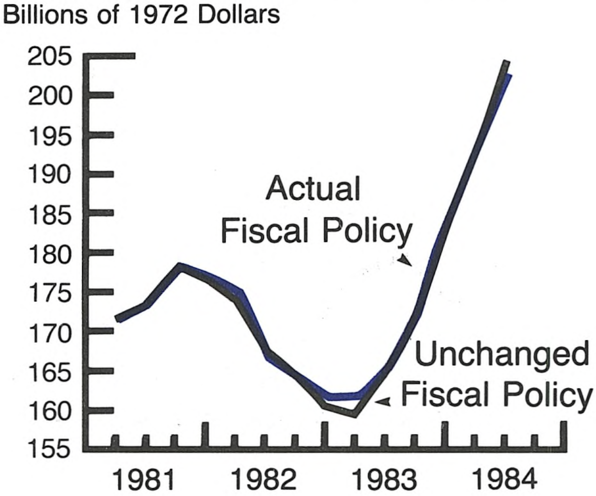


Chart 2D
Nonresidential Fixed Investment



half of 1984, nonresidential fixed investment is actually very slightly higher, by $0.6 billion, with an unchanged fiscal policy compared to the current fiscal policy, a major objective of which was to promote higher capital formation and growth in productivity.

To summarize, the overall longer term effect of current fiscal policy, compared to an unchanged one, has been to stimulate consumption rather than investment. At a given level of real GNP, nearly two-thirds of the current stimulus to consumption is being offset by a decline in net exports, and, consequently, a corresponding decline in net foreign investment. The remaining offset to higher consumption takes the form of declines in residential investment, inventory investment, and government spending on goods and services. Most strikingly, despite the tax advantages for plant and equipment investment in the 1981 Tax Act, nonresidential fixed investment actually has tended to be somewhat lower, rather than higher, as a result of higher real interest rates. In all respects, then, current fiscal policy has been pro-consumption rather than pro-investment.

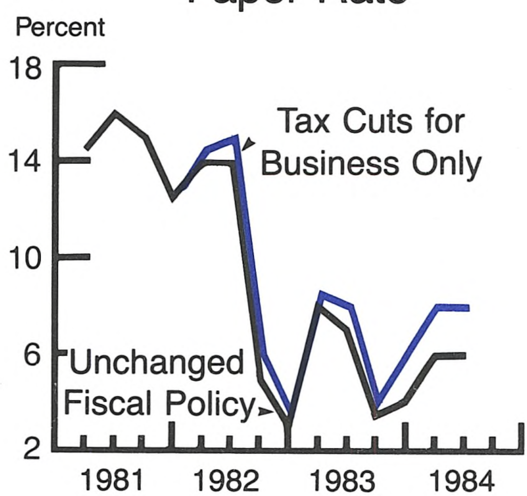
Tax Cuts for Business Only

As the first simulation clearly shows, the effects of reductions in taxes and increases in transfer payments for households have overwhelmed the tax incentives provided to business. Personal income tax cuts have increased the federal government's demands for credit by more than they raised private saving, thus putting upward pressure on interest rates. The result is that real debt and equity costs have risen by enough to offset the reduction in the cost of capital investment in plant and equipment that would otherwise have occurred.

Since a major objective of current fiscal policy was to promote capital formation and productivity growth, it is interesting to examine the extent to which business investment would have been stimulated if current fiscal policy had not included any net tax benefits for households. This is the purpose of the second simulation, which mirrors an unchanged fiscal policy except that effective tax rates on the cost of business investment are reduced and corporate profits are allowed to increase correspondingly.

The results of this policy of tax cuts for business only on the commercial paper rate is contrasted with the results of an unchanged fiscal

Chart 3A
6-Month Commercial Paper Rate

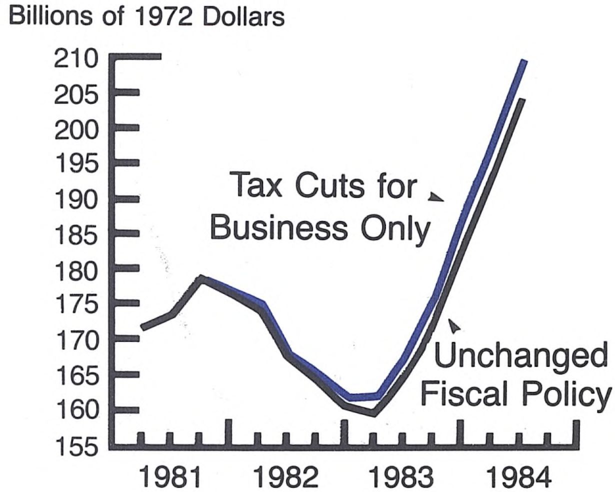


policy in Chart 3A. Compared to an unchanged fiscal policy, the 6-month commercial paper rate would be at 8 percent instead of 6 percent by the first half of 1984. Thus, compared with an unchanged fiscal policy, tax cuts for business raise the commercial paper rate, but not to its actual value of 10.1 percent. The effects on the corporate bond rate and the return on equity are similar. The AA corporate bond rises to 12.0 percent from 10.9 percent by the first half of 1984, but remains below its historical value of 13.6 percent. The earnings-to-price ratio on common stocks rises from 6.8 percent to 8 percent, but not to its historical value of 9.8 percent for that period. These higher interest rates in comparison to an unchanged fiscal policy, push up the real exchange value of the dollar about 4 percent, or by about a third of the difference between its actual value and that corresponding to an unchanged fiscal policy.

Personal consumption is initially stimulated by the impact of the business tax cuts on corporate dividends. But, as the effect on interest rates builds, expenditures on consumer durables are depressed to such an extent that by the first half of 1984 total personal consumption expenditures are almost exactly the same as in the case of an unchanged fiscal policy. Therefore, any stimulus to spending for plant and equipment must come at the expense of other types of investment.

As shown in Chart 3B, although nonresidential fixed investment rises, compared to an unchanged fiscal policy in this simulation, its increase is limited by the increase in interest rates. By the first half of 1984, nonresidential fixed investment is $6 billion, or 3 percent higher. But this expansion occurs only because other types of investment are crowded out. Net exports (and therefore net foreign investment) are displaced the most, followed by residential investment and inventory investment.

Chart 3B
Nonresidential Fixed Investment



This simulation illustrates the point that more saving is required in order to have more investment. Business tax cuts by themselves are able to increase investment in plant and equipment partly because foreign saving inflows increase by more than government saving is reduced, but also because the increase in plant and equipment investment comes partly at the expense of other domestic capital formation. If we wanted to increase investment in plant and equipment without contracting other kinds of capital formation, business tax incentives alone are not enough. They have to be combined with reductions in government expenditures and/or tax increases that boost national saving through an increase in government saving.

V. Summary and Conclusions

A major objective of the Economic Recovery and Tax Act of 1981 was to stimulate greater capital formation and productivity growth. The Reagan Administration's original program called for large tax reductions and even greater spending reductions to achieve a balanced budget by 1984. Federal spending on goods and services actually didn't rise relative to high employment GNP because cuts in non-defense spending offset the defense build-up. But the growth of transfer payments to individuals and the cuts in personal taxes greatly increased the credit demands of the federal government.

The result has been a fiscal policy that has been internally inconsistent for the purpose of promoting capital formation. On the one hand, investment in plant and equipment has been promoted by accelerated depreciation allowances and liberalized investment tax credits that have reduced effective tax rates on the cost of capital for this type of investment. On the other, the cost of capital is being raised by the effect of large federal demands for credit on interest rates.

This article has measured the permanent net impact of these opposing forces by simulating the effects of alternative fiscal policies on consumption and investment at unchanged levels of real GNP. Higher capital formation would eventually boost real GNP at any level of employment by raising labor productivity. But, for this to happen, the ratio of investment to GNP must first be increased. Simulations of this kind tell us whether fiscal policy is working in the desired direction.

Our simulation indicates that current fiscal policy is actually promoting consumption rather than investment. We estimate that the shift in fiscal policy that has occurred since the beginning of 1981 is having no effect on nonresidential fixed investment. The reason is that the permanent effect of current fiscal policy on real interest rates is just about equal to the size of the stimulus from the tax cuts for business investment. In contrast, the permanent effect of current fiscal policy on consumption has been very substantial because of its large boost to personal disposable incomes and the relative insensitivity of consumption to interest rates.

By far the largest offset to the increase in personal consumption is a decline in net exports. This decline occurs because the real foreign exchange value of the dollar is quite sensitive to the difference between U.S. and foreign real interest rates. As the fiscal deficit drives up domestic real interest rates the U.S. dollar appreciates, which in turn reduces the volume of net exports. The simulation thus clearly demonstrates that, in an open economy with floating exchange rates, the crowding out of investment by a fiscal deficit primarily takes the form of a reduction in net foreign investment or, equivalently, in net exports. Without this response, we estimate that short-term interest rates would have increased approximately 3 percentage points more, and the required return to equity, about 2 percentage points more. As a result, investment in plant and equipment actually would have been lower than with an unchanged fiscal policy.

Since a major objective of current fiscal policy has been to promote capital formation and productivity growth, we also examined the extent to which business investment would have been stimulated if the current fiscal policy had not included any net tax benefits for households. In this simulation, the rise in interest rates is by more than half. Although these higher interest rates reduce expenditures on consumer durables, the increase in disposable personal incomes due to higher dividend payments out of larger corporate profits boosts consumption to the point of leaving total consumption expenditures unchanged. Nonresidential fixed investment does rise under this policy, but mainly at the expense of net foreign investment. If we desire an increase in plant and equipment investment without a contraction in other kinds of capital formation, business tax incentives alone are not enough. They must be combined with reductions in government expenditures and/or tax increases that boost national saving through an increase in government saving.

Although our simulation estimates only the permanent, or longer term, effect of current fiscal policy on real interest rates and the composition of GNP, these effects can show up in the short-run as well if the Federal Reserve is successful in pursuing an anti-inflationary monetary policy. In such a case, the potential inflationary effects of the fiscal stimulus would be quickly offset by monetary restraint; and real interest rates would rise fairly immediately to their equilibrium level. The current high level of real interest rates and real exchange value of the dollar bear a strong resemblance to the simulated, longer term, effects of current fiscal policy. In fact, we estimate that real interest rates would now be close to historically normal levels, at current levels of real GNP, if fiscal policy had been unchanged since 1981. This suggests that the Federal Reserve has not allowed the fiscal stimulus to generate much more of an increase in real GNP than would otherwise have occurred, consistent with a policy of offsetting the inflationary effects of the fiscal stimulus.

Appendix

This Appendix describes the structural model of real aggregate demand in greater detail, and explains the estimated reponses of the various sectors of aggregate demand to real interest rates and the real exchange value of the dollar. Table A.1 brings these estimates together. Each of the main sectors of aggregate demand is considered in turn.

Nonresidential Fixed Investment

The equations for nonresidential fixed investment follow the neoclassical theory of investment, as developed by Jorgenson.[20] In the neoclassical theory, capital is viewed as being substitutable for other factors of production, so that firms respond to the relative price of capital in making their decisions to invest in capital goods. The per period payment for the use of a capital good is its "rental," or "user," cost, which was discussed in Box 2. Firms invest in fixed capital to bring their actual stock of capital into alignment with their desired stock, which, in turn, depends upon final sales and capital's rental cost.

Firms finance about one-third of fixed investment with debt and two-thirds with equity capital. In the model, a permanent increase of one percentage point in the weighted average of the real after-tax bond rate and the return to equity would currently depress real investment in equipment by \$3.8 billion in 1972 dollars, or 2.8 percent, and reduce investment in structures by \$1.5 billion in 1972 dollars, or also by 2.8 percent after 11 quarters. Both the real after-tax bond rate and the return to equity respond strongly to movements in the real short-term interest rate. A one percentage point change in the real short-term interest rate moves the real after-tax corporate bond rate by 47 basis points after 11 quarters, and the return to equity by 63 basis points.

Inventory Investment

Inventory investment in the model follows a stock adjustment process, modified by the effects of surprises in sales.[21] Such surprises result in unintended investment or disinvestment. The desired stock of inventories relative to sales depends upon the real after-tax short-term interest rate. However, the speed of adjustment is much faster than for business fixed investment. One-half of the adjustment is estimated to occur within one-quarter, and over 90 percent of it within a year. A one-percentage point increase in the real after-tax short-term interest rate is estimated to reduce inventory investment by \$2.1 million in 1972 dollars at current values of sales, or by 11 percent, within the current quarter.

Personal Consumption Expenditures

Consumption functions in this model are based upon Friedman's (1957) permanent income hypotheses. Permanent income is an anticipated long-run measure of income. The difference between permanent and current income is called transitory income. Permanent disposable income is calculated as a 16-quarter distributed lag on current disposable income, with geometrically declining weights. According to the permanent income hypotheses, the flow of consumption is simply a function of permanent disposable income. In the case of the consumption of nondurables and services, expenditures are approximately the same as the flow of consumption, and so depend only upon permanent income. However, for durables, consumption expenditures and the flow of consumption are quite different.

TABLE A.1
Estimated Response to a One Percentage Point Change in a Real Interest Rate or the Real Exchange Rate

Variable	Type of Rate	Response	Length of Lag in Quarters
Nonresidential Fixed Investment			
a) Equipment	Real After-Tax Bond Rate or Return to Equity	−2.8 percent	11
b) Structures	Real After-Tax Bond Rate or Return to Equity	−2.8 percent	11
Inventory Investment	Real After-Tax 6-Month Commercial Paper Rate	−11.0 percent	0
Consumer Durables	Real After-Tax 6-Month Commercial Paper Rate	−1.4 percent	2
Residential Fixed Investment	Real After-Tax 6-Month Commercial Paper Rate	−5.4 percent	3
Exports	Real Exchange Value of U.S. Dollar	−1.2 percent	7
Imports	Real Exchange Value of U.S. Dollar	0.5 percent	4
Real After-Tax Bond Rate	Real After-Tax 6-Month Commercial Paper Rate	47 basis points	11
Return to Equity	Real 6-Month Commercial Paper Rate	63 basis points	3
Real Exchange Value of U.S. Dollar	Real 6-Month Commercial Paper Rate less Foreign Real Short-Term Interest Rate	8 percent	11
Foreign Real Short-Term Interest Rate	Real 6-Month Commercial Paper Rate	40 basis points	2

Expenditures on consumer durables are viewed as following a stock-adjustment process, in which the desired stock of durables depends upon permanent income and the relative price of durables. The most volatile part of the relative price of durables is the real after-tax rate of interest. Also, any windfall of transitory income acts to speed up the stock-adjustment process.[22] The normal elimination of a discrepancy between the desired and actual stock of durables requires a reduction in financial saving, which may be limited by the fact that much financial saving is contractual. In contrast, a windfall of transitory income can be spent relatively rapidly on desired durables without decreasing the accumulation of financial assets.

According to estimates of the model, about 60 percent of transitory income ends up being spent on consumer durables after 3 quarters. Thus, movements in current income can significantly alter expenditures on consumer durables through the allocation of transitory income, even though permanent income is affected very little. The proportional effect of the real after-tax short-term interest rate on expenditures for consumer durables is weaker than in other sectors. A one-percentage point increase in this rate, if sustained for 3 quarters, depresses spending on consumer durables by $2.4 billion in 1972 dollars at current levels of income, or by 1.4 percent.

Residential Fixed Investment

Residential investment is also assumed to follow a stock adjustment process in the context of the permanent income hypothesis. The desired stock of housing depends upon the size of permanent income and the rental cost of capital for housing. Because the tax treatments of owner-occupied housing and rental housing differ, a weighted average of the rental cost of capital for the two types of housing units is employed.[23] The real after-tax, short-term interest rate affects the terms of mortgage credit, which, in turn, enter into the rental cost of capital. We estimate that a sustained 1-percentage point increase in the real, after-tax short-term interest rate reduces residential construction by $3.2 billion in 1972 dollars at current levels of income, or by 5.4 percent, after 3 quarters. Also, the model suggests that nearly all of the transitory disposable income that is not spent on consumer durables is spent on housing.

The equation for residential construction uses dummy variables to capture the impact of periods of disintermediation at financial institutions that were caused by Regulation Q ceilings on the interest paid on deposits. As deposits dropped off when market interest rates rose above Regulation Q ceilings, the availability of credit to housing was restricted to a greater extent than indicated by the market level of real interest rates.[24] However, by the end of 1983, deposits subject to Regulation Q interest rate ceilings constituted only 21 percent of all small time and savings deposits at banks and thrifts. Consequently, at the present time, the effect of tighter credit conditions on residential construction works almost exclusively through movements in market levels of real interest rates.

Wojnilower (1980) and some other financial market analysts have argued that monetary policy's ability to control spending is greatly weakened by the reduced effectiveness of Regulation Q. This view holds that the demand for credit is highly inelastic with respect to interest rates, and that it is subject to volatile expectations. Extraordinary and unacceptable increases in interest rates that are damaging to the health of financial institutions are needed to slow credit demands. However, our estimates indicate that, even in the absence of effective Regulation Q ceilings, the response of residential construction as well as other types of activity to changes in real interest rates is very substantial.

Net Exports and the Real Exchange Rate

Since the shift in 1973 to the managed floating of exchange rates, real interest rates have had an additional channel of influence on aggregate demand. An increase in real interest rates generates capital inflows that cause the real value of the dollar to appreciate. This, in turn, reduces the contribution of net exports to the level of aggregate demand.[25]

Exports are modeled as a function of the rest of the world's GNP and the real exchange value of the dollar, on a trade-weighted basis. Imports are related in a similar fashion to U.S. GNP and the real exchange value of the dollar. The influences of GNP on exports and imports are mostly contemporaneous. However, the responses of exports and imports to changes in the real exchange value of the dollar take much longer, with significant effects lasting for 7 quarters. As earlier studies have found, the response of exports is greater than that for imports.[26] A sustained one-percentage point increase in the real value of the dollar at current levels of income is estimated to reduce exports by 1.7 billion in 1972 dollars, or by 1.2 percent, and to increase imports by .7 billion in 1972 dollars, or by 0.5 percent.

The approach to modeling the real exchange value of the dollar follows the asset of view of the exchange market. In this view, asset prices adjust quickly to clear the foreign exchange market, and expectations play a central role in the determination of the short-run equilibrium exchange rate. Trade flows help mainly to tie down long-run expectations and also may influence demands for assets in some degree.[27] The basic equilibrium condition in this view is that the expected percentage change in the exchange rate over any period equals the difference between nominal returns on securities at home and those abroad with maturities of the same period. If this condition does not hold, investors will bid the value of the exchange rate to the point where it does. It is easily shown that a similar relationship would hold between the expected change in the real exchange rate and the difference between the real returns on securities. Thus, an increase in real interest rates in the United States raises the real value of the dollar to the point where its expected depreciation in the future is equal to the differential between U.S. and foreign real interest rates.

According to our estimated model, a 1-percentage point change in the real short-term interest rate differential in favor of the United States, sustained over a period of 11 quarters, raises the real exchange value of the dollar by a full 8 percentage points. Also, at current levels of income, an unanticipated increase in net exports of 1 billion in 1972 dollars appreciates the dollar by 0.4 percent by causing the expected value of the real exchange rate to be revised upward to that degree.

Finally, the model takes into account the responses of foreign central banks to movements in U.S. real interest rates. In the period of managed floating, it is estimated that foreign central banks have tended to respond to each 1-percentage point change in the U.S. real short-term interest rate with a 40-basis point change of their own. Moreover, we estimate about the same response during the 1981–84 period. This kind of partial response tends to minimize the impact of changes in U.S. real interest rates on foreign GNP. If, for example, a fiscal deficit in the U.S. produces higher real interest rates and therefore leads to an appreciation of the U.S. dollar, net exports from foreign countries would increase, creating inflationary pressures abroad. However, if foreign real interest rates rise to partially match the change in U.S. rates, foreign investment expenditures would be reduced; and this would tend to stabilize real aggregate demand and GNP abroad.

FOOTNOTES

1. Existing research on the relation between the saving rate and tax incentives is well summarized in Chapter 3 of Bosworth (1984). The stability of the private saving rate since 1981 is discussed in Bisignano (1984).

2. Initial budget cut proposals prepared by the Office of Management and Budget, a report on the proposed tax reductions issued by the Treasury, and the White House paper discussing the four major elements of the program are contained in a paper issued by the Executive Office of the President (1981).

3. Inflation premiums in interest rates have actually been highly variable in recent years. For a way of incorporating variable inflation premiums into the standard IS-LM framework, see Keran (1984).

4. Estimates differ as to the time required for the full adjustment of prices and complete "crowding out" of interest-sensitive expenditures by fiscal policy in the absence of any change in nominal money. According to the St. Louis reduced-form model of Anderson and Carlson (1970), such full crowding out takes place within 4 quarters.However, in the different reduced-form model of McElhattan (1982) it takes 5 or 6 years before real GNP returns to its original level. Similar differences also exist in estimates from large structural models. In the FMP model used by the staff of the Board of Governors of the Federal Reserve, the length of time required for full crowding out, given nominal money, is 2 to 4 years; but for some other structural models it is much longer. See Ando and Modigliani in Stein (1976) and Fromm and Klein (1973).

5. Presumably the Administration's plan was to increase the proportion of investment relative to consumption to secure more growth over time. Even if the fiscal deficit is accompanied by lower marginal tax rates that stimulate work effort and thereby increase the level of full employment GNP, the effect on the consumption and investment mix of the economy would be similar although total economic activity would be increased. In terms of Figure 1, the leftward shift of the LM curve resulting from either monetary policy or price adjustments would be less if full employment GNP were raised compared to the case where full employment output is unchanged.

6. Estimates of the average marginal tax rate for individuals are from Barro and Shahasokul (1983). Updates for 1981–83 were obtained from the Economic Research Group of Goldman Sachs. The figure for 1984 was estimated by the author.

7. Under ACRS, any depreciable asset falls into one of four classes and is given a tax life of 3, 5, 10, or 15 years. These shorter tax lives were effective immediately, and depreciation schedules were to become more accelerated during a five yar phase-in period. But the latter change was rescinded in 1982.

8. Before 1981, 10 percent of the value of investment in equipment could be deducted from corporate taxes for equipment with a life of 7 years or more. A 3-to-6 percent deduction could be taken on equipment with lives of between 3 and 7 years, and no investment tax credit was allowed on equipment with a life of less than 3 years. The 1981 Tax Act gave equipment with a recovery period of up to 3 years a 6 percent investment tax credit and all other equipment a 10 percent credit. However, in 1982 allowable depreciation on all equipment was reduced by 50 percent of the investment tax credits taken.

9. The underlying values of u, z, and k were estimated by Data Resources, Inc. and the staff of the Board of Governors of the Federal Reserve System.

10. For the derivation, see Jorgenson (1963) or Hall and Jorgenson (1967).

11. The effective tax rate on equity financed investment is *not* the same as the effective rate of taxation on all investment because a portion is financed by debt and nominal interest costs on debt are deductible from the corporation's taxable income. Thus, for example, while the current effective tax rate on equity-financed nonresidential fixed investment averages about 14 percent (derived from a weighted average of Table 2), the effective rate of taxation on all such investments is near zero. See Auerbach (1983).

12. For the empirical analysis, we use the high employment budget estimates, based on a 6 percent unemployment rate, that are maintained by the Bureau of Economic Analysis of the Department of Commerce. Recently, the Bureau has developed a cyclically adjusted budget based on the realized trend in real GNP, rather than an estimate of potential output at a specified unemployment rate. This has the advantage of automatically allowing for demographic and other changes that may affect the unemployment rate associated with full employment. However, use of this approach for relatively recent years requires a forecast of future real GNP to generate the trend, which introduces a different kind of uncertainty. Since the full employment rate of unemployment probably has not changed much over the 1981–84 period, the high employment budget based on a 6 percent unemployment rate was chosen. For descriptions and estimates of these two versions of the high employment budget, see de Leeuw, et al (1980) and de Leeuw and Holloway (1982, 1983).

13. The detailed breakdown of the high employment budget at a 6 percent unemployment rate that is used to derive this and other elements of Table 2 is provided in Holloway (June 1984, September 1984).

14. For a complete description, see Throop (1984).

15. Examples of such large scale neo-Keynesian models include Eckstein (1983), Evans (1969), and Federal Reserve Board (1983).

16. Reduced-form models capable of making such forecasts of real GNP and the price level include Anderson and Carlson (1970) and McElhattan (1981).

17. Actual values of real GNP could not be reproduced exactly in each period due to the dynamics of the model. Real interest rates and the exchange rate affect aggregate demand with distributed lags. Thus, only a fraction of the total effect of these variables on aggregate demand occurs in the first period. To offset a large change in fiscal policy exactly, as for example in 1982.3 and 1983.3, a very large change in real interest rates would be needed. However, in subsequent periods, the lagged effects of the initially large change in interest rates would have to be offset, re-

quiring further large movements of interest rates in the opposite direction. To reproduce real GNP in each period could require larger and larger changes in interest rates over time.

This is an example of the general problem of instrument instability. See, for example, Holbrook (1972). The resulting cycles could imply negative values for interest rates and, in any case, would make it difficult to compare the longer term impacts of different fiscal policies. A degree of smoothing of interest rates was therefore required. Still, the average deviation of simulated GNP from historical GNP for the entire 1981–84 period is less than $3 billion, in 1972 dollars; by the first half of 1984, the average deviation is less than $1 billion.

18. This point can be demonstrated by referring to Figure 1. Starting from a historically normal level of interest rates at i_1 and y_1 and considering the shift in the IS function from IS1 to IS2 due to the tax cuts, suppose that real GNP is allowed to increase, say along LM1 with a given (real) money supply, to y_2. Then the interest rate corresponding to an unchanged fiscal policy of IS1 at y_2 would be below the normal level at i_1. But if the Federal Reserve prevented higher inflation in the short-run by a policy action to shift the LM curve from LM1 to LM2, then the interest rate corresponding to an unchanged fiscal policy would be the same as the normal level i_1, as actually observed.

19. Since the simulated change in consumption, and consequent impact on interest rates, is the single most important effect of the change in fiscal policy, the results are sensitive to the form of the consumption function. As explained in the Appendix, consumption in the model is a function of permanent disposable personal income and real after-tax short-term interest rates. Permanent disposable income is measured by a 16-quarter distributed lag on actual disposable income. This is a fairly standard formulation, but other approaches are possible. Most of these alternatives would make the impact of the change in fiscal policy on consumption and interest rates even greater than indicated in the present simulation.

First, if households anticipate their tax changes to be permanent, their perceived permanent income may change more quickly than the adaptive construction based on a 16-quarter distributed lag. Second, if the public includes corporate earnings in its notion of permanent income, whether paid out in dividends or not, the effect of the tax cuts for business and households on consumption and interest rates would be somewhat greater than indicated here because of the additional effect of retained earnings on permanent income. Third, and extending household rationality somewhat further, households may perceive that the inflation premiums in interest payments on the federal debt are in reality the repayment of principal in real terms, and so should be saved. Thus, changes in disposable income due to changes in these inflation premiums would not affect consumption.

This last hypothesis has as its counterpart the notion of the inflation-adjusted high employment budget, which reduces the high employment deficit by the rate of inflation multiplied by the privately held stock of federal debt. See, for example, Cagan (1981) and Eisner and Pieper (1984). The increase in the inflation-adjusted high employment budget deficit between 1981 and 1984 was even larger than the change in the unadjusted high employment budget because of the decline in inflation, implying a greater effect on consumption. It shifted from a surplus equal to 1.3 percent of GNP to a deficit of 1.6 percent, compared to a change in the unadjusted deficit from 0.9 percent of GNP to 3 percent. However, the stability of the private saving rate contrasts with the behavior of saving that would be consistent with this inflation adjustment to the budget. As inflation and inflation premiums on government debt rose in the 1970s, the private saving rate should have increased. More recently, as inflation has declined, the private saving rate should have fallen. In practice, however, the private saving rate appears to have been relatively impervious to these influences. See Bisignano (1984).

In yet another alternative view of the consumption function, personal tax cuts would have little or no effect on consumption and interest rates. This is the ultrarationality hypothesis recently argued by Barro (1974), in which a tax cut causes households to raise their saving rate in order to pay the higher taxes that will be required for servicing the government debt in the future. In this case, all of a tax cut would be saved so that there would be no effect whatsoever on consumption. However, empirical studies of short-run consumer spending do not generally support this view. See Buiter and Tobin (1979) and Feldstein (1982).

20. The basic theory and its application are described in Jorgenson (1963) and Hall Jorgenson (1967, 1971).

21. The classic papers on this type of investory model are Metzler (1941), Lowell (1961), and Darling (1959).

22. On the role of permanent and transitory income in the stock adjustment process for consumer durables, see Juster and Wachtel (1972) and Darby (1975).

23. For a useful discussion of the application of the neoclassical theory of investment to owner-occupied and rental housing, including the specific taxes applicable to these sectors see Ott, Ott, and Yoo (1975).

24. For a theoretical demonstration of this point, see Lombra (1984).

25. The classic works emphasizing this link are Fleming (1962) and Mundell (1963).

26. See, for example, Feldman (1982) and Warner and Kreinin (1983).

27. The approach used is basically a simplification of Hooper and Morton's (1982) extension of the sticky price monetary model of exchange rate determination developed by Dornbusch (1976) and Frankel (1979). For a general survey of the asset view of exchange rates, see Shafer and Loopesko (1983).

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Inflation, Supply Shocks and the Stable-Inflation Rate of Capacity Utilization

Rose McElhattan*

Conventional Phillips Curve models emphasize the relationship between inflation and the unemployment rate. From these models, analysts derive the natural rate or stable-inflation unemployment rate. This is a rate which, if maintained, is associated with no change in the inflation rate. In this paper we focus upon inflation and the capacity utilization rate, and derive a stable-inflation capacity utilization rate which is about 82 percent (with its 95 percent confidence interval between 78.5 and 83.5 percent.) Evidence is presented that capacity utilization is a more informative inflationary signal than the unemployment rate.

The rate of inflation declined substantially between 1981 and 1983, from 9.6 percent to 3.8 percent. This reduction accompanied a recession that was the worst since the Second World War in terms of unemployment and unused manufacturing capacity. The jobless rate averaged 9.7 percent and the capacity utilization rate 71.1 percent in 1982. We must look back to 1941 to find a comparable unemployment rate of 9.9 percent, and to 1975 for the previous post-war low of 72.9 percent in the capacity utilization rate.

After paying such substantial real costs to bring inflation down, a concern has arisen that subsequent economic growth may start another inflationary spiral. Just how far can growth proceed before inflationary pressures are likely to rebuild? This is the major question addressed in this paper.

*Senior Economist, Federal Reserve Bank of San Francisco

Our starting point in answering this question is a traditional pricing model in which prices are determined as a mark-up on unit production costs. In an earlier version of this model (McElhattan, 1978), I estimated the inflationary impact of excess demand pressures, as measured by capacity utilization in U.S. manufacturing industries, and found that, on average, during the 1954–1977 period, stable inflation was associated with a capacity utilization rate of about 82 percent. Demand pressures tended to raise inflation when utilization rates rose much above 82 percent; inflation tended to fall when utilization rates fell below that critical value.

Since that earlier paper, the U.S. has experienced sharp and repeated changes in energy prices and substantial changes in the international value of the dollar. In addition, the capacity utilization series has been revised. The objectives of this paper therefore are to update and expand the earlier model by adding supply-side shocks, and to determine the degree to which the stable-inflation capacity utilization rate may have changed.

Section I presents an overview of the basic inflation model and the determination of the stable-inflation rate of capacity utilization. Section II considers the estimation of inflation and the inflationary impact of the following supply-side shocks: Nixon-era wage and price controls, changes in the real price of crude oil, and changes in the international value of the dollar. Section III provides estimates of the Stable-Inflation Rate of Capacity Utilization from the expanded inflation model and compares these to earlier estimates. Section IV compares capacity utilization and unemployment rates as signals of impending inflation. Section V discusses economic and policy implications of the stable-inflation capacity utilization rate concept, and the final section provides a summary.

I. The Inflation Model

The inflation equation used in this paper is derived from a traditional price mark-up model found in most econometric macro forecasting models and studies of inflation.[1] The model itself determines an aggregate inflation rate as measured here by changes in the GNP Implicit Price Deflator. Inflation behavior is described in terms of a wage and a price equation. The price equation relates prices to a mark-up on standard production costs, with wages as the major cost component. Wages, in turn, are determined by excess demand in labor markets and by expected inflation.

The mark-up of final product prices over production costs is related to excess demand pressures in final product markets. These pressures are most often measured by the GNP gap between actual and potential GNP or by capacity utilization rates. As aggregate demand builds and utilization rates increase, the mark-up increases as final product prices adjust to eliminate excess demand. The higher mark-up also may reflect noncompetitive pricing behavior by some firms that feel they can raise prices without a serious loss in sales during periods of increasing demand.[2]

In a typical price mark-up equation, the aggregate inflation rate (IR) is determined by changes in standard unit labor costs, measured by changes in nominal wages ($\dot{W}$) and a trend rate of labor productivity ($\dot{T}$), and by excess aggregate demand, expressed here as a function of capacity utilization, f(CU):

$$IR_t = a_{12}\dot{W}_t - a_{13}\dot{T}_t + f(CU)_t \qquad (1)$$

In Equation 1, dots over the variables indicate rates of change in that variable, and the subscript, t, refers to a period of time. Upward pressure is placed upon inflation when capacity utilization increases; that is, the change in IR_t with respect to $f(CU_t)$ is positive.

In Equation 2, the rate of change in nominal wages of labor are determined by the expected inflation rate (IR*), by the trend rate of growth of labor productivity and by excess demand in labor markets, expressed as a function of the unemployment rate, h(u).

$$\dot{W}_t = a_{21}IR^*_t + a_{23}\dot{T}_t - h(u) \qquad (2)$$

Rising unemployment places downward pressure on wages, and a decrease in the unemployment rate represents an increase in wage pressures, that is, $h' < 0$. According to Equation 2, inflation-adjusted wage changes ($\dot{W} - a_{21}IR^*$) will rise in proportion to labor productivity for given levels of unemployment.

Substituting Equation 2 into Equation 1, we obtain Equation 3, in which the inflation rate is determined by expected inflation, labor productivity and the two excess demand variables, unemployment and capacity utilization rates:

$$IR_t = a_{12}a_{21}\, IR^*_t + (a_{12}a_{23} - a_{13})\dot{T}_t - a_{12}\, h(u)_t + f(CU)_t \qquad (3)$$

Focus on Capacity Utilization

Because of the high correlation between the unemployment and capacity utilization rates, empirical estimation of Equation 3, or specifications similar to it, generally include only one of these variables, the unemployment rate.[3] The resulting negative relationship between the unemployment rate and inflation, popularly known as the Phillips Curve, has received wide attention.

In our model we focus upon the inflationary consequences associated with capacity utilization and drop the unemployment rate because the capacity utilization rate provides a more reliable signal of inflation than the unemployment rate, as shown in Section IV. Consequently, in our model, capacity utilization proxies for aggregate demand pressures in general as these affect both the price mark-up and the determination of wages.

Major changes that occurred in the post-war period have altered the unemployment rate associated with a given degree of inflationary pressure. For instance, many economists contend that demographic changes since the mid-1960s (particularly the presence of more women and young people in the labor force) have resulted in a higher average "natural" unemployment rate (a rate consistent with no change in inflation). There remains, however, a good deal of disagreement and uncertainty among economists over how much the natural rate of unemployment has changed.

This uncertainty about the natural rate of unemployment has public policy as well as academic implications. Some economists argue that it has led to some inflationary bias in past policy decisions. There was a natural tendency, they argued, to err on the side of underestimating the unemployment rate consistent with stable inflation and, therefore, to advocate policies which in retrospect were too stimulative and inflationary.[4] If this assessment were correct, the use of capacity utilization to gauge inflationary pressures may be helpful. It would at least serve as an independent check on assessments of inflation based on unemployment measures.

The capacity utilization data do not represent capacity measurements in some absolute or engineering sense.[5] Instead, they depend to a degree on the judgment of the respondents providing the data. Such judgment, nevertheless, represents an economic concept that bears on pricing decisions, just as inflation expectations, which also are difficult to measure, bear on pricing decisions. Moreover, the capacity utilization series has had a stable and close correlation with changes in the inflation rate throughout the post-war period. It therefore merits serious consideration as an empirical signal of inflation.

Formulation

In view of the above considerations, we may rewrite Equation 3 with capacity utilization as the sole excess demand variable. In addition, we express the general form, f(CU), as approximated by the linear relationship, $b_0 + b_1 CU_t$, to obtain Equation 4.

$$IR_t = a_{12}a_{21}\, IR_t^* + (a_{12}a_{23} - a_{13})\dot{T}_t + b_0 + b_1\, CU_t \qquad (4)$$

We regard inflation expectations, IR*, as a weighted average of past actual inflation. This is a general specification of the formation of inflation expectations and a common one in price mark-up models; it is shown in Equation 5.

$$IR_t^* = \sum_{i=1}^{k} b_i\, (IR_{t-i}) \qquad (5)$$

where $\sum_{i=1}^{k} b_i = 1,\ b_i \geqslant 0$ for all i.

Substituting Equation 5 into Equation 4 yields the reduced form equation of the wage-price sector of a more complete model of the U.S. economy. In the reduced-form specification, Equation 6, the trend rate of change in productivity of labor ($\dot{T}$) and capacity utilization (CU) are regarded as exogenous variables.

$$IR_t = a_{12}a_{21}\sum_{i=1}^{k} b_i\, IR_{t-i} + (a_{12}a_{23} - a_{13})\dot{T}_t + b_0 + b_1\, CU_t \qquad (6)$$

Equation 6 provides the short-run relationship between inflation and its determinants. A stable, long-run relationship exists only if the value of $(a_{12}a_{21})$ is less than unity. Under that condition, any gap between inflation and its expected rate, for given values of capacity utilization and productivity, will become smaller over time. Eventually, actual and expected inflation will be the same and will be associated with a specific capacity utilization rate. In the context of unemployment and inflation, the condition that $(a_{12}a_{21})$ is less than unity implies a stable, long-run Phillips Curve. By the same reasoning, a permanently lower capacity utilization rate would be needed to achieve a permanently lower inflation rate.

On balance, econometric evidence since the mid-1970s suggests that the value of a_{21} is unity and that the value of $a_{12} = a_{13} = 1$. This leads to the result that $(a_{12}a_{21})$ is unity.[6] In the case of the coefficient, a_{21}, the unity estimate suggests that inflation expectations are fully reflected in wages over time (see Equation 2). According to Equation 1, the estimate $a_{12} = a_{13} = 1$, suggests that the relevant long-run determinant of inflation is the rate of change in standard unit labor costs $(\dot{W} - \dot{T})$ that is fully incorporated in final prices.

These considerations enable us to rewrite the reduced-form inflation model (Equation 6) in terms of the difference between actual and expected inflation:

$$IR_t - IR_t^* = (a_{12}a_{23} - a_{13})\,\dot{T}_t + b_0 + b_1\,CU_t \qquad (7)$$

Equation 7 indicates that a stable relationship exists between the difference of actual and expected inflation and capacity utilization and labor productivity.

Adding Supply-Side Shocks

Since the early 1970s, a number of events have significantly affected U.S. prices. These include the Nixon-era wage and price controls, changes in the international value of the dollar and the OPEC changes in the price of oil. We shall refer to these events as supply-side shocks.

In the context of our model, the latter two events affect final prices through their impact on the the mark-up of domestic prices over costs. We recall that the inflation rate is measured by the GNP Implicit Deflator. The GNP Deflator is a value-added concept—it measures the value of goods and services produced in the U.S. Therefore, it directly excludes the value of imports. For example, although the value of imports is included in personal consumption spending, it is subtracted from GNP in the import account. As a result, imports have no direct net effect on GNP or the Deflator. However, changes in the price of imported items may be correlated with changes in the GNP Deflator to the extent that changes in foreign prices, through competitive pressures, lead to changes in the U.S. prices of traded products produced in the U.S.

Equation 8 includes a function of the vector Z to incorporate these supply-side shock variables as determinants of U.S. inflation.

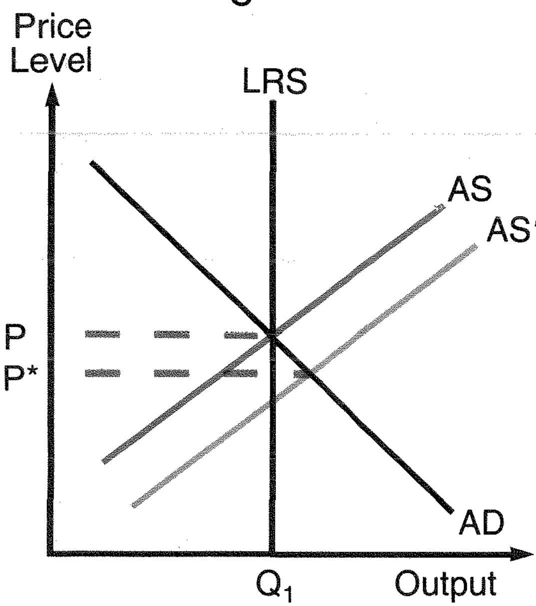
$$IR_t - IR_t^* = (a_{12}a_{23} - a_{13})\,\dot{T}_t + b_0 + b_1\,CU_t + k(Z) \qquad (8)$$

In the short-run, supply-side price shocks are likely to be positively correlated with inflation. Such shocks would have no transitory effect on the aggregate price level if other prices were perfectly flexible (and if the productive capacity of the economy were unaffected). However, we generally do not observe perfectly flexible prices over short periods of time so some positive correlation between movements in supply-side price shocks and the aggregate price level appears most likely.

What ultimately happens to U.S. prices following a price shock depends upon whether there are any related changes in (a) real GNP and/or (b) the money supply. We assume first that there is no long-run effect on the level of real GNP. Given this assumption, the ultimate impact on the GNP Deflator will depend upon the monetary response to the initial price shock.

We may distinguish two types of monetary responses to a one-time decrease in the relative price of crude oil. (A price increase has the same effects, but of opposite sign.) In the first case, the decrease in the general price level due to the oil price decline is met by no change in the money supply. This case is illustrated in Figure 1 in a simple aggregate demand-aggregate supply paradigm of economic behavior.

Figure 1



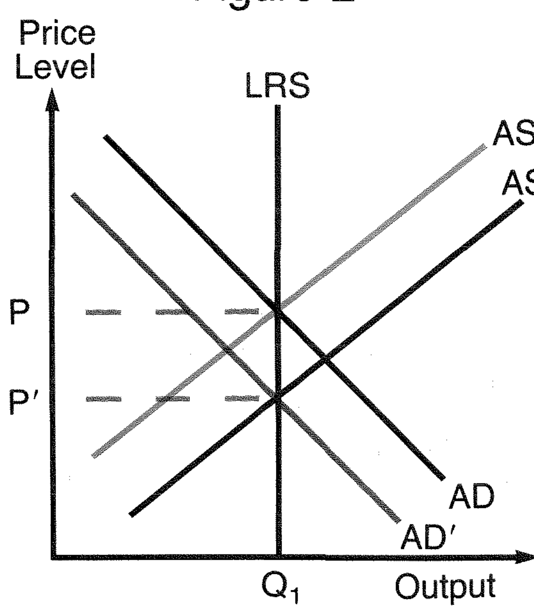
In this paradigm, the aggregate demand schedule (AD) slopes downward and to the right, signifying that greater quantities of output are demanded at lower price levels. This occurs because lower prices mean larger real money balances in private wealth portfolios, which stimulate demand in general. The quantity of output a nation can produce is ultimately constrained by the quantity and quality of real economic factors, including the productivity of its labor and population growth. In the long-run, because of these real constraints, the quantity of real GNP produced is regarded as independent of the price level. These considerations are expressed in the vertical, long-run supply curve, LRS. For short periods of time, however, greater quantities of output may be supplied at higher prices, as expressed in the upward sloping aggregate supply curve, AS. Changes in price expectations or supply-side price shocks, will shift the AS schedule.

Beginning at full-employment equilibrium, a decline in the OPEC price of crude oil means a downward shift in AS, say, to AS′ in Figure 1. In the absence of a monetary response, aggregate demand does not shift. The downward shift in aggregate supply means that the original quantity demanded, Q1, may be sold at a lower aggregate price, P* in Figure 1. That price level cannot be sustained, however. Over time, prices on other goods and services would rise. These revisions produce upward shifts in AS′ back to its original position, AS. At that final point, the price level for the quantity, Q1, is determined by the unchanged money supply and is equal to its original level, P.

In Figure 2, the shift in aggregate supply is met by a decline in the money supply. As a result, aggregate demand will shift downward, say, to AD′.[7] An equal shift in demand and supply denotes a fully "accommodative" monetary policy in the sense that the contraction in money constrains the level of prices for other goods from rising and thus prevents the aggregate supply schedule from shifting from AS′ back to AS. Ultimately, the price level is lower (P′) following the negative shock, its decline determined by the extent of the monetary "accommodation."

These cases illustrate the transitory effect of price shocks on domestic prices. Aggregate price changes occur during the transition period following the supply-side shock. In the subsequent equilibrium (P* or P′ in the prior ex-

Figure 2



amples), there will be no further change in the price level, or in the rate of inflation, as a result of the supply-side shock. A partially accommodative monetary policy will lead to a final price level somewhere between the P* and the P′ of our two examples, and would require some upward shift in the aggregate supply schedule from AS′. For how long, and by what magnitude, prices and the rate of inflation in the U.S. respond to different supply-side shocks is an empirical matter discussed in the following section.

The preceding discussion has assumed that the supply-side price shocks have no long-run effects on the level of real GNP—an assumption some economists have challenged in the case of oil-price shocks.[8] In the event that a permanent change in a supply-side variable alters the level of potential output, the price level will be changed in the long-run from what it otherwise would be independent of whether there is any monetary accommodation. Nevertheless, as in our example, even if the supply-side shock has a permanent effect on the price level, it would not permanently change the rate of inflation.

II. Estimation of the Inflation Model

The general form of the inflation model is expressed in Equation 8. All estimations in this paper use annual data since 1954, unless otherwise specified. The expected rate of inflation in Equation 8 was replaced with the value of the inflation rate lagged one period. This was done because in estimations of Equation 6 only the previous year's inflation rate is statistically significant, as was found in our earlier paper (see Appendix 3). Adding more values of past inflation did not significantly improve the determination of inflation according to the "F" test. Moreover, we found that the estimated coefficient associated with the previous year's inflation rate is not significantly different from unity.[9]

In addition, in this section, the results are reported with the productivity term ($\dot{T}$) omitted. The reason for doing so is that changes in labor productivity, measured by the trend rate of growth in real GNP per hour of employment, has no significant effect on the rate of inflation. This result accords with our earlier study and is generally found in estimations of reduced-form equations similar to the above. The economic significance of this result may best be understood by referring to the components of the productivity parameter in Equation 8. That parameter is derived from the parameters in the price mark-up and wage equation, $(a_{12}a_{23} - a_{13})$. As noted above, the parameters a_{12} and a_{13} from the price equation generally are found in empirical research to be equal to unity. This indicates that the relevant measure in pricing decisions is standard unit labor costs. In the wage equation, a_{23} also is expected to equal unity, reflecting that, on average, the rate of change in real wages is equal to the rate of change in labor productivity. Consequently, the productivity parameter is expected, from an economic point of view, to have a zero value.

With the estimated coefficient of productivity not significantly different from zero, and the coefficient on the previous year's inflation equal to unity, we may re-write the general inflation model (Equation 8) in terms of the change in the inflation rate:

$$\begin{aligned} DIR_t &= IR_t - IR_{t-1} \\ &= b_0 + b_1 CU_t + k(Z)_t \qquad (9) \end{aligned}$$

Regression results of Equation 9 are provided in Table 1, at first without supply-side shocks (Column I) and then with wage and price controls (Column II), changes in real oil prices (Columns III and IV), and changes in the international value of the dollar (Columns V and VI) progressively introduced. The dependent variable is the change in the inflation rate, with the latter measured by the year-over-year percentage change in the GNP Implicit Price Deflator. Capacity utilization, CU, is measured as the annual rate in total U.S. manufacturing, a series published by the Federal Reserve Board of Governors.

TABLE 1
Regression Results for Change in the Inflation Rate
(Measured by the GNP Implicit Deflator*)

Independent Variables	Equations					
	I	II	III	IV	V	VI
Constant						
C (b_0)	−15.518	−18.322	−11.748	−13.626	−10.283	−12.090
	(−4.0)	(−5.4)	(−3.7)	(−4.4)	(−3.3)	(−4.2)
Capacity Utilization Rate						
CU (b_1)	.190	.222	.145	.167	.127	.148
	(4.0)	(5.4)	(3.8)	(4.8)	(3.4)	(4.3)
Wage/Price Controls "On"						
WPON		−1.04	−1.21	−1.10	−1.52	−1.44
		(−1.0)	(−1.6)	(−1.4)	(−2.0)	(−1.9)
Wage/Price Controls "Off"						
WPOFF		2.67	1.18	.93	.97	.95
		(3.5)	(1.7)	(1.4)	(1.5)	(1.4)
Change in Real Price of Oil						
DIPE			.027			
			(2.1)			
DIPE Lagged One Year						
$DIPE_{-1}$			−.001			
			(−0.1)			
DIPE Lagged Two Years						
$DIPE_{-2}$			−.054			
			(4.2)			
Acceleration in Relative Price of Oil						
DDIPE				.036	.045	.039
				(3.4)	(3.8)	(3.6)
DDIPE Lagged One Year						
$DDIPE_{-1}$				.044	.053	.058
				(4.2)	(4.9)	(5.4)
Acceleration in Exchange Rate of U.S. Dollar						
DDEX of U.S. Dollar					.091**	.059***
					(2.2)	(1.2)
DDEX Lagged One Year						
$DDEX_{-1}$					.054**	.107***
					(1.0)	(2.4)
Stable Inflation Capacity Utilization Rate						
CU^e ($= -b_0/b_1$)	81.7	82.5	81.0	81.6	81.0	81.7
95% Confidence Interval†	78.7–84.6	80.5–84.6	76.5–83.3	79.4–83.7	76.2–83.5	78.5–83.6

Summary Statistics						
R^2	.35	.55	.76	.76	.80	.80
DW	1.97	1.73	2.20	2.22	2.29	2.24
SE	1.22	1.02	.74	.75	.70	.69

* Estimation period is 1954–83 for equations (I) through (IV) and 1959–1983 for equations (V) and (VI). Figures in parentheses are t-statistics.
** Nominal exchange rate
*** Real exchange rate
† The derivation of confidence limits for the ratio of two estimators is described in Scadding (1973).

Wage and Price Controls

In Equation II, Table 1, wage and price controls are included in the determination of the change in the inflation rate. These controls were applied in several stages from August 1971 through April 1974, when they were removed entirely. The "on" effect is represented by the dummy variable WPON, which is unity in 1972 and zero elsewhere, and the "off" effect, by the dummy variable WPOFF, which is unity in 1974 and 1975.[10]

Controls, according to the estimates in Column II, tended to lower the measured inflation rate about 1.0 percentage points in 1972; their removal tended to increase inflation about 2.7 percentage points in both 1974 and 1975. Other studies also have found a greater price increase when controls were removed than a price decrease—reduction in inflation—when they were imposed. However, such estimates are suspect since a number of other events influenced the economy in 1974 and 1975. If not explicitly included in the estimation, their influence will tend to be captured by the dummy variable. The dollar depreciation in 1973 represents one such influence that, due to adjustment lags, could have increased domestic inflation the following year. Another important influence was the OPEC quadrupling of oil prices beginning in December 1973, which led to unprecedented increases in domestic energy prices shortly thereafter. We will consider first the introduction of energy shocks, and then changes in the international value of the dollar.

The Real Price of Crude Oil

To estimate the impact of oil price changes upon the GNP deflator, we used a measure of the real (or relative) price of crude oil that consists of the ratio of the producer price index for crude petroleum to the aggregate producer price index. The producer price index is not based on a value added in production concept, as is the Deflator, so it reflects price changes in crude petroleum used in the U.S. whether imported or domestically produced. The data on the annual percent rates of change in the relative price of crude oil used in this section are presented in Appendix 1.

Equation III of Table 1 adds the contemporaneous, first and second year lagged values of the percentage change in the real price of crude petroleum (DIPE). (Additional lags did not add significantly to the estimation.) These changes in relative prices are statistically significant in the determination of inflation. Including them reduced the standard error of the estimation from 1.02 percentage points (Equation II) to .74 percentage points.

It is important to consider the sum of the coefficients associated with changes in the real price of oil. A sum significantly different from zero implies that a one-time change in the real price of crude would have a *permanent* impact on the rate of inflation. Rather, we would expect a one-time change in oil prices to have a transitory impact on the rate of inflation as far as its direct effect on price indices is concerned. In addition, there may be indirect effects that are longer lasting. Depending on how monetary policy responds, the shock may get embedded in inflation expectations, for example. This indirect effect, however, would be caught by the lagged inflation terms in our regressions. Similar reasoning applies to the indirect effects caused by the price shocks' impacts on the effective capacity utilization rate.

We therefore tested whether the sum of the coefficients in Equation III of Table 1 is significantly different from zero. We did so by specifying accelerations in the real price of crude oil in Equation IV of Table 1: DDIPE = DIPE-DIPE$_{-1}$. The accelerations were entered contemporaneously and with a one-year lag. This constrained estimation was then compared with Equation III. The "F" test statistic indicated that there is no significant difference between the two estimations at the 95 percent level of significance. In light of this, we concluded that the statistical results indicate oil prices have only temporary inflation effects. We subsequently specified the energy variable in later estimations as accelerations in the real price of oil.[11]

Table 2 illustrates the estimated impact of a one-time 10 percent increase in the real price of crude oil upon the aggregate price level, the rate of inflation and the change in the rate of inflation according to the estimates of Equation IV of Table 1.

During the first year of the shock, the price level and inflation rate increase .36 percentage points. The cumulative effect on the price level is .8 percentage points, which is reached in the second year. The rate of inflation is .36 percentage points higher in the first year and .44 percentage points higher in the second year; it shows no effect of the energy price change in the third year. The volatility in the inflation rate is illustrated by the change in the inflation rate. After increasing in the first and second year by a total of .44 percentage points, the inflation rate declines .44 percentage points in the third year.[12] This fairly abrupt change in the inflation rate is associated with the full adjustment to the oil shock that has occurred in the level of the price deflator.

Inclusion of these energy prices in the estimation substantially reduces the estimation errors, particularly after 1974. Also, as shown in Table 1, after including changes in the real price of crude oil, less of the increase in prices in 1974 and 1975 is attributable to the removal of wage and price controls, "WPOFF." Before the consideration of energy prices, the removal of controls was associated with an increase in the inflation rate of 2.67 percentage points in both 1974 and 1975 (Equation 2). By expressly incorporating real energy prices in Equation 4, this is reduced to .93 percentage points.[13]

The International Value of the Dollar

Changes in the international value of the dollar have recently been included in price-mark-up models[14] because they are believed to affect the mark-up of domestic prices over domestic production costs. In addition, changes in the international value of the dollar may affect directly the determination of wages. For instance, competitive pressures may induce workers in industries competing in foreign trade to change their wage demands. Consequently, in our reduced-form model, which combines the price mark-up and wage equations, changes in the international value of the dollar may affect both the mark-up on domestic costs and domestic costs themselves.

The international value of the dollar may be expressed in nominal or real terms. The nominal value is simply the trade weighted average of the dollar's value in terms of foreign currencies. The "real" exchange rate is obtained by adjusting the nominal rate for differences in domestic and foreign prices. It is the real exchange rate that appears more relevant in the price-mark-up and wage equations because appreciation of the dollar does not necessarily lead to cheaper foreign products if foreign prices have risen proportionally to offset the appreciation. However, since no convention appears in the literature establishing the appropriate measure of exchange rates in empirical estimation, we present empirical results for both the nominal and real exchange rates.

TABLE 2
Effects of One-Time Ten-Percent Rise in the Real Price of Crude Oil*
(percentage points)

	Change in the Inflation Rate	Inflation Rate	Cumulative Percentage Change in Price Level
First Year of the Shock	.36	.36	.36
Second Year	.08	.44	.80
Third Year	−.44	-0-	.80

* Based on Equation IV of Table 1. Inflation measured by GNP Implicit Deflator

We anticipate that a one-time change in the dollar's exchange rate will lead to transitory changes in the U.S. inflation rate but not to a permanent change. This suggests that the estimated coefficients associated with changes in the dollar's exchange rate in our inflation model should sum to zero, as was the case for oil price shocks. We therefore constrained the sum to zero by specifying accelerations in the exchange rate, as we did in the previous estimation for the effects of oil price shocks. We let DEX represent the yearly percentage change in the exchange rate of the dollar. The acceleration in the exchange rate, DDEX, thus was the difference in the yearly percentage changes in DEX, $DDEX_t = DEX_t - DEX_{t-1}$.

Table 1 provides the empirical results from the estimation of Equation 9 using two values of the dollar's exchange rate—the nominal effective bilateral exchange rate, EXB, and the real effective bilateral exchange rate, REXB. Data for both EXB and REXB are provided in Appendix 2[15].

We anticipate that an appreciation (depreciation) of the dollar would be correlated with a decline (increase) in U.S. prices, and therefore that the sign associated with the estimated parameters would be positive. Equations V and VI in Table 1 include the acceleration in the two exchange rates in the contemporaneous year (DDEX) and lagged one year ($DDEX_{-1}$). The estimated coefficients are all of the expected sign. In each case, the exchange rate adds significantly (at the 5 percent level of significance according to the F statistic) to the determination of U.S. prices when both the contemporaneous and one-year lagged accelerations are included. Based on the results from Equation VI, a 10 percent real appreciation of the dollar is correlated with changes in the level and rate of change in the GNP Implicit Deflator, as shown in Table 3.

According to this estimated response in the U.S. price level, the period required to adjust to changes in the dollar's exchange rate is two years. Within the first year after a 10-percent appreciation, the U.S. price level is .6 percentage points below what it would be otherwise. By the second year, it is 1.7 percentage points lower. The rate of inflation is correspondingly .6 percentage points lower within the first year of appreciation, and it is 1.1 percentage points lower than it otherwise would be during the second year. The inflation rate during the third year shows no effect related to the one-time change in the dollar's international value.

The change in the inflation rate illustrates the variation in inflation in response to changes in the international value of the dollar. The inflation rate is .6 percentage points lower within the first year than it was the year before the dollar's appreciation. It continues to fall in the second year by .5 percentage points. By the third year, after the price level has fully adjusted, the inflation rate increases by 1.1 percentage points. In that third year, the inflation rate is back to what it would have been if the dollar had not appreciated.

TABLE 3
Effects of a Ten-Percent Appreciation in the Real Bilateral Exchange Rate*
(percentage points)

	Change in the Inflation Rate	Inflation Rate	Cumulative Percentage Change in the Price Level
Year of the appreciation	−0.6	−0.6	−0.6
Second Year	−0.5	−1.1	−1.7
Third Year	+1.1	-0-	−1.7

* Based on Equation VI of Table 1. Inflation measured by GNP Implicit Deflator

III. Estimates of the Stable-Inflation Capacity Utilization Rate

A purpose of this study is to estimate the stable-inflation capacity utilization rate with the additional data since 1977 and the expanded specification which includes both energy price shocks and changes in the international value of the dollar. The additional variables played a significant role in determining inflation, particularly since mid-1975 as we have discussed above, and, if not expressly included in the econometric specification, could bias our estimation. Moreover, the additional data cover a period in which inflation was extraordinarily volatile.

Following McElhattan (1978), the stable inflation capacity utilization rate, CU^e, is estimated as

$$CU^e = -b_0/b_1 ,$$

where b_0 and b_1 are estimated from Equation 9. Since capacity utilization is positive, this suggests that the constant term in Equation 9 should be negative and the coefficient on CU should be positive, which they are in Table 1. Referring to Equation 9 again, this estimate of CU^e also assumes that supply shocks have no inflationary impact in the long run, which is consistent with the results reported in Table 1.[16]

The regression estimates in Table 1 indicate a remarkable stability in CU^e with respect to model specification. In addition, CU^e has been stable over time. As shown in Table 4, the estimate of this rate was 81.9 percent in my earlier study for the period 1954–1973. The model for that period included the simple relationship only between the change in the inflation rate and the level of capacity utilization. The same simple relationship, but with an expanded estimation period of from 1954–1977, also yielded an 81.9 percent stable-inflation capacity utilization rate. However, as indicated by the wider 95 percent confidence interval, the additional data introduced greater uncertainty with regard to the population value of the stable-inflation capacity utilization rate. That uncertainty is related to the sharp variations in inflation that occurred at the same time as the removal of wage and price controls, the quadrupling of the OPEC oil prices and the sizable changes in the international value of the dollar.

In our current study, with annual data from 1959–1983 and with the inclusion of the three types of price-shocks mentioned above, the stable-inflation capacity utilization rate estimate is 81.7 percent. In addition, the precision of this estimate is improved over the 1954–1977 period as illustrated by the fairly narrow 95 percent confidence interval of 78.5 percent to 83.6 percent.

The stability of the estimate for CU^e over time is particularly notable given the behavior of inflation. After the mid-1970s, inflation was much higher and more variable than in the earlier period. Inflation averaged 3.0 percent per

TABLE 4
Estimates of the Stable-Inflation Capacity Utilization Rate
(Annual Data)

	Estimation Periods*		
	1954–1973	1954–1977	1959–1983
Stable-Inflation Capacity Utilization Rate	81.9	81.9	81.7
95% Confidence Limits	79.6–83.5	74.9–86.0	78.5–83.6

* Equations associated with these estimates:
1954–1973, see McElhattan (1978), Equation (1), Table 1
1954–1977, see McElhattan (1978), Equation (2), Table 1
1959–1983 Equation VI, Table 1

year between 1954 and 1973. Its standard deviation during that time was 1.5 percentage points, or 50 percent of its mean value. Over the entire 1954–1983 period, the variation in inflation rose to 61.4 percent of its mean value.

According to our estimates, neither the substantially higher average inflation rate nor the increased uncertainty with regard to that rate apparently altered the stable-inflation capacity utilization rate.

TABLE 5
Comparison of Capacity Utilization and Unemployment Rates in the Inflation Model: 1959–1983

	Equation I	Equation II	Equation III
Constant	−12.090 (−4.2)	2.087 (2.9)	−14.809 (−2.4)
Capacity Utilization Rate	.148 (4.3)	—	.175 (2.7)
Unemployment Rate	—	−.329 (−2.7)	.091 (.5)
Wage & Price Controls:			
On	−1.436 (−1.9)	−1.174 (−1.3)	−1.476 (−1.9)
Off	.950 (1.4)	.725 (.9)	.911 (.13)
Acceleration in the Relative Price of Oil:			
Current year	.039 (3.6)	.042 (3.2)	.040 (3.6)
Last year	.058 (5.4)	.051 (3.8)	.060 (5.0)
Acceleration in the Real Bilateral Value of the Dollar:			
Current year	.059 (1.2)	.021 (.4)	.066 (1.3)
Last year	.107 (2.4)	.101 (1.9)	.110 (2.4)
Stable-Inflation Rate	81.7	6.3	—
95% Confidence Intervals	78.5–83.6	5.1–9.1	—
Summary Statistics			
$\overline{R}^2$	.80	.72	.80
Standard Error	.69	.83	.71

IV. Comparison of Capacity Utilization and Unemployment Rates as Inflation Signals

We suggested earlier that as a signal of inflation, capacity utilization may be a more reliable policy guide than the unemployment rate. To examine that proposition more formally, we next compare the performance of unemployment and capacity utilization rates in determining inflation. For convenience, Equation I of Table 5 repeats Equation VI from Table 1. In Equation II of Table 5, the unemployment rate replaces the capacity utilization rate as the proxy for excess demand. In Equation III, both the capacity utilization and unemployment rates are included.

In comparing Equations I and II of Table 5, we find that the standard error of the regression is less and the correlation is higher when capacity utilization is the proxy for excess demand in the estimation. The larger standard error and uncertainty associated with the unemployment rate estimates also is reflected in the fairly wide 95 percent confidence interval for the natural rate of unemployment, 5.1 percent to 9.1 percent. This appears too wide a range to provide a very useful policy guide.

The statistical F-test enables us to determine whether adding capacity utilization to Equation II to obtain Equation III would significantly improve the determination of changes in the inflation rate. The F-statistic of 7.4 compared to the critical value of 4.5 suggests that capacity utilization does add significantly to the determination of changes in inflation, above and beyond any information provided by the unemployment rate.

However, when unemployment is added to Equation I to get Equation III, the comparable F-statistic is only .24. This means that the civilian unemployment rate does not provide any statistically significant information once we use the capacity utilization rate in the same determination of changes in the inflation rate. We interpret this as evidence that capacity utilization has been a more informative inflationary signal than the unemployment rate.

V. Inflation In the 1980s and Policy Implications

This section details how the change in inflation in the 1980s is explained by the inflation model as estimated in Equation VI Table 1. In 1980 and 1981, inflation increased continuously and reached a record high of 9.6 percent in 1981, despite weak aggregate demand that was working to reduce the inflation rate in those years (illustrated in Table 6). Capacity utilization averaged 79.6 percent and 79.4 percent in 1980 and 1981, respectively, holding the inflation rate down .3 percentage points in each year. In addition, the continued appreciation of the dollar added downward pressure on inflation. The 13 percent (as measured by the real effective bilateral exchange rate) increase in its value is estimated to have reduced inflation by a total of 1.5 percentage points over the 1980–81 period. However, the depressing effects of both the domestic economy and the international value of the dollar were more than offset by the increase in the relative price of oil which, in 1980 and 1981, was 70 percent. The fast rising oil price alone pushed inflation up by 2.8 percentage points in 1980 and 1981. Other factors (representing the estimation error) added .2 percentage points. On balance, inflation increased .9 percentage points between 1979 and 1981, although the dollar appreciated and the economy was producing below its potential.

Between 1981 and 1983, the inflation rate reversed course, declining from 9.6 percent to 3.8 percent. That reduction was associated with a fall in capacity utilization to a post-war low in 1982 and a partial recovery during 1983. The relatively low capacity utilization over those years reduced the inflation rate by 2.5 percentage points. In addition, the real price of crude oil dropped almost 20 percent. This decline, coupled with the fact that the large energy price increases in 1980 and 1981 had largely worked their way through to a higher price level by 1983, resulted in a sharp deceleration in the change in the price of crude oil. Alone, the deceleration in energy prices decreased the aggregate inflation rate by a total of 4.3 percentage points in 1982 and 1983.

The international value of the dollar continued to appreciate in 1982 and 1983 but by a substantially smaller amount than in 1981. This meant that the depressing effects on the aggregate inflation rate in 1983 were significantly less than in 1981 and 1982. On balance, the contribution of an appreciating dollar to holding down inflation was 0.9 percentage points less in 1983 than in previous years.

Over 1982 and 1983, our inflation model overestimated the 5.8 percentage point decline in inflation by only .3 percentage points. The results clearly highlight the importance of economic slack and supply-side price movements in both the decline and volatility of inflation since 1981. The inflationary model of excess demand and supply-side shocks explains the sharp decline in inflation—even as the economy was experiencing its strongest cyclical recovery in the post-war period.

This discussion illustrates the applicability of conventional inflation models to describing the degree and volatility of inflation. It also illustrates the relevance of the important, but temporary, inflationary effects of supply-side shocks, such as changes in the real price of crude oil and in the international value of the dollar, to macro policy decisions. In essence, any inflationary increase due to a supply-side price shock will be temporary. Once the aggregate price level adjusts to a higher relative price, the inflation rate will drop back to levels that would have existed without those shocks and which reflect aggregate demand pressures. Conversely, any decline in inflation associated with an appreciation of the dollar or decline in the real price of crude oil will be temporary. Once the aggregate price level has adjusted for lower relative prices, the aggregate inflation rate will increase, reflecting the fact that the benefits from the lower energy and/or traded goods prices are over. Ultimately, the inflation rate will reflect aggregate demand pressures in the domestic economy. According to our estimates, adjustments to supply-side shocks take about two years to work their way through the price level.

TABLE 6
Inflation Since 1979

	Inflation Rate (Percent)	Percentage Point Changes in the Inflation Rate	Percentage Point changes in the inflation rate due to:			
			Capacity Utilization	Exchange Rate	Real Price Crude Oil	Other Factors
1979	8.7					
1980	9.2	0.5	−0.3	−0.9	1.5	0.2
1981	9.6	0.4	−0.3	−0.6	1.3	0
1982	6.6	−3.6	−1.6	−0.3	−1.7	−0.1
1983	3.8	−2.2	−0.9	0.9	−2.6	0.4
Cumulative Change		−4.9	−3.1	−0.9	−1.5	0.5

V. Summary

In this paper, we have derived an inflation model that is the reduced-form of conventional wage and price equations of a more complete structural model of the U.S. economy. The reduced-form contains at least two excess demand measures: the unemployment rate, which proxies for slack in the labor markets, and the capacity utilization rate, which proxies for excess demand in final product markets. Because of the close correlation between the two, either unemployment or capacity utilization may serve as a general measure of excess demand in the economy.

Conventional Phillips Curve models emphasize the relationship between inflation and the unemployment rate. We focus upon inflation and the capacity utilization rate. From the conventional Phillips Curve, analysts derive the natural rate or stable-inflation unemployment rate. This is a rate which, if maintained, is associated with no change in the inflation rate. Similarly, we have found a stable-inflation capacity utilization rate, and estimated this rate to be about 82 percent (with its 95 percent confidence interval between 78.5 percent and 83.5 percent).

In this paper, we also have introduced supply-side shocks into the conventional correlation between inflation and excess demand. These shocks include wage and price controls during the Nixon Administration, changes in the international value of the dollar, and changes in the real price of crude oil. We found that both changes in the exchange rate and real price of crude oil added significantly to the determination of inflation during the 1980s. Changes in the inflation rate over the past four years are due almost as much to these temporary price shocks as to the fundamental correlation between excess demand and inflation.

The negative relationship between unemployment and inflation has received wide attention, but we believe the capacity utilization rate may be a more reliable indicator of inflation. Our belief rests on the observation that the stable-inflation capacity utilization rate has remained steady over time, making it a reliable standard. In contrast, a good deal of uncertainty surrounds the estimate of the natural rate of unemployment. This uncertainty may have led to some inflationary bias in past policy decisions to the extent that policymakers and others have tended to underestimate the natural rate and recommend policy actions which in retrospect were too stimulative. The use of capacity utilization rates to gauge inflationary pressures therefore also may be helpful as an additional check on the inflation assessments based on unemployment measures.

Appendix 1
Percentage Change in the Real Price of Crude Oil
(Producer Price Index)

Year	Percentage Change	Year	Percentage Change	Year	Percentage Change
		1960	−0.7	1972	− 5.1
1949	3.7	1961	0.7	1973	− 2.4
1950	− 4.0	1962	0	1974	49.3
1951	−10.8	1963	−0.2	1975	6.7
1952	2.7	1964	−0.6	1976	− 1.4
1953	8.7	1965	−2.2	1977	2.0
1954	2.7	1966	−2.5	1978	1.7
1955	− .2	1967	0.9	1979	12.9
1956	− 2.7	1968	−1.7	1980	33.7
1957	7.4	1969	0.5	1981	35.3
1958	− 1.2	1970	−2.7	1982	−10.7
1959	− 3.5	1971	4.7	1983	− 8.3

Appendix 2
Percentage Change in Bilaterally Weighted Exchange Rate (EXB)

Year	Percentage Change	Year	Percentage Change
1957	−0.3	1971	3.2
1958	−1.0	1972	6.8
1959	−0.9	1973	8.1
1960	−0.2	1974	− 1.6
1961	−0.3	1975	0.9
1962	−1.2	1976	− 5.1
1963	−0.3	1977	1.5
1964	0	1978	7.7
1965	0	1979	3.1
1966	−0.1	1980	0.5
1967	−0.2	1981	−10.4
1968	−1.3	1982	− 7.7
1969	−0.6	1983	− 4.7
1970	1.6		

Percentage Change in the Real Bilateral Exchange Rate (REXB)

Year	Percentage Change	Year	Percentage Change
1957	−3.1	1971	3.0
1958	−3.6	1972	6.3
1959	−0.1	1973	6.6
1960	0.7	1974	1.3
1961	0.1	1975	1.3
1962	−0.6	1976	2.5
1963	2.0	1977	4.1
1964	1.9	1978	6.2
1965	−0.3	1979	− 1.5
1966	−0.9	1980	− 2.7
1967	0.2	1981	−10.0
1968	−2.7	1982	− 2.2
1969	−0.3	1983	− 0.6
1970	2.5		

Source: Board of Governors of the Federal Reserve System, MPS database.
REXB = PD/EXB*PF where PD represents U.S. prices
PF foreign prices.

APPENDIX 3

(Dependent Variable: Rate of Inflation as Measured by the GNP Implicit Deflator Estimation Period: 1954–1982*)

Independent Variables	Equations			
	(1)	(2)	(3)	(4)
Constant				
C	−14.578	−14.395	−14.061	−14.258
	(−4.0)	(−3.1)	(3.0)	(3.0)
Capacity Utilization Rate				
CU	.180	.176	.173	.173
	(4.3)	(3.3)	(3.1)	(3.2)
Inflation Lagged One Year				
IR_{-1}	.932	1.003	1.113	1.141
	(11.8)	(10.7)	(6.0)	(6.2)
Wage/Price Controls "On"				
WPON	−.639			
	(−.7)			
Wage/Price Controls "Off"				
WPOFF	2.287			
	(3.1)			
Deviation of Productivity from Trend				
DPR	−.688			
	(−1.27)			
Inflation Lagged Two Years				
IR_{-2}			−.132	−.311
			(−.7)	(−1.3)
Inflation Lagged Three Years				
IR_{-3}				.201
				(1.3)
Summary Statistics				
$\overline{R}^2$	.88	.81	.80	.81
DW	2.09	2.02	2.12	2.23
SE	.912	1.19	1.20	1.19

* t-statistics in parentheses.

FOOTNOTES

1. See references in McElhattan, 1978, and in the international study by Tavlas.

2. For a view of the mark-up model that describes competitive market behavior, see Nordhaus. For a view that pertains to noncompetitive behavior, see Modigliani (1958).

3. See, for instance, Modigliani and Papademos, in which unemployment rather than capacity utilization is used in an inflation model.

4. See Scadding 1980.

5. For a description of how the capacity utilization rate series are constructed see the Federal Reserve Bulletin of February 1978 and July 1983.

6. See the discussion in Gordon and in Frye and Gordon.

7. For a discussion, See Dornbusch and Fischer.

8. See, for instance, John Tatom and Tavias' study of the OECD countries.

9. In recent studies of inflation models, Frye and Gordon have suggested that the productivity measure relevant in the price equation may differ from that in the wage equation because opposing sides in labor negotiations have different views of productivity. If that is the case, Frye and Gordon illustrate that the relevant measure of the deviation of productivity from its trend has a small but statistically significant effect upon inflation in the contemporaneous quarter. I have considered a similar measure in the estimation of Equation 1, in Appendix 3. DPR represents the deviation of actual from trend productivity, but it is not statistically significant in my estimation. Adding additional lags does not change that result. This finding may be due to inflation estimates that use annual data rather than quarterly data as did Frye and Gordon's work. Annual data allows time for offsetting quarterly effects to occur. Not finding productivity statistically significant, I have dropped the productivity term from further estimates and discussions of the inflation model in this paper.

10. A possible alternative to the dummy variable technique has been suggested by Blinder, as described in Frye and Gordon. Blinder constructed a variable to represent the impact of controls. It is equal to the fraction of the CPI subject to price controls in each month, based on government records for the period between August 1971 and May 1974. However, Frye and Gordon have compared the Blinder methodology with the simple dummy variable approach similar to that used in this paper and concluded that the Blinder series provided neither a better fit nor an evaluation of the controls that differs from the simple dummy variable approach. Therefore, I have applied only the dummy variable technique in assessing these controls.

11. This specification constrains the sum of coefficients of the rates of change in real oil prices, DIPE, to be zero. A constrained estimation based on this priori knowledge provides more efficient estimates than unconstrained estimates. This is our reason for continuing estimations with accelerations in real oil prices.

12. The change in the inflation rate in the second year is only .08 percentage points because the one-time 10 percent increase in the real price of crude oil in the first period means that in the second period the oil price decelerates by 10 percent. Relating this to the coefficients for DDIPE and $DDIPE_{-1}$ in Equation IV, the 10 percent acceleration in the first year and the subsequent 10 percent deceleration leads to a net second year impact on the change in inflation of (.44 − .36 =) .08.

13. Recently, it has been argued that due to differences in adjustment costs, inflationary responses will vary according to whether the real price of energy is increasing or falling (see Promboin). According to this argument, an energy price increase may render obsolete some portion of the capital stock. Also, an energy price decline may render obsolete certain capital items that might be energy-efficient but too expensive to operate if energy costs become less important. However, there is no reason to believe *a priori* that these costs are the same and that, therefore, energy price changes have symmetric inflationary effects. To test this hypothesis, Equation III from Table 1 was modified to include a variable that is equal to the change in energy prices when the change has been positive, and zero elsewhere. This added variable was entered contemporaneously and with the first and second year lagged values. The results indicate that there was no significant difference in the impact of changes in the real price of crude oil related to the sign of the change. The implication is that adjustment costs to energy shocks are not statistically different during the estimation period depending upon whether the energy shock increased or lowered the real price of crude oil.

14. The MPS model incorporates the real bilateral exchange rate and Gordon's work uses the effective multilateral exchange rate.

15. The exchange rate data is taken from the Board of Governors of the Federal Reserve System database for the MPS model. The Bilateral Exchange rate is a 10-country weighted index.

For the period 1955–1976 the series is a geometrically weighted average of exchange rates with the following countries. The weights are average bilateral trade shares (shares of trade with U.S.).

Country	**Weight**
Canada	.251
Germany	.160
Japan	.160
U.K.	.104
France	.085
Italy	.068
Netherlands	.061
Belgium	.055
Sweden	.028
Switzerland	.028

The exchange rate data were taken from IMF, *International Finance Statistics*.

16. In McElhattan (1978), the change in inflation was expressed as a function of the difference between actual capacity utilization (CU_t) and the stable inflation capacity utilization rate (CU^e).

$$DIR_t = b_1 (CU_t - CU^e).$$

By incorporating the parameter CU^e in the constant term, the equation can be written as

$$DIR_t = b_0 + b_1 CU_t,$$

where $-b_0 = b_1 CU^e$. This leads to the expression $CU^e = -b_0/b_1$.

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International Debt with Unenforceable Claims

by Jürg Niehans*

What is called the "international debt crisis", like every complex problem, has many aspects. The present paper concentrates on one of them—the unenforceability of foreign claims. Recent developments make the investigation of the implications of unenforceable claims for the international credit market particularly worthwhile. The resulting picture of international loans to developing countries is inevitably incomplete, but it is nevertheless revealing and, in part, novel.

Prevailing views on the international debt crisis are based on the notion that the international loans in question are essentially similar to private domestic loans. In particular, the "conventional wisdom" assumes that debtors can be expected to service their debt to the limit of their ability. From this assumption, the current crisis appears to be a consequence of a diminished ability to pay, partly due to higher interest rates and partly to deteriorating economic conditions. This view raises the hope that a decline in interest rates and a return to prosperity would cause the crisis to fade away.

It is argued in this paper that the conventional wisdom overlooks a fundamental difference between private domestic loans and the international loans in question. Economic thinking about borrowing and lending is commonly based on the paradigm of debt enforceable through the law. In a cash transaction, there is an immediate *quid pro quo*—the contract is self-enforcing. In a credit transaction, the two parts of the exchange are separated in time. As a consequence, there have to be procedures to enforce the fulfillment of the contract. Because ethics are usually not enough, enforcement becomes a problem. Western civilization has solved this problem through an elaborate system of contract and bankruptcy laws. If a debtor defaults on his obligations, he forfeits collateral, that is, his assets can be attached, impounded, or turned over to his creditors by a bankruptcy court. By such means, the debtor is put under strong pressure to live up to his obligations, no matter how onerous, to the limit of his abilities. Without these legal enforcement mechanisms, modern credit systems could not have developed.

The circumstances are very different for international bank loans to developing countries. Most of these loans are made to governments or guaranteed by governments. To the extent they are loans to private firms, exchange control tends to subject them to a calculus similar to that for government loans. There is usually no collateral and, at least in practice, no access to bankruptcy courts. While the seizure or attachment of assets is conceivable, it is rarely

*Professor, University of Bern and Visiting Scholar, Federal Reserve Bank of San Francisco. Comments from staff economists and the research assistance provided by Paula Crosswright were valuable and greatly appreciated.

feasible. This makes such loans legally unenforceable.[1] It is true that concern about "political" repercussions, about "gunboat diplomacy" or about disruption of trade may, to a certain extent, substitute for legal remedies, but they seem relatively weak. World opinion today tends to side with the debtors rather than the creditor banks.[2]

The analysis in this paper is based on the assumption that such penalties do not exist at all. Its specific contribution is the development of an "unorthodox" model in which concern about the future availability of credit is the *only* deterrent to default. No doubt this radical assumption does not do justice to the complexities of reality because at least some traces of enforceability are often present, and even the principles of ethics may be of some help. There are, indeed, historical cases of governments faithfully repaying their foreign debts over decades. Recent developments strongly suggest, however, that it is worthwhile to investigate the conditions under which the international credit system might still be viable under this radical assumption.

In the last few years, the implications of unenforceability have found growing attention.[3] The present paper is written in the belief that these implications are not yet fully understood. Section I outlines the statistical contours of the problem. Section II shows that unenforceable claims do not necessarily lead to crisis. Sections III and IV analyze, respectively, the objectives of rational debtors and creditors. Using a specific model of creditor strategy, Section V pays particular attention to the relationship between the rate of interest and the rate of growth. Section VI extends this analysis to the initial "overshooting" of the long-run debt level. The exposition uses verbal, graphical and mathematical arguments. A reader not worried about mathematical precision can obtain the main content of the paper by concentrating on words and graphs.

Throughout the paper, it will be assumed that international lending, while important for the levels of output and consumption at any moment, has only a negligible influence on the rate of economic growth over decades, the latter depending mainly on population, natural resources and technological progress. Although this assumption may not be strictly valid, the inaccuracies involved do not seem large enough to invalidate the conclusions. Uncertainty about future developments, although obviously important in reality, also is disregarded in this paper. The paper thus does not purport to provide a complete theory of lending with unenforceable claims, but concentrates on certain aspects that seem to be important from the point of view of current debt problems.

I. Statistical Contours

As a preface to the theoretical argument, this section presents some statistical contours of the current debt crisis. These contours are intended to show that the interpretation developed in this paper, although based on a somewhat radical assumption, is consistent with important stylized facts. The data are taken from the World Debt Tables (External Debt of Developing Countries), published by the World Bank, 1983–84 and the first supplement. From 1978 to 1982, as Table 1 and Chart 1 show, disbursements of private loans through financial markets to public debtors or debtors with public guarantees were in the range of \$39 to \$48 billion. Repayments of principal moved roughly between \$14 and \$18 billion. Neither of these flows displayed a pronounced trend. Interest payments, however, increased dramatically year by year from \$6 billion in 1978 to \$24 billion in 1982. As a consequence, net transfers to the governments of developing countries through the international banking market, representing the net cash flow to the debtors, declined from \$19 billion to less than \$2 billion. With little exaggeration, it can be said that net transfers came to a standstill.

This was immediately followed by the outbreak of the international debt crisis. Based on

Chart 1

Developing Countries: Public and Publicly Guaranteed Debt to Private Creditors Through Financial Markets, 1973–1982

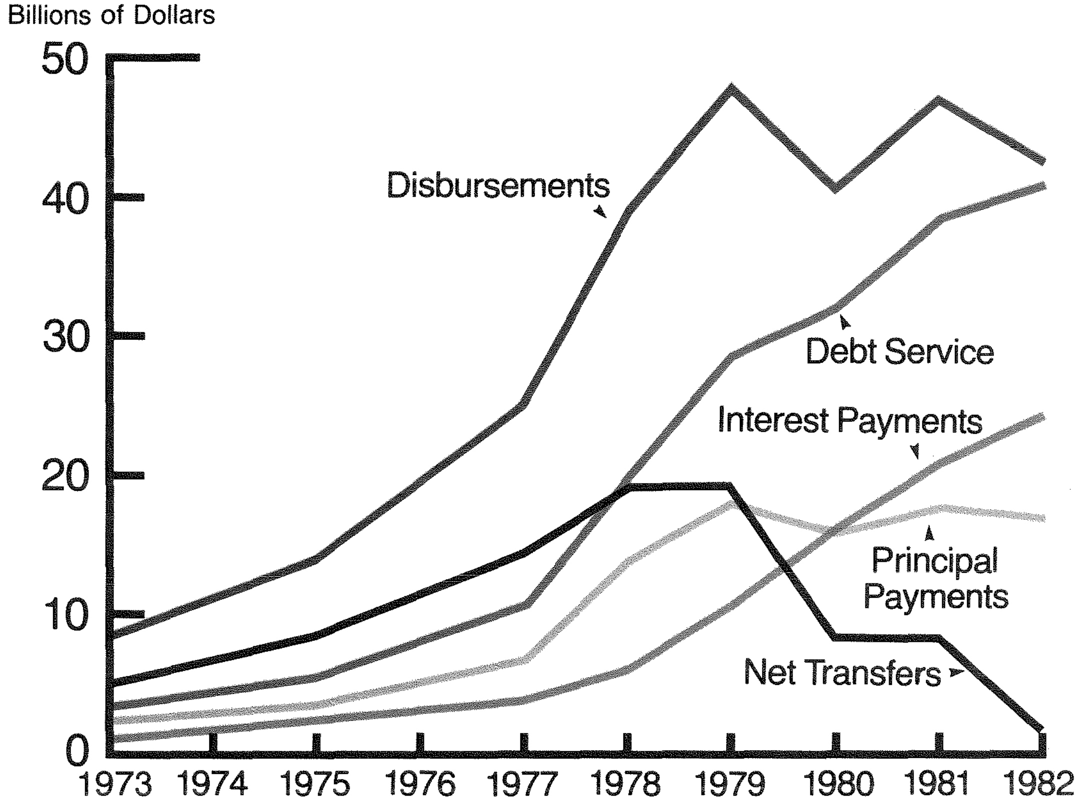


TABLE 1

Developing Countries: Public and Publicly Guaranteed Debt to Private Creditors Through Financial Markets, 1973–1982.
(Billion Dollars)

	1973	1975	1977	1978	1979	1980	1981	1982
Disbursements	8,652.0	14,225.7	25,349.0	39,188.4	47,995.8	40,708.0	47,134.7	42,770.3
Interest Payments	1,064.9	2,651.9	4,136.2	6,287.9	10,703.9	16,317.9	21,021.7	24,149.8
Principal Payments	2,487.6	3,104.4	6,808.6	13,853.7	18,081.2	16,002.6	17,754.0	16,880.3
Total Debt Service	3,552.6	5,756.3	10,944.8	20,141.6	28,785.1	32,820.5	38,775.7	41,030.1
Net Transfers	5,099.5	8,469.4	14,404.2	19,046.7	19,210.7	8,387.4	8,359.0	1,740.2

Source: World Bank, World Debt Tables: External Debt of Developing Countries, 1983–84 and First Supplement, Washington 1984.

the International Monetary Fund's (IMF) chronology of bank-debt restructuring cases (IMF, 1983), there were 3 completed cases in each of 1978 and 1979, 6 cases completed in each of 1980, 1981 and 1982, and 20 cases completed in 1983 by early October with 8 cases still under negotiation.[4]

It is difficult to believe that the association of the virtual vanishing of net transfers and the wave of reschedulings was a mere coincidence. The nature of their causal connection, however, is not obvious. According to one possible hypothesis, borrowers asked for restructuring because rising interest rates, together with deteriorating terms of trade and worldwide recession, had made the burden of their debt unbearably heavy. Evaluated against the statistical contours, this argument is not convincing. It is true that total debt service, consisting of payments on principal and interest, reached a high amount. The relevant burden of international debt, however, is the net transfer obtained by deducting from debt service the disbursements on new loans. Since these disbursements were also very high, there was, until 1982, not a single year with a negative net transfer. Far from carrying an intolerable debt burden, debtors received net benefits throughout, albeit on a rapidly declining scale.

The preceding argument was based on aggregate data for all developing countries. A more detailed picture can be obtained by focusing on Latin America and the Caribbean. Table 2 and the corresponding Chart 2 present net transfers from 1973 to 1982. It is significant that their amount, after reaching a high point of $11 billion in 1978, actually turned negative in 1982. It is also important to note that this negative balance was far from alarmingly large. The overall burden of the debt cannot have been very heavy.

The Latin American countries can be divided into those with rescheduling between 1974 and 1982 and those without. The difference is revealing. The 15 rescheduling countries present, although at a somewhat lower level, the same picture as Latin America as a whole. The 10 "good" debtors, however, show roughly stable and positive transfers since 1977; in the last three years, their net transfers actually increased. This observation fits nicely into the aggregate picture.[5]

According to another hypothesis, it is precisely the *prospect* of negative transfers that triggered the debt crisis. This hypothesis is consistent with the effective unenforceability of most of these claims because it is an essential aspect of unenforceable claims that the debtor cannot be forced to accept negative transfers. If, and when, they appear on the horizon, he defaults. The present paper hypothesizes that this hypothesis is largely correct.

It is true that most applications for debt renegotiation are accompanied by arguments intended to show that acute balance-of-payments problems make it impossible for the borrower to pay his debts. Such arguments, however, should not be accepted at face value. Balance-

TABLE 2
Latin America and the Caribbean: Net Transfers from Private Creditors to Public Debtors through Financial Markets, 1973–1982
(Billion Dollars)

	1973	1975	1977	1978	1979	1980	1981	1982
All Countries	2,779.2	4,403.0	8,975.5	11,004.0	9,940.4	1,699.6	3,990.8	−2,317.7
Rescheduling Countries	2,573.0	4,261.9	8,605.6	10,549.1	9,609.1	1,405.7	3,538.1	−2,791.6
Non-Rescheduling Countries	206.2	141.2	369.8	455.1	331.3	294.1	452.9	473.6

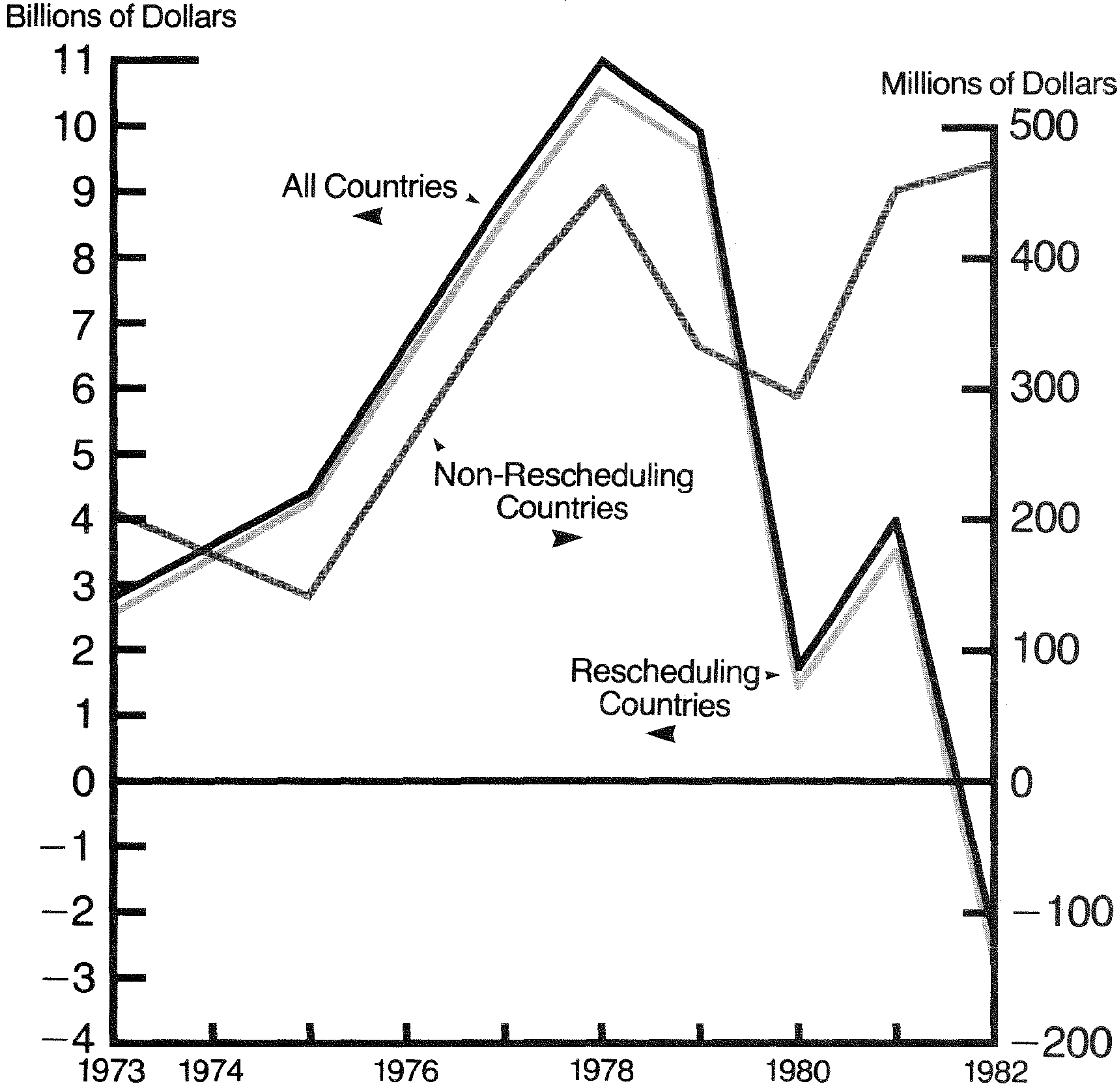
Source: World Bank, World Debt Tables: External Debt of Developing Countries, 1983–84 and First Supplement, Washington 1984.

of-payments crises result primarily from a country's own policies. They can be produced at will, virtually overnight, simply by overvaluating the exchange rate.[6] The fact that IMF lending, despite the collapse of the Bretton Woods system, still is largely conditional on a balance-of-payments crisis creates an incentive for a country to let itself slip into such a crisis whenever IMF lending is desired.[7]

The rough statistical contours presented in this section, although far from proving anything, suggest that net transfers, defined as the difference between new loans and debt service on old loans, may be of crucial significance for international solvency. The following sections elaborate on the theory behind this idea.

Chart 2

Latin America and the Caribbean: Net Transfers, 1973–1982



II. Lending Without Budget Constraints

This section considers the long-run feasibility of lending with unenforceable claims. Goods exchanged in the market are, at market prices, of equal value. Their exchange is nevertheless of mutual advantage because the goods, despite their equivalence, have different utility for the buyer and the seller. Similarly, the future payments promised by a borrower, properly discounted, have a present value equal to the amount he borrows; the present value of all his cash flows is zero. This is the intertemporal budget constraint for loans. Despite this constraint, the loan is regarded as advantageous by both parties because a dollar may have different utility depending on the time at which it is available.

An essential implication of an intertemporal budget constraint is that once the loan is disbursed, its present value to the borrower turns negative. For example, once a homeowner has received a mortgage loan, he has to make payments to the bank for years. Economically, therefore, there is a virtually irresistible incentive to default. To counteract this incentive, loan contracts have to be enforced by collateral and bankruptcy courts.

Such a budget constraint, by analogy with individual loans, is often postulated for an economy as a whole (McDonald, 1982; Sachs, 1983; Sachs and Cohen, 1982). As a matter of fact, the unenforceability of loans means that there is no way of imposing this constraint. The paradigm of unenforceable debt thus implies that borrowing is not subject to the familiar intertemporal budget constraint. The constraints that take its place are the main topic of this paper.

In the absence of a budget constraint, a country can forever borrow more each year than what it needs to service its outstanding debt. International lending begins to look like a "Ponzi scheme." Economists, conditioned to the paradigm of enforceable claims, tend to regard such a state of affairs as intrinsically unsustainable. As a matter of fact, it may conceivably be sustained, although only under stringent conditions. Even firms, if they grow rapidly enough, may end up never repaying their aggregate debt. The same applies to growing economies. While the budget constraint is faithfully observed for every single loan, the present value of aggregate cash flows to the debtor may well be positive and even infinite.

The possibility of such a case over an indefinite period depends largely on the relationship between a country's rate of growth and the rate of interest.[8] Consider a country in balanced growth at rate g with net foreign debt A. Debt expands at the rate $\alpha = (dA/dt)(1/A)$. There is clearly no reason why α should not be positive in such an economy for an indefinite period. Specifically, in a world economy in balanced growth, there is a continuing capital flow from the creditors to the debtors, growing exponentially at the same rate as debt. Aggregate debt is never repaid.

The net cash flow to the debtor country depends on the difference between new debt and the interest payments on the existing debt. It corresponds to the net transfers of Section I. If there is a world interest rate i, the cash flow is

$$c = \frac{dA}{dt} - iA = (\alpha - i)\,A. \tag{1}$$

Disregarding other service items, this is equal to the trade deficit. Depending on α and i, c may be positive or negative, which means that debtor countries can have trade deficits or surpluses.

Is it possible for a debt expansion rate different from the interest rate to be maintained forever? The answer depends largely on the relationship between α and g. A rate of debt expansion significantly different from the rate of economic growth would imply that debt either increases beyond any limit relative to national income or else virtually shrinks away. It is unlikely, therefore, to be maintained for very long. Within the framework of balanced growth, one is clearly forced to assume $\alpha = g$. The above question thus pertains in essence to the relationship between the rate of growth and the rate of interest.

In balanced growth with $g = i$, the net cash flow is zero at all times and so is the trade balance; interest payments are continuously reinvested. With $g < i$, the debtor needs a trade surplus to finance the excess of interest payments over new lending; cash flows are negative and their present value is equal to outstanding debt.[9] In the case $g > i$, the debtor enjoys a positive cash flow forever, which finances a permanent trade deficit; the present value of cash flows is infinite.

There seems to be no general reason to rule out any of these possibilities. In particular, there is nothing intrinsically unsustainable in a situation in which a growing economy increases its international indebtedness by more than its interest payments virtually forever, thereby financing a permanent trade deficit.[10] Are the creditors cheated by the debtors in such a case? This analogy to fraudulent bankruptcy would be misplaced. In successive generations, each individual creditor obtains full repayment. It is just that the number of such creditors grows continuously. If the world suddenly came to an end, the last generation of creditors would indeed regret having made those loans, but its regret would be shared by those who hold other assets.

III. The Borrower's Objective

The concept of balanced growth helps to clarify one's thoughts on debt problems. The world, however, is not in balanced growth. This raises the question, under what conditions can a debt crisis generally be avoided, despite the unenforceability of claims. In the present section, this question is considered from the borrower's point of view. The analysis assumes that the rate of interest is given by the market, but that the available amounts of loans may be limited. Although potentially important, risk premia depending on the borrowing strategy of the particular country are disregarded.

If a country with unenforceable debts is able to maintain a positive cash flow at all times, then its aggregate borrowing is not subject to the usual efficiency criteria according to which the marginal return on investment must be no lower than the rate of interest. If loans, in effect, turn into gifts, they cannot be excessive from the borrower's point of view. The overriding objective of borrowing becomes the maximization of the present value of future cash flows.

This objective can be formalized by postulating that the finance minister in the borrowing country at time zero, in choosing the time profile of debt, $A(t)$, seeks to maximize

$$\int_0^{\infty}\left[\frac{dA}{dt} - iA(t)\right] e^{-it}dt. \tag{2}$$

If this expression is infinite for several paths, he presumably will prefer the path that approaches infinity, in some sense, as fast as possible.

In pursuing this objective, the borrower is constrained not by the cost of future debt service but by the willingness of creditors to lend. If the interest rate is assumed to be given by the world market, this constraint expresses itself in a quantitative limitation of the loan supply. The nature of this constraint will be discussed in the following section.

The essential point is that the optimal strategy of the debtor may well entail default.[11] More specifically, a "crisis" will occur if, and when, the present value of cash flows becomes negative over future time spans of any length.[12] In more formal terms, default will occur at time T if

$$\int_T^{\theta}\left[\frac{dA}{dt} - iA(t)\right]e^{-i(t - T)}dt < 0 \tag{3}$$

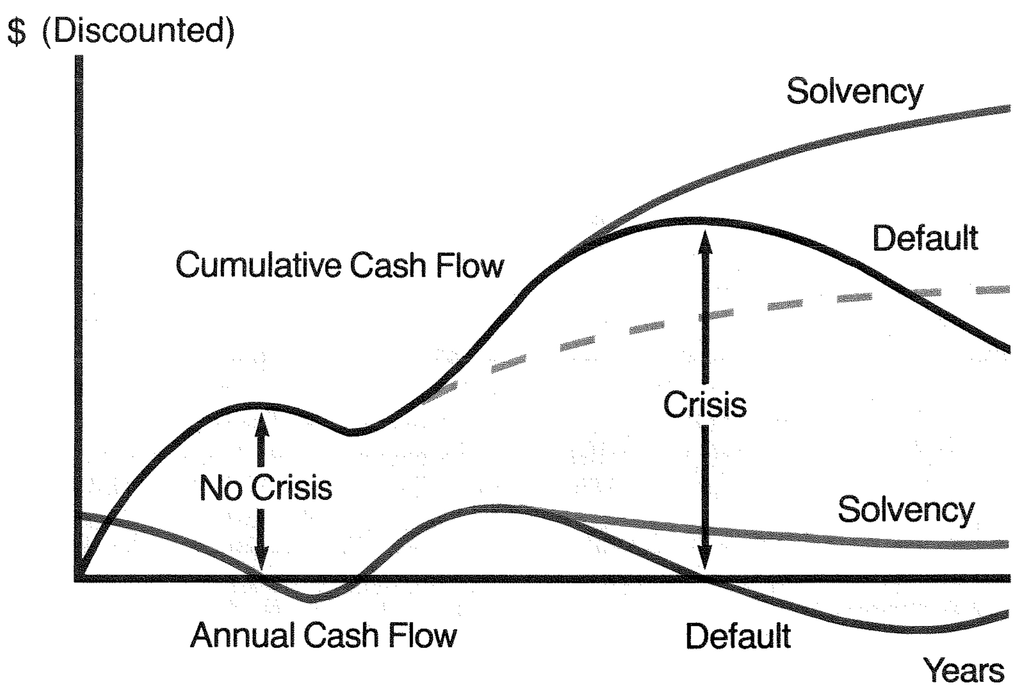
for all θ from T to infinity. The unenforceability of contracts means precisely that the debtor cannot be compelled to accept the prospect of paying out more than he receives for an indefinite future.[13]

The foregoing argument is illustrated in Figure 1. The blue curve describes a path of expected annual cash flows from now into the indefinite future. These cash flows are conceptually similar to the net transfers in Tables 1 and 2 and Charts 1 and 2 except that (1) they relate to future periods and (2) the dollar value for each year is assumed to be discounted back to the present time at the appropriate interest rate. The black curve is derived from the blue curve by cumulating the annual cash flows from time zero to a given future year. It thus represents the present value of all future cash flows over a given future time period. For the moment, one may imagine that the shape of these curves is imposed on the borrower from the outside.

Under what conditions will the debtor, confronted by these curves at time zero, detect a future time T at which default is advantageous? The two cases of solvency and default are illustrated by two variants of each curve. In the solvency case, represented by light lines, the upper curve has no (global) maximum. Whatever the present value of future cash flows up to a given time, there is a later time promising a still higher value. There may indeed be subperiods of negative cash flows, illustrated on the left, but these do not trigger default because the debtor expects positive cash flows of even larger size in the future.[14] In the other case, represented by the dark lines, the upper curve has a maximum that is never surpassed. At that point, the rational debtor will default.[15] Any further servicing of debt would reduce his total benefit.

In reality, of course, the shape of these curves is not given to the debtor but depends in part on the debtor's own policies. It is in the debtor's interest to choose those policies that would raise the upper curve as high as possible. In particular, a path with infinite present value is always better than any default path since the latter's present value is finite. This means that the debtor will often do his best to escape default. In contrast a path with solvency is not necessarily better than default because, although it never declines, it may never reach the level of the default path at the crisis point. This possibility is illustrated by the dotted solvency path in relationship to the black default path. It means that there may be no incentive for the debtor to remain solvent.

Figure 1
Net Cash Flows



The shape of the curves also depends on circumstances beyond the debtor's control. Thus, a change in interest rates may produce a downturn where none was anticipated before. Even more importantly, the shape of the cash flow curve is heavily influenced by the policies of the lender. This aspect will be taken up in Section IV.

In general, default will not take the form of an outright repudiation of existing obligations. The rational debtor will, instead, use the threat of repudiation to induce his creditors to negotiate a rescheduling of debt, a lowering of interest rates, and an extension of new loans. The intended result of such negotiations is a further increase in the cash flow to the borrower, pushing the maximum further up. As Sachs (1982) pointed out, outright repudiation is most likely if the creditors cannot be brought to the bargaining table. This is consistent with the observation that repudiation was frequent when most lending took the form of bonds whose numerous owners could not speak with a common voice. Today, with most lending done through banks, default usually appears in the form of renegotiation (but renegotiation does not necessarily involve default).

IV. Strategic Planning for Creditors

If, with unenforceable contracts, debtors have, loosely speaking, an unlimited demand for loans, what is the appropriate strategy for creditors? To prevent default, creditors have to plan aggregate lending in such a way that the present value of future cash flows to the debtor remains positive forever. This necessary condition for solvency can be formalized as

$$\int_{T}^{\infty}\left[\frac{dA}{dt} - iA(t)\right]e^{-i(t - T)}dt > 0 \qquad (4)$$

for all T. It will be called the solvency constraint.[16] There must never be a moment at which default would pay in this scenario. The larger the present value of the cash flow at any moment, the larger is the safety margin against insolvency.

This constraint imposes no limit on lending at a particular time. Rather, it relates to the shape of the whole lending profile. Specifically, it requires that the cumulative cash flow curve in Figure 1 never pass an all-time maximum. By and large, more rapid debt expansion in the early periods makes default more likely at a later time. The more slowly debt expands in the early stages, the better is the chance of avoiding a crisis. This intuitive argument will be elaborated upon below.[17]

The solvency constraint, although necessary, is not sufficient for avoiding a debt crisis. In addition, each creditor must have confidence that the other creditors will continue to lend on an ever-increasing scale. It is difficult to state precisely what this condition requires. For the present purpose, it is enough to draw attention to two aspects. First, the confidence of creditors will be difficult to maintain unless the path of outstanding debt can be expected to merge into a path of balanced growth. Clearly, an explosive debt profile with a debt ratio rising beyond any limit would not be acceptable, but a debt ratio asymptotically approaching a finite limit may inspire confidence.[18] This idea can be formalized by postulating that the rate of debt expansion eventually should approach the rate of growth.

Besides the expansion rate of debt, the creditors will have to consider the level of debt at a given time. This level determines the size of the net cash flows, positive or negative, relative to the national incomes of debtor and creditor countries along a given growth path. With enforceable debt, the main criterion for judging the optimal level of debt is the condition that the marginal social product of the loan shall be at least as high as the rate of interest. With unenforceable claims, this criterion is clearly not relevant. In fact, with unenforceable claims there are no established criteria for optimal debt levels. The decisive consideration seems to be the share of their portfolios creditors are willing to hold in the form of unenforceable loans. This will be called the "acceptable" level of debt here. From the point of view of the viability of the credit system, precise determination of the acceptable level is of little importance. The important thing is that it is not subject to marked fluctuations.

A lending strategy along these lines requires coordinated planning.[19] With unenforceable claims, decentralized decision-making is likely to lead to crisis. The reason is that continued debt service on each loan depends crucially on continued net lending by *all* lenders. This creates an externality somewhat analogous to a congestion problem. Even full information of all participants will not, in itself, prevent market failure in such cases. In the absence of concerted action, international lending with unenforceable claims is a game of "devil take the hindmost."

This is probably the basic reason that the familiar country risk indicators performed so poorly in guiding the banks' lending activities. Developed by analogy to domestic indicators of creditworthiness, they put the emphasis on the debtor's ability to pay. This is appropriate for enforceable claims because, if a debtor is able to pay, the law can make him willing. With unenforceable claims, however, the ability to pay loses its crucial relevance for solvency because a rational debtor, no matter how able to pay, will not do so unless he can borrow the required funds. The decisive factor, therefore, is the willingness of creditors to lend.[20]

For the same reason, even drastic improvements in economic conditions, in the debtor's terms of trade, or in his export performance may fail to resolve the debt crisis. If default was in the debtor's interest in adversity, it may still be in his interest in prosperity, no matter how much his ability to pay may have improved. With unenforceable claims, solvency depends on the collective action of the creditors and not on the economic strength of the debtor.

V. The Growth/Interest Relationship

Considering some particular debt profiles will make the preceding argument more concrete, albeit at the loss of some generality. This section concentrates on the significance of the relationship between interest rates and the rate of economic growth.

To relate the present discussion to that of Section II, it is convenient to begin with an analytically trivial case. Suppose at time $t = 1$, a country with a growth rate g has no foreign debt. With the world interest rate at i, it is now perceived, both at home and abroad, that under the given economic conditions the acceptable level of foreign debt as described in Section IV is $A(1) = A_0e^g$. It is also perceived that, in the long-run, the rate of debt expansion cannot differ from the rate of the country's growth. There is, therefore, a growth path for acceptable debt:

$$A(t) = A_0e^{gt}. \tag{5}$$

Suppose at $t = 1$, the country obtains loans in the full amount of A_0e^g, thus "jumping" instantaneously to the growth path. In this case, the new net lending each year will be equal to the annual increase in A,

$$\frac{dA}{dt} = gA_0e^{gt}, \tag{6}$$

while interest payments on the outstanding debt are

$$iA = iA_0e^{gt}. \tag{7}$$

The net cash flow, therefore, is

$$c(t) = (g-i)A_0e^{gt}. \tag{8}$$

If the growth rate exceeds the rate of interest, there is a positive cash flow forever. As long as parameters do not change, there will not be a debt crisis. If the two rates are equal, the situation is just barely viable. With a growth rate lower than the interest rate, the cash flow is forever negative—the borrowing country would immediately default.

Figure 2 depicts this last situation. The two curves represent, respectively, the growth path of new lending and the growth path of interest payments. With $g < i$, the first curve lies below the second throughout. The shaded area between the curves measures (negative) cash flows.

This case, in all its simplicity, suggests the consequences of an increase in interest rates. Suppose interest rates so far have lain well below growth rates, but that they now rise while growth rates remain constant. Borrowers and lenders would encounter the case in which $i > g$, with the expectation that this will remain so for a long time. With unenforceable debt, the result would be an immediate debt crisis with widespread default. The same result would hold if, at given interest rates, the growth prospects deteriorated.

In reality, the adjustment of debt to a higher acceptable level usually takes time. This idea can be formalized by postulating that debt follows the path given by

$$A(t) = A_o e^{gt} - \frac{a}{t}, \tag{9}$$

where $a = A_o e^g$ is set equal to acceptable debt at time $t = 1$, so that $A(1) = 0$. The particular specification of the adjustment term a/t is arbitrary. The important point is that actual debt, beginning at zero, approaches its acceptable level monotonically as shown by the debt curve in Box 1.

New lending is determined by taking the derivative of debt,

$$\frac{dA}{dt} = g\, A_o e^{gt} + \frac{a}{t^2}. \tag{10}$$

Initially, at $t = 1$, new lending is far above its growth path, $gA_o e^{gt}$, but approaches this path in a U-shaped curve without ever crossing it. Interest payments, on the other hand, are

$$iA(t) = iA_o e^{gt} - i\frac{a}{t}. \tag{11}$$

They are initially zero and approach their growth path from below.

The resulting cash flow is the difference between new lending and interest payments,

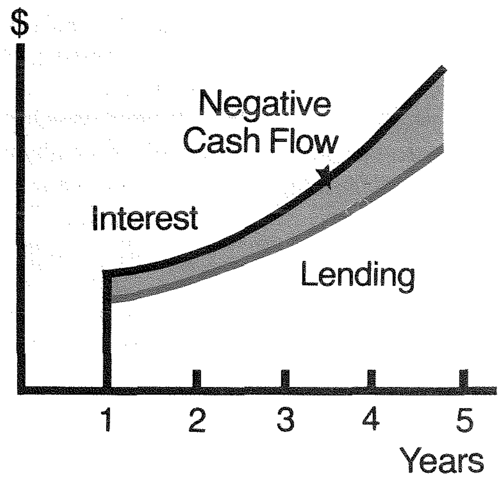
$$c(t) = (g-i)A_o e^{gt} + i\frac{a}{t} + \frac{a}{t^2}. \tag{12}$$

The profile of cash flows depends crucially on the relationship between g and i. First consider the case $g = i$ as illustrated in Box 1. In this case, the growth paths of lending and interest payments coincide. New lending, represented by the blue arrow, approaches this growth path asymptotically from above, whereas interest payments, represented by the black arrow, approach the growth path from below. Cash flows, measured by the vertical distance between the arrows, never become negative although they diminish over time. Their present value, therefore, is positive throughout. The debtor will never find it profitable to default.

This is even more true if $g > i$. In this case, the growth path of lending lies above the growth path of interest payments. As a consequence, the lending curve and the interest curve, after first moving closer together, eventually diverge. Cash flows, after passing a minimum, will increase beyond any finite limit. In this case, even unenforceable claims are quite safe.

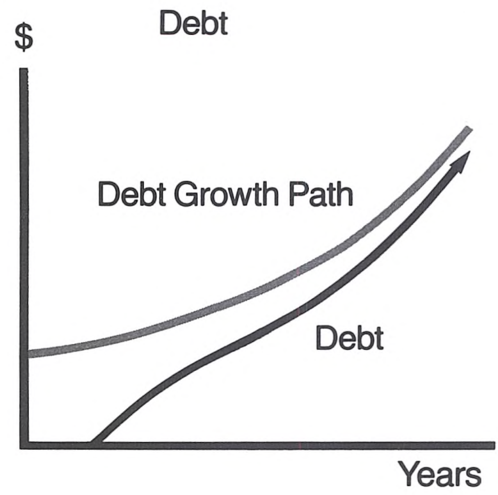
In the opposite case, with $g < i$, unenforceable claims are not safe. As shown in Box 1, the growth path of lending now runs below the growth curve of interest payments. New lend-

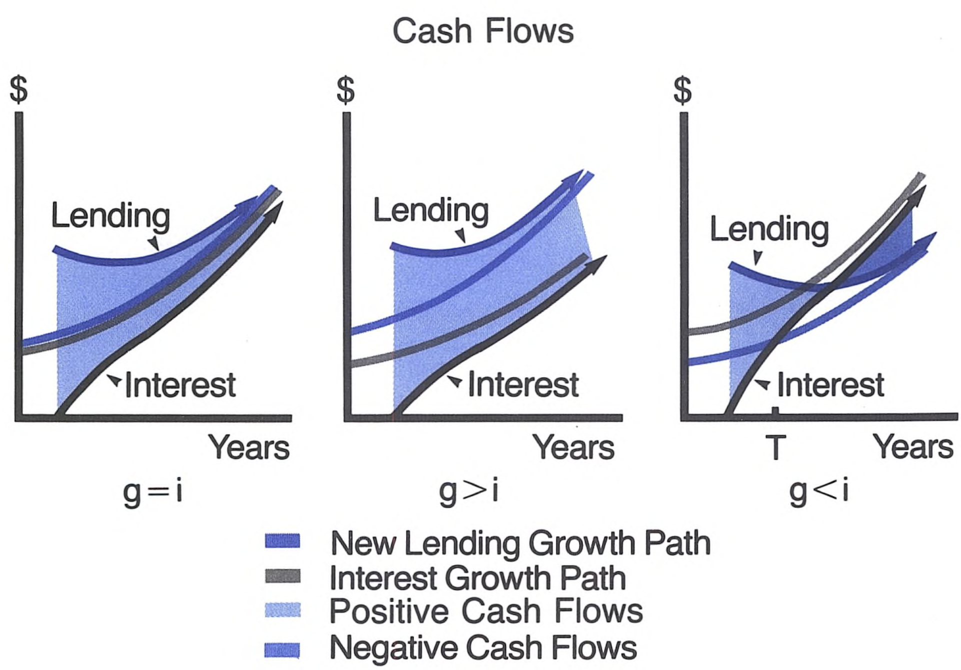
Figure 2
Instantaneous Debt Adjustment



Box 1

Monotonic Debt Adjustment





ing, therefore, while initially exceeding interest payments, will sooner or later fall below them. In the initial stages, positive cash flows give debtors a strong motive to service their debt. Eventually, however, the cash flow is bound to become negative forever. With unenforceable claims, therefore, the debtor will find it advantageous to default. This leads to strong advice for the lending banks: do not acquire unenforceable claims unless the borrower's rate of economic growth exceeds the rate of interest. (Clearly, the validity of this conclusion is limited by the assumptions underlying the present analysis.)

What should the creditors' strategy be if unenforceable claims have already been acquired and the system has reached a point such as T in the diagram for $g < i$? If lenders, under the pressure of increasing default risk, succumb to the temptation to raise interest rates and to curtail lending, they will precipitate the crisis they are trying to protect themselves against. The only way to forestall a crisis seems to be a combination of lowering the interest rate to a level not in excess of long-run growth and continued lending at a level slightly in excess of interest receipts. The cost of such a strategy to the creditors would have to be weighed against the costs of default.

VI. Debt Overshooting

The preceding cases are characterized by a debt path that starts below the acceptable level but approaches that level monotonically from below. Debt is never too high compared to its growth path. In reality, debt may initially expand so rapidly that it overshoots its growth path, and one is inclined to suspect that this is what happened in the late 1970s under the pressure of lenders' competition. It will be shown that this may lead to a debt crisis even though the rate of interest does not exceed the rate of growth.

Suppose creditors permit loans to expand according to

$$A(t) = A_o e^{gt} + \frac{b-a}{t} - \frac{b}{t^2}, \qquad (13)$$

where $b-a > 0$. In this case, the debt profile looks like the debt curve in Box 2. At $t = b/(b-a)$, the curve crosses the debt growth path. It reaches the maximum amount of overshooting at $t = 2b/(b-a)$ and gradually approaches the debt growth path thereafter. There may actually be a phase of absolute decline in debt, but this is not necessary.

To describe the implications of debt overshooting for cash flows, the following discussion is restricted to the case $g = i$. New lending is

$$\frac{dA}{dt} = gA_o e^{gt} - \frac{b-a}{t^2} + \frac{2b}{t^3}. \qquad (14)$$

It can easily be ascertained that new lending is initially, at $t = 1$, above its growth path, which is given by $gA_o e^{gt}$. At $t = 2b/(b-a)$, the lending curve declines below the growth path, reaching its maximum shortfall compared to the latter at $t = 3b/(b-a)$. Thereafter, it gradually approaches its growth path from below (see Box 2). The important point is that, with overshooting, new lending will eventually run below the growth path.

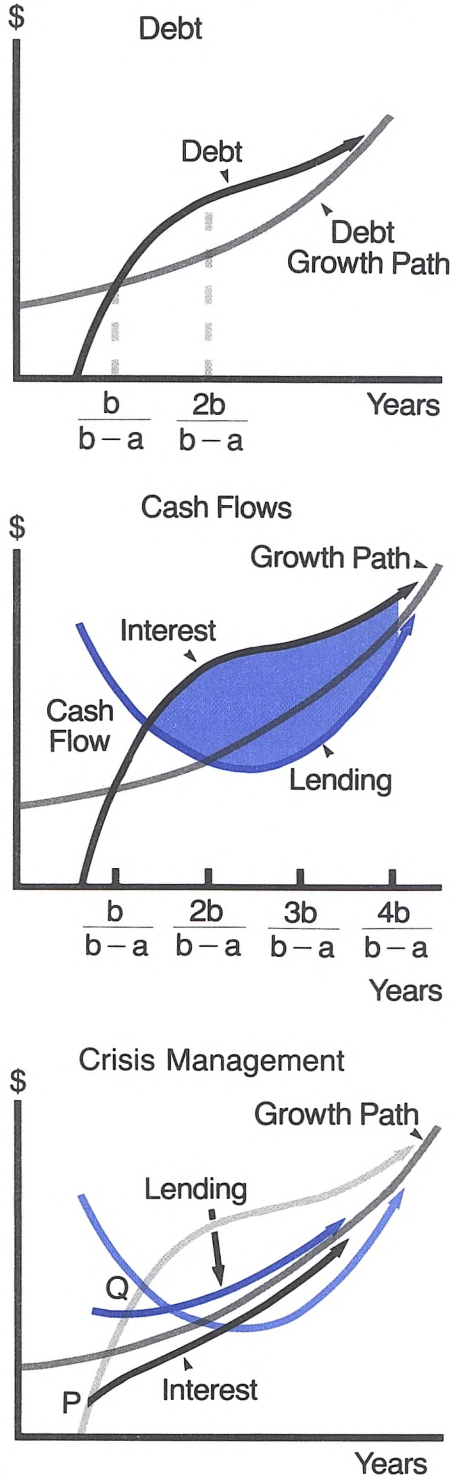
The path of interest payments,

$$iA = gA = gA_o e^{gt} + g\frac{b-a}{t} - g\frac{b}{t^2}, \qquad (15)$$

has the same shape as the debt path with all amounts multiplied by $g = i$. It crosses the debt growth path at $t = b/(b-a)$ and reaches the maximum deviation from the latter at $t = 2b/(b-a)$. With debt overshooting, therefore, the path of interest payments is bound to lie above the growth path of debt except in the early stages.

This means that the cash flow to the debtor, while positive in the early stages, becomes negative and remains negative after the change. With unenforceable claims, overshooting makes a debt crisis inevitable. The stronger the overshooting, as measured by the parameter b, the larger the negative cash flows become and the more acute the debt crisis grows. Extending this reasoning to the case $g > i$ would be

Box 2
Debt Overshooting



straightforward. In that case, a rate of interest safely below the rate of growth, despite overshooting, may avoid a crisis but can lead to one as well. It is evident that with $g < i$, there is no chance of avoiding a crisis.

The policy conclusions suggested by this analysis of debt overshooting, provided the underlying assumptions are regarded as realistic, may be summarized in three rules.

(1) If, in a country with a growth rate safely above the interest rate, a higher ratio of foreign debt relative to national income is perceived to be acceptable, this ratio should never be permitted to overshoot its acceptable level or a repayment crisis would emerge. Once this rule has been violated, efforts to slow down the excessive debt expansion are likely to precipitate the crisis.

(2) If debt, even though it is not yet overshooting its acceptable level, is seen to be on an overshooting path (as at P in the crisis management diagram in Box 2), lending should switch to a monotonic (non-overshooting) adjustment path as described in Section V. This would involve an immediate lowering of the rate at which debt is allowed to expand. Gradually, debt would approach its growth path from below. The same is true for interest payments. New lending, in contrast, would be instantaneously reduced, but its future decline also would be reduced and possibly even eliminated. In any case, new lending would remain continuously above its growth path. As a consequence, positive cash flows, and thus solvency, could be maintained. This is illustrated in Box 2, where the light curves represent the original paths whereas the dark curves describe the revised paths.

(3) Once the crisis point has been reached (as at Q in Box 2), a feasible emergency strategy may consist of a combination of a lowering of interest rates to a level clearly below the rate of growth and continuous relending of interest payments. If competently executed over many years, such a strategy, while achieving no overnight mir-

acles, could gradually lead debt back to a sustainable path. Such a strategy may actually be emerging from current international negotiations, although perhaps without clear insight into its underlying principles.

VII. Concluding Remarks

Practical men of affairs, bankers, financial writers and policymakers, can often be heard to say, at least in less guarded moments, that, "of course," a large part of the bank loans to governments of developing countries will never, in the aggregate, be repaid. This paper tries to develop the implications of this notion for the viability of the international credit system.

To focus attention on the essential aspects of the problem, the analysis in this article was based on the assumption that concern about the future availability of credit is the *only* deterrent to default. Any other penalties, both legal and extra-legal, were disregarded, as was the ethical maxim that contracts shall be honored. In reality, such penalties may exist and even ethics may have some force. To the extent that they do, the basic assumption of this paper may be one-sided and the conclusions derived from it invalid.

Despite this limitation, the paradigm of unenforceable claims seems to shed light on important aspects of the recent "debt crisis". Over the last decade, banks have acquired vast claims on foreign governments, claims whose enforceability is weak and in many cases virtually nonexistent. In doing so, the banks probably did not fully understand the implications of unenforceability. They also did not recognize the significance of the relationship between a country's economic growth and interest rates. In addition, the apparent profitability of the loans during the early stages seems to have induced the banks to "overshoot" the sustainable debt level. It is hard to believe that the last was not an important contributing factor to the recent debt crisis. From this point of view, the analysis of international debt under the radical assumption of unenforceable claims may perhaps make some contribution toward the prevention of future debt crises.

FOOTNOTES

1. The basic ideas of this paper are summarized in Niehans (1984).

2. Despite the most severe pressures, including partial occupation, vanquished Germany after WWI could not be compelled, on balance, to bear the burden of reparations. Quite to the contrary, by defaulting on her foreign debt, which amounted to roughly twice the cumulative reparation payments, she extracted a vast transfer of resources in her favor (Schmidt, 1934, p. 82 f.).

3. Among the most illuminating contributions are Aliber (1980); Eaton and Gersovitz (1981 a,b); Sachs and Cohen (1982); Sachs (1983); Cline (1983); and Swoboda (1984). Important suggestions can be found in Wallich (1982).

4. Germany in the 1920s presented strikingly similar contours. Before 1929, new foreign lending, with the exception of 1926, far exceeded interest payments and reparations. In 1929, the net transfer became negative, followed by default in the Summer of 1931 (Schmidt, 1934, p. 111).

5. It should be noted, however, that Mexico and Uruguay differ from the group of rescheduling countries in that they enjoyed substantial positive transfers in recent years. Through rescheduling, these countries seem to have increased the net benefits from foreign lending long before these benefits were near the vanishing point.

6. This point is rightly stressed by Aliber (1980).

7. The moral hazard inherent in IMF lending policies is analyzed in Vaubel (1983). Tying the schedule of debt service payments to exports, as is sometimes proposed, would create still another moral hazard.

8. Inflation is not considered in this paper: Nominal rates are thus equal to real rates throughout.

9. If debt in period t is $e^{gt}A_o$, the corresponding cash flow, discounted to the initial period, is $(g - i)\, e^{(g - i)t}A_o$. The present value of cash flows, therefore, is

$$\int_0^{\infty} (g - i)\, e^{(g - i)t} A_0 dt = - A_0 .$$

10. It may be noted in this context that for a debtor country in balanced growth, the "Golden Rule" for maximum consumption per capita requires a rate of growth in excess of the rate of interest. The reverse is true for a creditor country. (For the world as a whole, unequal growth rates would, of course, be inconsistent with balanced growth.)

11. The optimality of default also has been discussed in the finance literature (for example, in Van Horne, 1976), but there, with enforceable claims, optimality is seen from the point of view of the creditor, while here, with unenforceable claims, it relates to the debtor.

12. Essentially the same criterion for default is used by Eaton and Gersovitz (1981 b, pp. 11–12).

13. Sachs and Cohen (1982) postulate a default penalty in the amount of a certain percentage of gross national product. It is the essence of unenforceability, however, that there are no effective penalties of this sort.

14. This was pointed out by Eaton and Gersovitz (1981 b).

15. Eaton and Gersovitz (1981 a,b) argue that the benefits from future borrowing are higher, and the likelihood of default therefore smaller, the more future income is expected to fluctuate.Their benefit/cost calculus thus relates to the traditional borrowing criteria. From the point of view of the present analysis, these criteria are immaterial. Once the cash flow is reversed, no amount of net benefits in the sense of Eaton and Gersovitz would dissuade a country from defaulting on its unenforceable debts.

16. Solvency, in the present context, is meant in the sense of maintaining debt service. In the sense of positive net worth, the concept has no relevance for unenforceable government debt.

17. Eaton and Gersovitz (1981 b, p. 13) argue that unenforceable loans would be rationed to a sub-optimal level. From the point of view of the present analysis, there is no general reason for this to be the case. Even inefficiently high lending might satisfy the solvency constraint.

18. There is evidently an analogy between this problem and that of "bubbles" in financial markets.

19. This point is forcefully made in De Grauwe and Fratianni (1984).

20. Strictly speaking, with fiat money and floating exchange rates a country is always able to pay its debts because (1) it can print its own money and (2) this money can be exchanged for foreign currency at *some* exchange rate, although perhaps at very onerous terms (similarly, Sachs and Cohen, 1982, p. 22). A historical example is provided by German reparation payments in 1921, promptly followed by suspension (Bresciani-Turroni, p. 93 f.; Graham, 1930, p. 30 f.; Stolper, et al, 1967, ch. IV).

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