# *Economic Review*

# Federal Reserve Bank of Atlanta

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Debate about the perfect markets hypothesis—which, put simply, states that asset returns on stocks, bonds, and the like are not fore-castable—has alternately swirled and subsided since the 1960s. Studies challenging the validity of the hypothesis have generally been based on one of two different assumptions—that dividends fluctuate around a smooth trend or that variability is built into the level of dividends. The authors' own empirical work adopting a procedure different from the usual statistical practice eliminates the need to decide beforehand how to account for dividend growth. Their results indicate that the perfect markets hypothesis appears relatively less plausible than a model designed specifically to ex-ploit statistical regularities in forecasting prices and dividends.

Mortgage-backed securities, which have become increasingly popular during the past decade, have unconventional cash flows that call for hedging techniques different from those used for fixed-income securities. This article examines the potential gains and loss-es from issuing long-term liabilities to finance mortgage-backed securities. After reviewing the concepts of duration and convexity and the ways these measures are influenced by varying prepayments, the authors analyze how equity values change with interest rates for alternative financing arrangements. They focus particularly on the "convexity trap"—equity losses in both low- and high-rate environ-ments—when mortgage-backed securities are financed by fixed-rate liabilities. Finally, the authors discuss some methods for hedging conventional convexity risks, including higher initial equity invest-ments and various off-balance-sheet instruments.

This history of Georgia's banking industry from 1865 to 1929 highlights the effects of the period's extreme economic shocks and regulatory changes on Georgia's banks. As an example of how banking evolved under such historical conditions, the discussion may provide useful contemporary lessons for banking reform.

*Doing Business in Eastern Europe and the Newly Independent States: Information Sources to Get Started*

# More Unsettling Evidence on the Perfect Markets Hypothesis

David N. DeJong and Charles H. Whiteman

*I* f you're so smart, why aren't you rich? While most people have no answer for this question, economists have a ready-made response—the perfect (or efficient, or rational) markets hypothesis. Loosely speaking, the hypothesis states that asset returns (on stocks, bonds, real estate, and the like) are not forecastable: The market aggregates information efficiently, or market participants use that information rationally, or the market is perfectly void of unexploited profit opportunities. If the hypothesis holds, trying to get rich in the stock market amounts to what Burton G. Malkiel, in the title of his famous book, called *A Random Walk Down Wall Street* (1973).

If the perfect markets hypothesis is not valid, the only defensible answer to the question posed above is "I'm not that smart." Ego preservation might be reason enough, but economists cling to the hypothesis for other reasons, primarily because the alternatives are unpalatable. For one thing, it is difficult to fathom the nature of the imagined economic profit opportunities. These would involve something other than the usual rewards to productive activity. Instead, they would be easily identifiable, costless, and riskless ways to get rich. Furthermore, even if these opportunities were to exist, how could they persist? In such a scenario there would, in effect, be dollar bills lying all over the main street and no one stooping to pick them up.

The possibility of persistent unexploited profit opportunities in any market poses a theoretical problem for all of economics. If economists are wrong about such a simple premise, why should more subtle predictions (for example, that a tax cut will spur economic activity) be trusted?

*David N. DeJong is an associate professor of economics at the University of Pittsburgh. Charles H. Whiteman is a professor of economics at the University of Iowa and a visiting scholar in the Atlanta Fed's research department.*

# An Introduction to the Perfect Markets Controversy

The crack in the foundation of economics may already have appeared. The empirical validity of the perfect markets hypothesis, once thought to be settled in the 1960s and 1970s by regression tests of one of its implications, has recently been challenged in several studies. Robert J. Shiller (1981b) and Stephen F. LeRoy and Richard D. Porter (1981), for example, purport to show that aggregate annual stock prices are too volatile to reflect the underlying, fundamental values predicted by the hypothesis.

However, economists have been quick to point out that Shiller's evidence of "excess volatility" is not truly evidence or is not evidence of imperfection in the financial markets. Indeed, one counterattack, mounted by Marjorie A. Flavin (1983), LeRoy and C.J. LaCivita (1981), and Ronald W. Michener (1982), argues that the volatility tests of Shiller and others suffer from sampling and specification error and that the properties of the data highlighted in the studies are in fact consistent with the hypothesis. The work of Terry A. Marsh and Robert C. Merton (1986, 1987) and Allan W. Kleidon (1986a, 1986b) yielded a second counterattack, arguing that the perfect markets hypothesis can be resurrected by simply modifying an assumption Shiller made regarding the temporal stability of aggregate dividends.

The temporal stability issue arises in the perfect markets context because dividends grow over time. Chart 1 illustrates this fact for real (corrected for inflation) aggregate dividends associated with the Dow Jones Industrials, the New York Stock Exchange, and the Standard and Poor's 500 for the years from 1928 to 1978.[1] The question for the analyst concerns what manner of growth this is and how it influences share prices. Are dividends well described by fluctuations around a smooth trend? (Are they "trend-stationary"?) Or are dividends characterized by noisy "ratchet" growth—that is, does a random additional payout each year add to ("integrate with") what was paid out the previous year? (Are they "integrated"?)

The distinction between the two dividend assumptions involves how one revises one's forecasts of future dividends in light of surprisingly high or low current dividends. If dividends are trend-stationary, one would expect that today's dividend surprise will not persist but that, at some point in the not-too-distant future, dividends will revert to values predicted by the historical trend; a trend-stationary process never strays very far
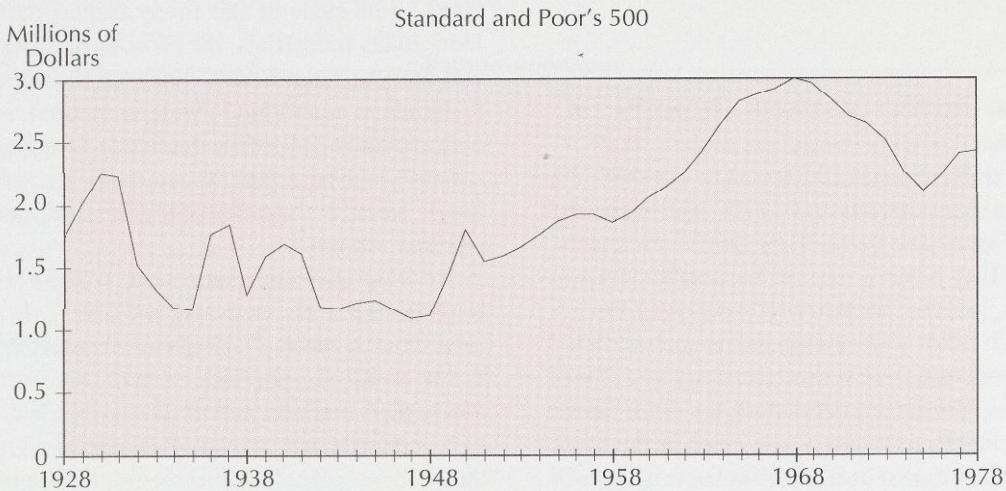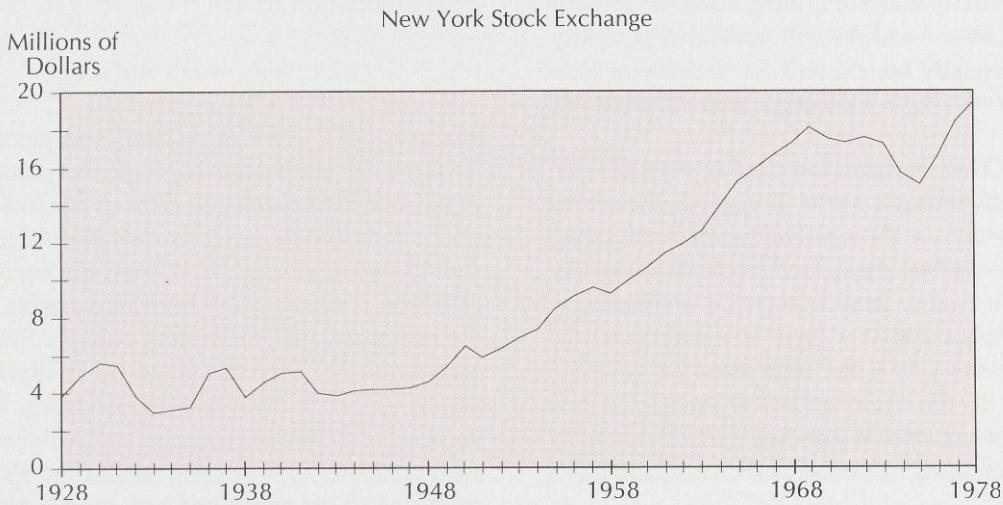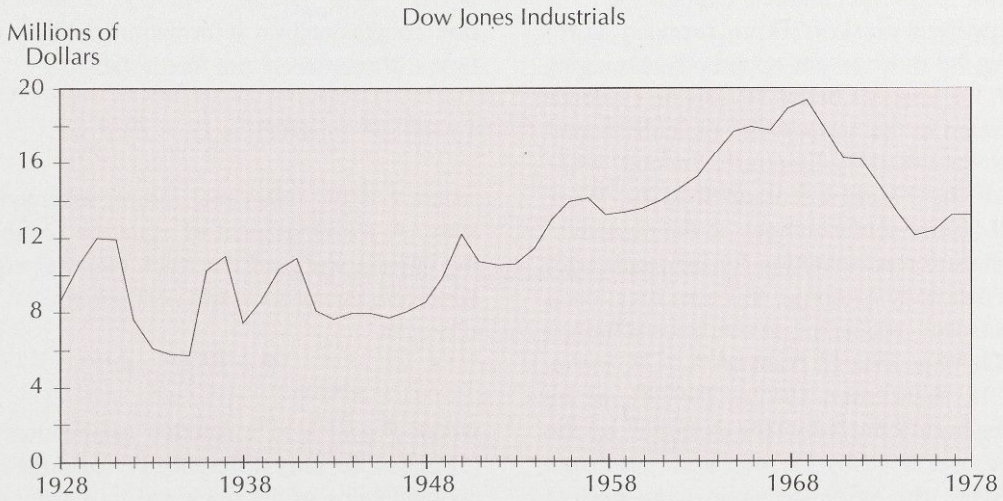
from its normal course of growth. On the other hand, an integrated process behaves like a drunken sailor on a random walk: regardless of the intended path, at any given point it is a coin toss as to whether the sailor will step right or left. If dividends are integrated, each new surprise is built into the level of dividends so that they may tend to grow, but they do not trend.

For interpreting the evidence on the perfect markets hypothesis the distinction matters because the two types of processes carry different implications for the variability of dividends. If dividends are integrated, actual dividend variability might be much less than what could have occurred but did not (to continue the metaphor—by sheer luck the drunken sailor might have stayed on the sidewalk), whereas under trend-stationarity, observed dividend variability is a good indicator of potential variability.

Shiller followed common practice in assuming trend-stationarity and found evidence against the perfect markets hypothesis. Marsh-Merton and Kleidon showed that under the integration assumption, investors might have been wary of potential dividend fluctuations that did not come to pass—for example, they might have held fears of a Soviet invasion of Poland in the 1980s, which of course were never realized. In this case, the interpretation of Shiller's evidence is exactly reversed, and the data thus appear to support the perfect markets hypothesis.

To this twofold counterattack has come a fourfold response. First, the sampling and specification considerations raised by Flavin, Michener, and LeRoy-LaCivita could account for some excess volatility but not for the amount Shiller had found. Second, N. Gregory Mankiw, David Romer, and Matthew D. Shapiro (1985) and Kenneth D. West (1988) developed excess volatility-type tests that are valid under the integration assumption about dividends; these studies found evidence against the perfect markets hypothesis, though it was much less dramatic than the results of Shiller and LeRoy-Porter. Third, John Y. Campbell and Shiller (1987) explicitly adopted the integration assumption about dividends and showed that restrictions implied by the perfect markets hypothesis were still generally rejected by the data. Finally, a new attack on the perfect markets hypothesis, one that does not hinge on the temporal stability issue, has been provided by the mean-reversion studies of Lawrence H. Summers (1986), James M. Poterba and Summers (1988), Eugene F. Fama and Kenneth R. French (1988), and Andrew W. Lo and A.C. MacKinlay (1988). These studies search for evidence that low returns are likely to be followed by higher ones—returns "revert" to their mean. If returns

## Chart 1
## Real Aggregate Dividends on Stocks Traded, 1928–78

### Dow Jones Industrials

Millions of Dollars



### New York Stock Exchange

Millions of Dollars



### Standard and Poor's 500

Millions of Dollars

are mean-reverting, they are forecastable, and the perfect markets hypothesis is violated. Using aggregate monthly data, several of the studies did in fact find mean reversion and thus provided seemingly robust evidence against the perfect markets hypothesis.

Still, the perfect markets issue remains unresolved. Taking the most recent apparently damaging evidence first, the analysis below reveals no evidence of mean reversion in the annual data typically examined in the excess-volatility literature. Second, while the validity of the Mankiw-Romer-Shapiro, West, and Campbell-Shiller studies hinges on the plausibility of the integration representation for the stock price and dividend data they examine, this specification is at minimum suspect (according to evidence obtained by David N. DeJong, John C. Nankervis, N.E. Savin, and Charles H. Whiteman 1992a, 1992b), or by some measures highly unlikely (for example, by the Bayesian measures used by DeJong and Whiteman 1991). Moreover, the evidence against the perfect markets hypothesis under the integration assumption is not very dramatic and, as will be shown presently, is in fact practically nonexistent for the annual Dow Jones, New York Stock Exchange, and Standard and Poor's data.

As Herbert Hoover might have put it, what the perfect markets hypothesis needs is a good one-armed economist. While on the one hand (trend-stationary dividends) the perfect markets hypothesis looks implausible, on the other hand (integrated dividends), it is not very implausible. Yet there is a way to let the data decide which arm is the right one—by adopting an alternative to the usual statistical practice. Upon doing so, DeJong and Whiteman (1992) recently found more unsettling evidence on the perfect markets hypothesis.

## Tests of the Perfect Markets Hypothesis

Numerous studies in the 1960s (many of which are summarized in Fama 1970) and 1970s had tested the "weak" version of the perfect markets hypothesis, which posits that returns cannot be predicted from their own past, and the "semistrong" version of the hypothesis, which holds that returns cannot be predicted using other economic time series. One way to think of these tests is as follows. Let $P_t$ denote the ex-dividend price of a stock at time $t$ (that is, the price of the stock just after the most recent dividend has been paid), and let the (end of) time $t$ dividend be $D_t$; assume that $P_t$ is

known at time $t$, but that $D_t$ is unknown. Then the expected one-period return to buying the stock (for price $P_t$), holding it long enough to receive the dividend payment $D_t$, and selling it (one period later for price $P_{t+1}$) is $E_t(P_{t+1} + D_t - P_t)/P_t$, where $E_t$ denotes the expectation conditioned on information publicly available at time $t$. If returns are not forecastable,

$$E_t(P_{t+1} + D_t - P_t)/P_t = r, \tag{1}$$

where $r$ is the mean real return, assumed to be constant. A rearrangement of equation (1) indicates that the current worth of the stock ought to equal the discounted value of its worth next period:

$$P_t = \beta E_t(P_{t+1} + D_t), \tag{2}$$

where $\beta = (1 + r)^{-1}$. Another implication of equation (1) is that the only difference between the realized discounted value of the stock and its current price results from expectation error:

$$\beta(P_{t+1} + D_t) - P_t = \epsilon_t, \tag{3}$$

where $\epsilon_t = \beta(P_{t+1} - E_t P_{t+1})$ is the expectation error.

The weak implication of the perfect markets hypothesis is that the expectation error in equation (3) should not be forecastable using its own past values (that is, it should be serially uncorrelated); the semistrong implication is that it should not be possible to forecast the return residuals using any publicly available data. Many tests of this sort have been applied to (and passed by) stock price and dividend data; the authors' versions of these tests are reported in Table 1. The first section reports statistics that result from testing the hypothesis that the return residuals are not serially correlated.[2] For each of the three annual data sets—the Dow Jones Industrials, the New York Stock Exchange, and Standard and Poor's 500 (see the appendix)—the residuals in equation (3) were computed, and the serial correlation statistic calculated. In no case is there reason to suspect that the residuals are serially correlated; weakly, the perfect markets hypothesis is not rejected.

Regression tests of the semistrong version of the hypothesis are also reported in Table 1. In each of the data sets the return residuals are forecastable by prices or the dividend-price ratio or both. Semistrongly, then, the perfect markets hypothesis is rejected, but the return residuals are not very forecastable—in each case the $R^2$ is very small. Moreover, as Shiller notes, "Such small correlations detected in long historical data are

# Table 1
## Tests of the Perfect Markets Hypothesis

| | Dow Jones Industrials 1928–78 | New York Stock Exchange 1926–81 | Standard and Poor's 1871–1985 |
|---|---|---|---|
| **Are Return Residuals Serially Correlated? (Weak Test)** | | | |
| Q-statistic | Q(21) = 11.10 | Q(30) = 25.27 | Q(21) = 12.29 |
| Significance Level | 0.96 | 0.71 | 0.93 |
| **Are Return Residuals Forecastable? (Semistrong Test)** | | | |
| *Regression on Lagged Price* | | | |
| Coefficient | −0.241 | −0.174 | −0.141 |
| *t*-statistic | −2.70 | −2.36 | −3.27 |
| *R* Squared | 0.13 | 0.10 | 0.09 |
| *Regression on Lagged Dividend-Price Ratio* | | | |
| Coefficient | 4252.568 | 0.148$E$+11 | 333.027 |
| *t*-statistic | 1.55 | 1.82 | 2.35 |
| *R* Squared | 0.05 | 0.06 | 0.05 |
| **Volatility Tests** | | | |
| $\sigma(p)$ | 352.18 | 0.21$E$+08 | 52.37 |
| $\sigma(p^*)$ | 116.81 | 0.55$E$+07 | 13.40 |
| **Variance Ratio Tests**[a] | | | |
| $pVR(k)$ | 10.03 | 10.30 | 14.40 |
| $k$ | 5 | 6 | 11 |
| $q$ | 13 | 12 | 14 |
| $P$-value | 0.69 | 0.59 | 0.42 |

[a] Under the null hypothesis of no mean reversion, $pVR(k)$ is distributed as $\chi^2(q)$; $k$ denotes the horizon over which returns are analyzed.

of questionable relevance to modern conditions and of minor interest given possible errors in data from remote times in history" (1981a, 294).

Weak though it may be, the forecastability evidence is evidence against the perfect markets hypothesis. Shiller (1981a, 1981b) argues that while this evidence might not convince anyone of anything, his volatility tests ought to. These tests, he suggests, have advantages over regression tests of "greater power in certain circumstances of robustness to data errors such as misalignment and of simplicity and understandability" (1981a, 292).

Shiller's tests are based on three assumptions:
- Stock prices reflect investor beliefs that are rational expectations of future dividends.
- The real expected rate of return on the stock market, $r$, is constant.
- Aggregate real dividends can be described by a trend-stationary process.

To derive the relationship on which the test is based, it is useful to begin by defining the ex post rational (or perfect markets) price per share, $P$. It is obtained by noting that equation (2) describes $P_t$ in terms of $D_t$ and $P_{t+1}$, which in turn must be describable by $D_{t+1}$ and $P_{t+2}$,

which must then be describable by $D_{t+2}$ and $P_{t+3}$, and so on, and carrying out the "forward substitution," whereupon the current price can be expressed in terms of the entire future course of dividends:

$$P_t^* = \beta D_t + \beta^2 D_{t+1} + \beta^3 D_{t+2} + \ldots \equiv \Sigma_{k=0}^{\infty} \beta^{k+1} D_{t+k}. \quad (4)$$

In words, $P$ is the present value of actual subsequent dividends. From the first assumption actual stock prices are ex ante rational—that is, they equal the current expectation of $P$,

$$P_t = E_t(P_t^*), \quad (5)$$

so that actual prices represent the expected present value of subsequent dividends. Equation (5) indicates that $P_t$ is the optimal forecast of $P_t^*$; hence the forecast error $u_t \ (= P_t^* - P_t)$ cannot be predicted using the actual price $P_t$. By implication, $P^*$ must vary more than $P$:

$$\begin{aligned} variance(P^*) &= variance(P) \\ &+ variance(u) \geq variance(P). \quad (6) \end{aligned}$$

Chart 2 shows estimates of $P$ and $P^*$ for the three data sets, and sample estimates of $variance(P^*)$ and $variance(P)$ are reported in Table 1.[3] The calculations replicate Shiller's results for the Dow Jones Industrials and the Standard and Poor's and produce similar results in the New York Stock Exchange figures. Note that contrary to the prediction of the perfect markets hypothesis, the ex post rational stock price $P^*$ is much less volatile than the price $P$ itself: stock prices appear too variable to be accounted for by subsequent changes in dividends.

There are a number of reasons to view these calculations with some suspicion. First, the assumptions are questionable. On the constancy of the real rate, Michener (1982) and LeRoy and LaCivita (1981) have shown that in a theoretical model economy, risk-averse investors may behave in such a way that the real rate of return on the stock market fluctuates over time. This means that the $r$ in equation (1) would not be the constant Shiller assumed. Further, if the return varies, the variance of $P$ need not be less than the variance of $P^*$. But the amount by which the $P^*$ bound could be exceeded was not as large as what Shiller had found. Indeed, Shiller (1981a) argued that for real rate variability to induce enough excess volatility to account for the $P^*$ variance bound violations he found, the real rate would have had to vary from −8.16 to 17.27 percent, a range too large to be believable.

A second problem, discussed by Flavin (1983) and Kleidon (1986a), is that tests based on equation (6) are biased in favor of the inference of excess volatility. Their argument involves noting that the sample variances of $P_t$ and $P_t^*$ are biased estimates of the actual variances (because they are computed using deviations from estimated means rather than the true underlying means). Further, the greater the temporal dependence of a series, the greater the downward bias in its sample variance. Because $P^*$ is a highly persistent series, its sample variance exhibits greater downward bias than that of $P$. However, Kleidon conceded that this bias does not seem to explain the dramatic violations Shiller reports.
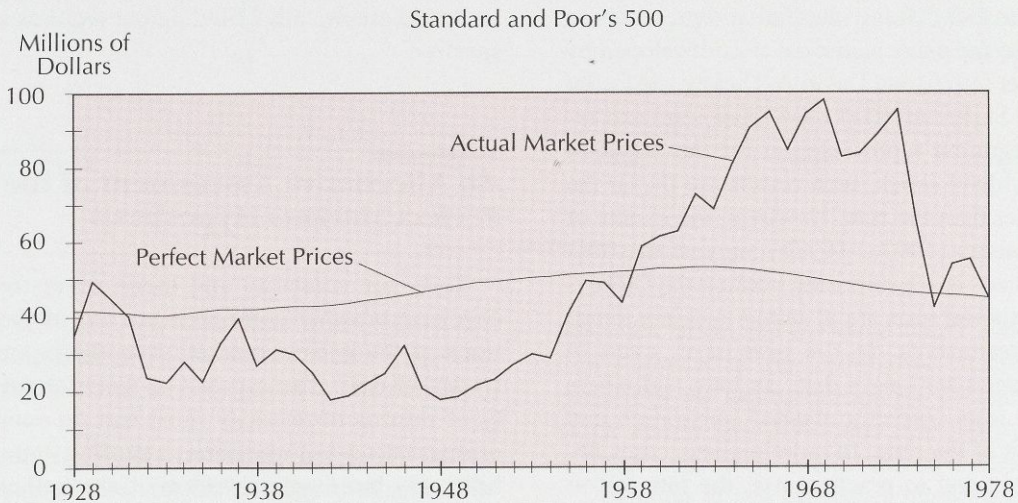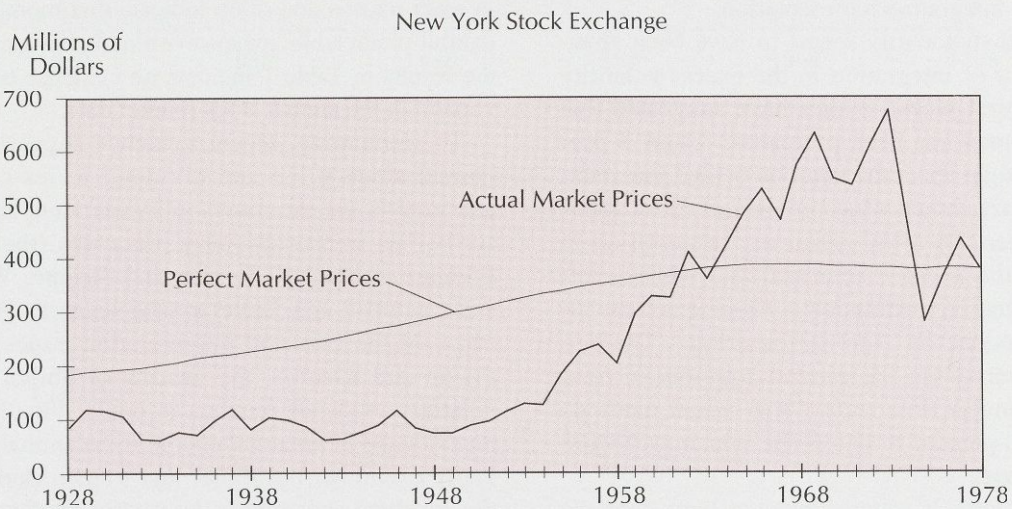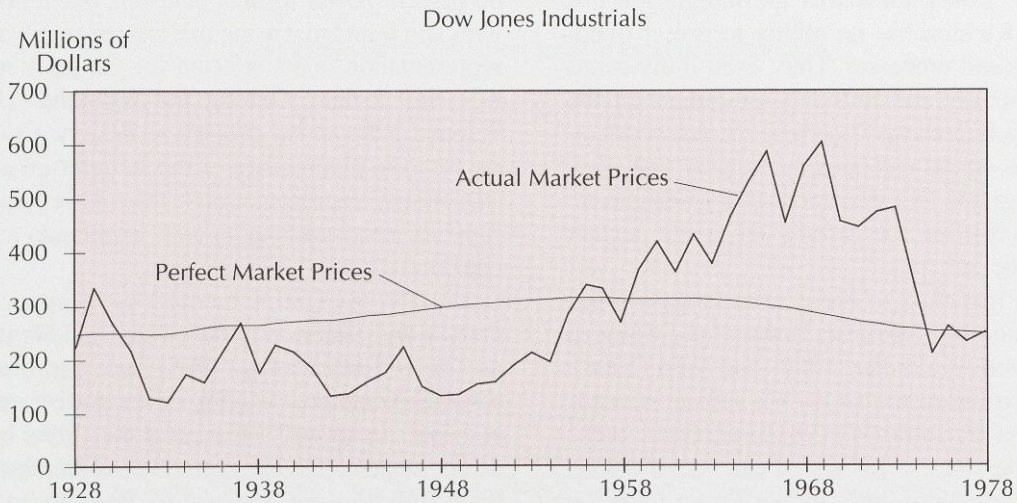
Finally, a number of authors have attacked Shiller's third assumption. For example, Marsh and Merton argued that "his variance bound test results might be better interpreted as an impressive rejection of his model of the dividend process than as a rejection of stock market rationality" (1986, 485). To establish this point, Marsh and Merton maintained the first and second assumptions but used a different model to characterize how dividends, and hence rational prices, are determined. In so doing, they managed to reverse the inequality in equation (6) and establish a variance bound test that directly contradicts Shiller's.

Marsh and Merton began by assuming that managers who set dividend policies for business firms dislike frequent dividend changes, yet they try to achieve a constant dividend-price ratio.[4] The implication is that the managers would make the current dividend a weighted average of historical stock prices. But $P^*$ is itself a weighted average of actual dividends, and these two facts together imply that $P^*$ is a weighted average of actual prices. In fact, this simultaneity (dividends are set on the basis of past prices, and prices are the expected discounted value of future dividends) causes both prices and dividends to be integrated. As a result, Shiller's variance inequality should be reversed; intuitively, because an average is less volatile than the series from which it is computed, $P^*$ should be "smoother" than $P$.[5]

Marsh and Merton (1987) provided empirical support for the dividend-smoothing idea by estimating what can be interpreted as the managerial equation for setting aggregate dividends as a function of stock prices. This equation, it turns out, explains much more of the variability of aggregate dividends than does the trend-stationary model attributed to Shiller.

Kleidon (1986b) has also argued that the apparent integration of stock prices may account for Shiller's findings. He failed to reject the null hypothesis of

## Chart 2
## Actual and Perfect Markets Prices for Portfolios of Stocks, 1928–78

### Dow Jones Industrials



Millions of Dollars

Actual Market Prices

Perfect Market Prices

### New York Stock Exchange



Millions of Dollars

Actual Market Prices

Perfect Market Prices

### Standard and Poor's 500



Millions of Dollars

Actual Market Prices

Perfect Market Prices

integration for the Standard and Poor's price and dividend series and used simulations to show that rationally determined prices can appear "excessively" volatile if dividends are integrated. However, West (1987) and Pierre Perron (1988) noted that the integration test employed by Kleidon has no ability to detect trend-stationary dividend processes. Thus, even if dividends are trend-stationary and Shiller's indictment of the perfect markets hypothesis is correct, the test conducted by Kleidon would erroneously suggest that dividends are integrated and thus mislead a researcher to conclude that Shiller was wrong about the perfect markets hypothesis.

Perhaps in response to these criticisms, several researchers, notably Mankiw, Romer, and Shapiro (1985), Campbell and Shiller (1987), and West (1988), developed volatility tests that do not subsume trend-stationarity. As in Shiller's (1981b) analysis, these studies provide some evidence of excess volatility. However, the validity of these studies hinges upon the validity of the integration representation.

While trend-stationarity seems to have been abandoned in favor of integration in the excess-volatility literature, several recent studies have suggested that this abandonment has been premature. Chart 3 provides some insight about the intuition behind this statement. The chart shows what remains of Dow Jones dividends when the trend-stationary assumption is adopted and the trend is removed and what is left when the integration assumption is adopted and the integration is undone by "first-differencing." The two methods for removing the growth component yield remarkably similar time series, and casual methods would be hard-pressed to determine which procedure is the correct one.

Trend-stationarity's stature seems to have been diminished by the fact that the integration representation is not often rejected using statistical tests developed by Wayne A. Fuller (1976) and David A. Dickey and Fuller (1981). While Shiller (1981a) used these tests and rejected the integration representation for the Standard and Poor's dividend series, such results are by far the exception rather than the rule. However, the results of DeJong and others (1992a, 1992b) suggest that this dearth of rejections is not surprising because the Dickey-Fuller type statistical tests are ill suited to detect trend-stationary alternatives. In the best case, even in experimental trend-stationary data, DeJong and others found that the tests correctly rejected integration less than 50 percent of the time. In more realistic cases designed to correspond to practical use, the rate fell to less than 20 percent. Hence, a failure to find convincing evidence against the integration hypothesis does not provide convincing evidence in its favor. Moreover, DeJong and others (1992a) developed a test of a trend-stationary representation that has approximately 60 percent power against plausible integrated alternatives and found that using this test the trend-stationarity representation is not rejected for the stock market series. Still further, DeJong and Whiteman (1991) developed a Bayesian procedure designed to evaluate the relative plausibility of the integration and trend-stationarity representations; this procedure strongly supports trend-stationarity over integration for the data considered here.

Finally, tests implemented by Summers (1986), Poterba and Summers (1988), Fama and French (1988), and Lo and MacKinlay (1988) have also been used to assess the empirical validity of the perfect markets hypothesis. An attractive feature of these tests is that they do not hinge on the integration versus trend-stationarity issue. The tests are designed to detect mean reversion in asset returns and often indicate that monthly returns exhibit predictable, mean-reverting behavior. However, the results in Table 1 indicate no evidence of mean reversion in the annual stock market data.

To summarize, recent evidence suggests that the annual stock price and dividend series commonly analyzed in the excess-volatility literature are well described as trend-stationary processes (therefore the findings of Mankiw, Romer, and Shapiro, West 1988, and Campbell and Shiller appear suspect). Further, because of the bias and interpretation issues raised by Flavin and Kleidon, the validity of Shiller's excess-volatility evidence remains in doubt. Finally, there is no evidence of mean reversion in the annual data originally examined by Shiller and Marsh-Merton. Thus, the unsolved question: is the perfect markets hypothesis sound empirically? Finding out requires a new perspective.

## An Alternative Assessment of the Perfect Markets Hypothesis

Tests for volatility and mean reversion involve checking whether some, but not all, of the implications of the perfect markets hypothesis are violated by actual data. The regression tests for predictability of returns necessarily must rest on economically uninteresting assumptions regarding temporal stability. By building on work by Campbell and Shiller (1987) and DeJong and Whiteman (1991), DeJong and

**Chart 3**
**Deviations of Real Dow Jones Dividends from Trend, 1928–78**

Trend Removed by Extracting Smooth Exponential Growth
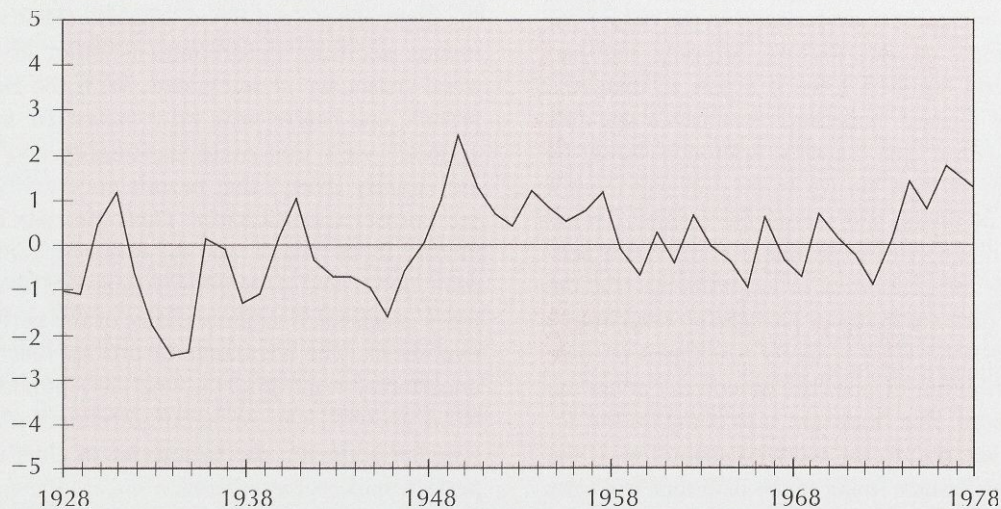


Trend Removed by First Differencing



Whiteman (1992) have developed a procedure for testing all implications of the theory without needing to decide beforehand how to account for dividend growth.

The Campbell-Shiller procedure involves starting with an assumption about dividend growth and with a general, unrestricted statistical representation for the stock price and dividend data.[6] This representation summarizes the information in the data. In the context of the representation the connection between stock prices and dividends implied by the perfect markets hypothesis in equation (2) can be tested.

Adoption of this procedure highlights the sensitivity of inferences regarding the hypothesis to the dividend

growth assumption. DeJong and Whiteman (1992, Table 1) report that the perfect markets hypothesis is resoundingly rejected under the trend-stationarity assumption and not rejected under the integration assumption.

That this sort of situation can arise is a consequence of how classical statistical analysis is done. The general approach is easiest to understand in the context of a simple example of dice-tossing. Suppose one had observed several hundred rolls of a pair of dice (the "sample") and wished to determine whether the dice were fair or loaded. The classical approach would be to locate a pair of dice known to be fair, roll them a large number of times, and record the results. (In actual practice, this sort of experiment is often not necessary because the properties of experiments like the rolling of fair dice are given in probability textbooks.) The results describe what is likely to happen on dice rolls (the distribution of possible outcomes) given the "fair-dice" model. The final step is to compare the actual data (the sample) to the model distribution. If the actual data distribution looks much different from the model distribution, the data are said to reject the model and would indicate that the original dice were not fair. It is significant that the approach requires data sufficient to sway a skeptic away from a belief in a particular model. Put another way, it involves asking whether the data look unusual or atypical from the point of view of the hypothesized model.

An alternative approach, which developed from the work of eighteenth-century statistician Sir Thomas Bayes, is to take the data rather than the hypothesis as given and ask what model is most likely to have generated those data. In the dice-tossing example, the data would be used to determine what sort of dice were most likely used in the actual tosses.

The contrast between the procedures is in what each views as known and unknown. In the classical procedure, one behaves as if the model is known and the data are unknown and random; in the alternative procedure, one takes the data as known (they have already been generated) and the model as unknown (because it is the object of study.)

Both approaches have strong foundations in probability theory, but they stem from different perspectives on the meaning of probability. The classical view associates probability with relative frequency: if, in a large number of identical experiments, a particular outcome (for example, the effectiveness of a drug) appears 75 percent of the time, the probability of that outcome is said to be 75 percent. The Bayesian view associates probability with the analyst's "degree of belief": the analyst would say that he or she was 75 percent certain that the drug works.

For many empirical questions, the two approaches yield identical answers, and no arcane issues involving the fundamental meaning of probability need be addressed. But for questions like those associated with dividend growth and the perfect markets hypothesis, the approaches do differ. Using the classical approach means deciding beforehand whether dividends are trend-stationary or integrated. With the Bayesian approach, one begins with prior views (for instance, the agnostic view that trend-stationarity and integration are equally likely) that permit uncertainty regarding the correct specification. Then the data are used to modify these beliefs, and the resulting combination of prior belief and data information can be used to address issues such as the validity of the perfect markets hypothesis. The advantage of this approach is that the uncertainty regarding the ancillary hypothesis (dividend growth) can be accommodated while the researcher addresses the hypothesis of chief interest (the perfect markets hypothesis).

A feature of the Bayesian procedure is that while it facilitates measurement of the relative plausibility of one model over another, there is no easily-defined notion of absolute plausibility. Classical and Bayesian statisticians argue constantly about these issues, with classical statisticians often claiming that they can assess absolute plausibility because their procedures take one hypothesis as given and ask whether actual data look unusual from that point of view. They claim that their tests can pit a given hypothesis against all comers. Bayesians argue that doing so always involves adopting questionable ancillary hypotheses (like the dividend growth assumption in testing the perfect markets hypothesis), that in practice the data record could be spotty enough that it would fail to reject each of several mutually exclusive hypotheses, and that science advances by finding new hypotheses that are relatively more plausible than the old ones.

The consequence of this feature of Bayesian reasoning is that, in testing a hypothesis like the perfect markets hypothesis, one must be willing to specify an explicit alternative—one must specify how stock prices would evolve if the perfect markets hypothesis were violated. There is freedom to try each of several alternatives, but each comparison must involve the perfect markets hypothesis and a specific alternative. For this reason, DeJong and Whiteman report tests of the perfect markets hypothesis against a variety of alternatives. Each of these tests accommodates uncertainty regarding dividend growth.

The DeJong-Whiteman results indicate that the perfect markets hypothesis appears relatively less plausible than a model designed specifically to exploit statistical regularities in forecasting prices and dividends. However, such a model has little theoretical foundation. DeJong and Whiteman show that researchers less certain of the nature of price-dividend interaction would find some, but not too much, reason to look beyond the perfect markets hypothesis.

## Conclusion

Regression tests opened the controversy about the validity of the perfect markets hypothesis. Did the hypothesis pass? Were the tests powerful enough? When study after study either found no evidence against the perfect markets hypothesis or explained away any evidence found, the debate subsided. The controversy was reopened by applying volatility tests, which spurred an additional debate concerning the temporal stability of prices and dividends. While the stability issue seems to be settling in favor of trend-stationarity, the volatility tests suffer from bias, misspecification, and interpretational difficulties and have done little to settle the controversy over the perfect markets hypothesis.

Work that permits analysis of the perfect markets hypothesis without conditioning on the nature of dividend growth suggests that from at least one viewpoint something seems to be amiss. The problem with the perfect markets hypothesis may very well be the constancy of the real rate of return. Whatever the explanation, something other than the simplest version of the perfect markets hypothesis is needed to explain the aggregate dividend-price data. Indeed, economists are actively seeking better explanations (than the simple version of the perfect markets hypothesis) for why they are not rich.

## Appendix

### Data Set 1: Modified Dow Jones Industrial Average

Annual, 1928-78. Here, $P_t$ and $D_t$ refer to the real price and dividends of the portfolio of thirty stocks that made up the sample for the Dow Jones Industrial Average when it was created in 1928. However, because the stocks used to calculate this average are continually adjusted, Shiller has extensively modified it to control for these adjustments. These modifications are described in the appendix of Shiller (1981b).

### Data Set 2: Value-Weighted New York Stock Exchange Index

Annual, 1926-81. $P_t$ represents the January value-weighted New York Stock Exchange stock price divided by the January producer price index (PPI). $D_t$ represents total dividends for the year accruing to the portfolio represented by the stocks in the index, divided by the annual average PPI. These data are contained in the Center for Research in Security Prices data set. In the Marsh and Merton (1987) analysis, $P_t$ represents December rather than January prices, but January prices are considered here to remain consistent with the Shiller dating scheme.

### Data Set 3: Modified Standard and Poor's 500 Series

Annual, 1871-1985. The price series is Standard and Poor's monthly composite stock price index for January, divided by the producer price index (January PPI starting in 1900, annual average PPI before 1900 scaled to 1.00 in the base year, 1979). The dividend series represents the total calendar year's dividends accruing to the portfolio, represented by the stocks in the index, divided by the average PPI for the year. These data differ slightly from Shiller's (1981b) numbers; some adjustments have been made to correct minor errors in the original data, and the series have been updated to 1985.

## Notes

1. The Dow Jones Industrials and Standard and Poor's data were originally investigated by Shiller (1981a, 1981b), and the New York Stock Exchange data correspond to the series examined by Marsh and Merton (1987). The data are described in the appendix.

2. The statistic used was the Box-Pierce $Q$ statistic. Further, the calculations in the table are carried out on data from which an exponential trend has been removed. Exponential detrending does not materially affect the implications of the perfect markets hypothesis: if $P_t$ and $D_t$ possess deterministic exponential trends, then equations like (1), (2), and (3) characterize the relationships between exponentially detrended prices and dividends but $\beta$ is replaced by $\eta = (1 + g)/(1 + r)$, where $g$ is the exponential growth rate.

3. The $P$ series was calculated by backward iteration on equation (3) beginning with a terminal price $P = P_T$. Shiller used the average price over the sample for this terminal value; Flavin (1983), Mankiw, Romer, and Shapiro (1985), and Kleidon (1986a, 1986b) emphasize that this choice introduces biases into the calculations. Using the actual terminal price avoids (some of) this problem.

4. Lintner's (1956) interviews suggested that managers try to achieve a constant dividend-price ratio. Why they do it is another unsettled question.

5. Actually, the simultaneity complicates matters. It turns out that both $P^*$ and $P$ will have infinite variance under the dividend-smoothing assumption; sample estimates of variability will of necessity be badly biased downward, and $P^*$ may appear to fluctuate less than $P$.

6. The representation is known in the econometrics literature as the vector autoregression.

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# The Convexity Trap: Pitfalls in Financing Mortgage Portfolios and Related Securities

James H. Gilkeson and Stephen D. Smith

**T**he securitization of residential mortgages has been one of the biggest growth areas in credit markets during the last decade. In recent years the supply of new mortgage securities has far exceeded the supply of new corporate bonds (see, for example, Douglas T. Breeden 1991), and these instruments are being purchased in large part by financial institutions. Indeed, the relatively high returns and absence of default risk has made Government National Mortgage Association (GNMA) passthroughs, and their corresponding derivative securities, very attractive investment vehicles for banks in all size categories. Holdings of certificates of participation in residential mortgage pools and collateralized mortgage obligations by U.S. banks increased tenfold between 1985 and 1991 (from around $12 billion to $120 billion).[1] Moreover, these mortgage-related securities now make up about 8 percent of commercial bank assets.

The growing popularity of mortgage credit instruments has caused a tremendous increase in studies analyzing the unconventional cash flow characteristics of mortgage-backed securities. Unlike those of a true fixed-income security (such as a Treasury note or bond), the cash flows to mortgages, and therefore mortgage-backed securities, are influenced by the homeowner's option to prepay the mortgage without penalty. This clause makes traditional yield-to-maturity measures unreliable indicators of return because homeowners are more likely to prepay after rates have fallen. Myriad approaches have been developed to deal with this problem, including the option-adjusted spread and arbitrage-free spread measures of return (see, for example, John D. Finnerty and Michael Rose 1991, Lakhbir S. Hayre 1990, and Stephen D. Smith 1991).

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While much work has been devoted to examining the relationship between the value of mortgage-backed securities and interest rates, there has been much less discussion of the interaction between mortgage values and the funding techniques traditionally used by banks. Regulators concerned about bank and thrift solvency should be aware that certain methods of financing mortgage portfolios or securitized mortgage-backed securities may expose institutions to capital losses in both high and low interest rate environments.[2]

In addition, portfolio managers should recognize that traditional methods used to hedge the interest rate risk of fixed-income securities may be counterproductive when applied to mortgage-related products. More generally, managers of financial institutions may lack adequate knowledge of the price/yield relationship associated with mortgage portfolios. It is important to understand that changes in the market values of mortgage-related assets and the liabilities used to fund them can interact in ways that cause unusual swings in the market value of equity positions. Managers need to be aware that the value of such equity (or capital) investments in mortgage portfolios, even those funded by (duration) "matched" liabilities, behaves very differently from the residual ownership claim in more traditional asset/liability combinations. Standard return measures, even those that are "adjusted" for risk, may fail to capture institutions' full exposure to interest rate fluctuations.

Practitioners are well aware that funding long-term assets with variable-rate liabilities produces exposure losses in high-rate environments. This article concerns itself with the potential gains and losses from issuing long-term liabilities to finance a portfolio of mortgages or a mortgage-backed security. It is not simply that prepayments alone cause interest rate risk. Rather, it is the asymmetric response of prepayments to rate changes that exposes the manager to risk in both high- and low-rate environments.

This article reviews the concepts of duration and convexity and ways these measures are influenced by prepayments.[3] The discussion then analyzes how equity values change with rates for alternative financing arrangements. Special attention is paid to a so-called "convexity trap" (equity losses in both low- and high-rate environments) when mortgage-backed securities are financed by fixed-rate liabilities. Finally, some solutions to the risk problem are presented. These include higher initial equity investments and various hedging instruments such as interest rate options, interest rate caps and floors, interest-only and principal-only strip securities, and traded futures contracts.

## Prepayments, Mortgage Values, And Negative Convexity

An investment in a fixed-rate mortgage-backed security promises a uniform stream of payments over the life of the contract. For the moment, suppose that the mortgage either disallows prepayments or that prepayments are a fixed proportion of the mortgage pool balance. Chart 1 shows the relationship between the market value of this mortgage-backed security and interest rates. (The box on page 23 provides the example used to construct Charts 1-6 and Tables 1-2.) The absolute value of the slope of this function is often referred to as the security's duration.[4] The duration measure can be viewed as the weighted average maturity of the security, with the weights being the present value of each cash flow divided by the present value of all the cash flows (the price). Unlike maturity, which represents only the timing of the last cash flow, duration recognizes that some cash flows will be received before maturity and that these timing differences influence the security's interest rate sensitivity. Indeed, as noted earlier, the (percentage) change in price as rates change is the duration. Therefore, the slope of the line relating price to interest rates (approximately) equals the security's duration.

Notice, however, that in the case of the fixed prepayment portrayed in Chart 1, the slope (or duration) gets smaller as rates increase. This shape implies that the security's value is decreasing more slowly as market interest rates increase. The change in the duration (or rate of change in the price) is referred to as the convexity of the security, and in this case the convexity is positive. Positive convexity implies that the duration of the security is inversely related to the level of interest rates: when rates are high, later payments get less weight (in a present-value sense) than when rates are low (earlier cash flows are relatively more valuable in high-rate environments).

By way of contrast, Chart 2 shows the market value of a mortgage-backed security whose prepayment rate (realistically) increases as interest rates decline. Notice that the value is still decreasing as rates increase and increasing as rates decline. However, over most of this range of rates, the duration of the mortgage is increasing as rates increase. Similarly, the duration is decreasing as rates decline. This characteristic, called negative convexity, requires that cash flows not only increase as rates decline but that, at least for some time periods, they increase at an increasing rate. (The appendix contains a more mathematically

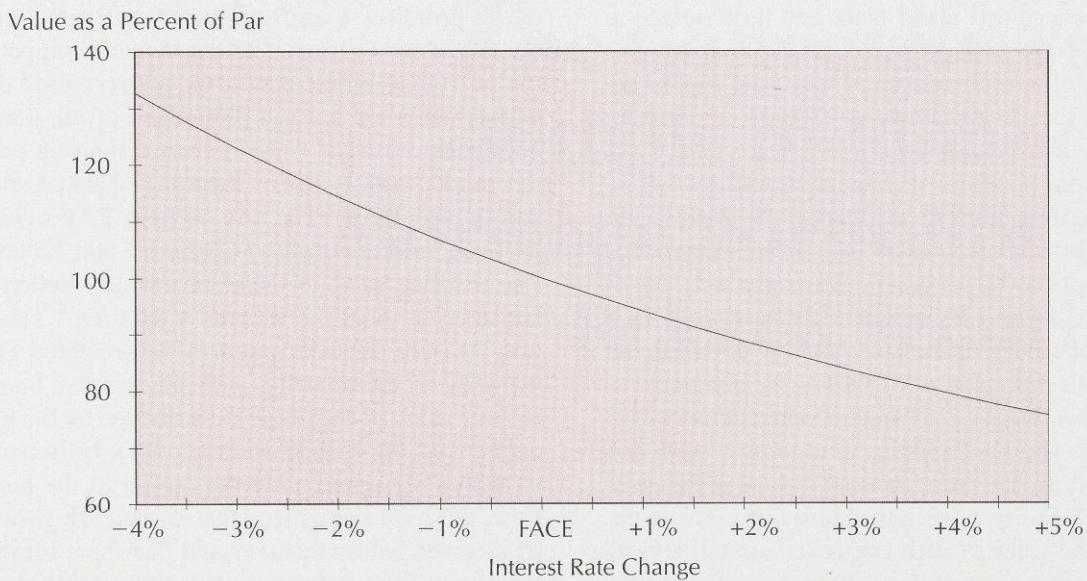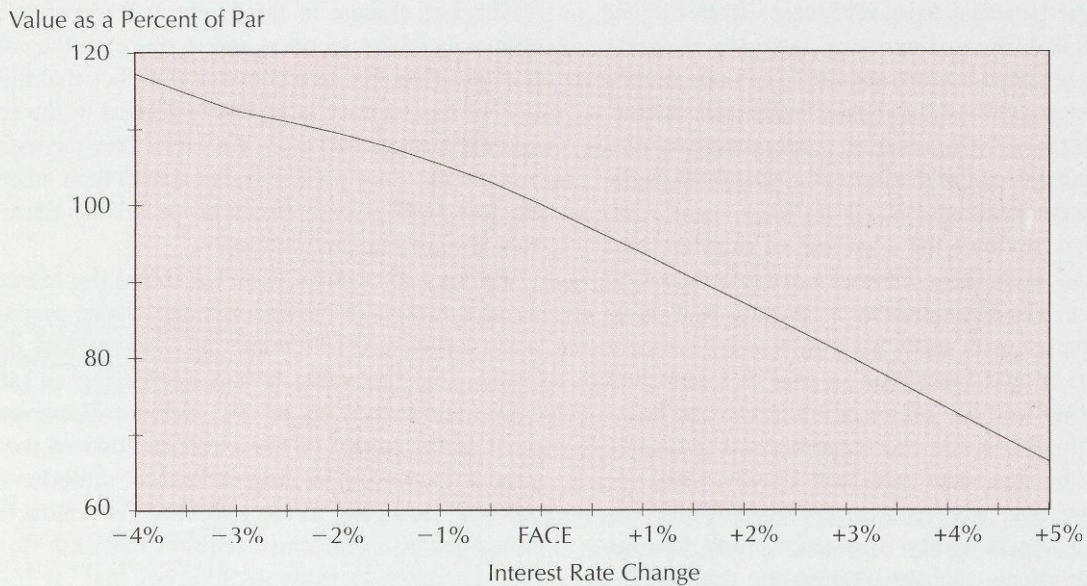## Chart 1
### Constant-Prepayment Mortgage
*(Market Value)*

Value as a Percent of Par



Interest Rate Change

## Chart 2
### Variable-Prepayment Mortgage
*(Market Value)*

Value as a Percent of Par



Interest Rate Change

rigorous discussion of this issue.) The intuitive explanation for this unusual value/rate relationship as rates decline is that prepayments are speeding up at exactly the time that these funds must be reinvested at low interest rates. On the other hand, there are few early cash flows in high-rate environments as prepayment rates decline or cease altogether. Therefore, the weighted maturity measure (duration) is increasing as rates rise because less weight is being placed on early cash flows when rates are high. Notice, however, that at a certain low-rate level prepayments (which cannot exceed 100 percent) begin to flatten out, and the value/rate relationship may return to one of positive convexity. In other words, at some (low enough) interest rate, an increase in prepayments is unlikely, and the mortgage portfolio behaves like a fixed-income security.

The following discussion analyzes the ways that three different financing arrangements might influence equity values, depending on whether the funds are placed in a true fixed-income security or a mortgage with varying prepayment rates. The first financing instrument considered is a fixed-term, fixed-rate certificate of deposit (CD). The duration of this instrument is chosen so that liability is initially duration-matched with both assets.[5] Chart 3A shows both the value of a constant prepayment mortgage and the value of the CD as a function of interest rates. The distance between the two curves is the market value of capital. Notice that in this case the value of equity is relatively constant, regardless of the level of rates, because the percentage change in price is the same for both the asset and the liability. The duration is also a measure of the percentage change in price for a 1 percent change in rates, and this depiction is just another way of showing that the durations of the two securities go up and down together as rates change.

Another deposit source commonly used by banks is the fixed-term, fixed-rate deposit that allows the depositor to withdraw funds after paying an early-withdrawal penalty. These deposits typically pay a lower rate than no-withdrawal deposits, allowing a bigger spread (higher equity value) at par. If rates decline, consumers have no incentive to withdraw and, if the liability's initial maturity is chosen to duration-match the asset, the market value of equity remains relatively constant. However, if rates rise significantly, consumers may rationally elect to pay the withdrawal penalty in order to reinvest their funds at the new, higher rates (see, for example, James H. Gilkeson and Craig K. Ruff 1992). At high rates, the market value of the bank's equity position may decline or even become negative unless some hedging activity is under-

taken. Chart 3B shows an example of this funding strategy.

Finally, Chart 3C shows how the bank may elect to fund a constant prepayment mortgage security using short-term, floating-rate deposits, such as money market deposit accounts (MMDAs). These accounts typically pay the lowest rates, offering the highest equity value at par.[6] If interest rates fall, the rates on these deposits fall as well and the market value of the bank's equity increases. However, if interest rates rise, the deposit rates will also rise (leaving the market-value line for deposits flat) and the market value of equity will decrease quickly. Under this funding strategy, the bank will have to hedge against rising rates. While the market value changes shown in Chart 3 (and throughout the other graphs) will not immediately show up on an institution's balance sheet (which is in book-value terms), the lower net cash flows will eventually dilute earnings and, therefore, capital.
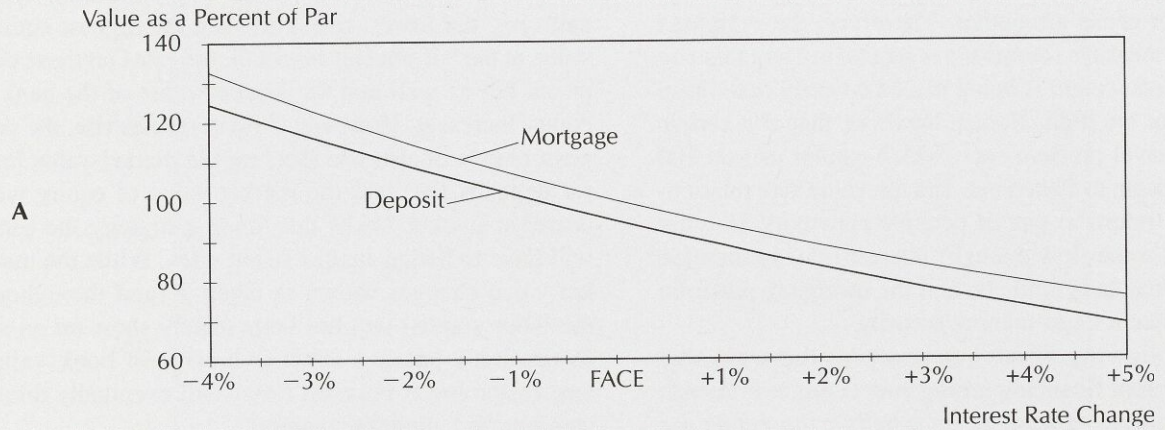
Charts 4A-C consider the same three financing alternatives for variable-prepayment mortgages that Charts 3A-C considered for fixed-prepayment mortgages. In Chart 3A, a fixed-term, no-withdrawal deposit was shown to "lock in" a positive equity value through duration matching. Chart 4A shows that, for a mortgage that exhibits negative convexity (as discussed previously), this kind of asset-liability management is not, by itself, feasible. If rates rise, the market value of the mortgage security falls more quickly than the cost of the deposits, implying a decrease in equity value. As rates decline, the market value of the mortgage security increases more slowly than the cost of deposits, again implying a decrease in equity value.

For fixed-rate, fixed-term deposits with a withdrawal option, the upside-rate risk is similar to that associated with fixed-prepayment mortgages. However, there is also the risk that, if rates fall far enough, the slower increase in mortgage value will be overwhelmed by the faster increase in the cost of the deposit, entailing a loss of equity value. Chart 4B represents this risk.[7]
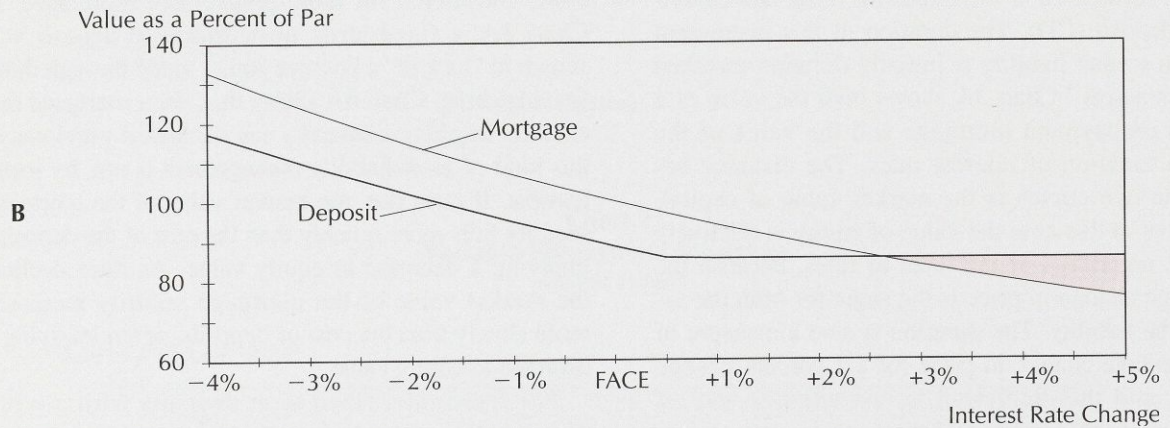
If mortgages are financed by short-term, floating-rate deposits, as shown in Chart 4C, the interest rate risks are much the same as for financing fixed-prepayment instruments. Equity value grows as interest rates decrease and falls as they rise. However, a close comparison of Charts 3C and 4C will show that, in this case, the increase in equity value is smaller and the decrease in equity value is larger for mortgages with variable prepayments. However, Chart 4C shows that the institution still has only a one-sided hedging problem when using the floating-rate funding strategy.
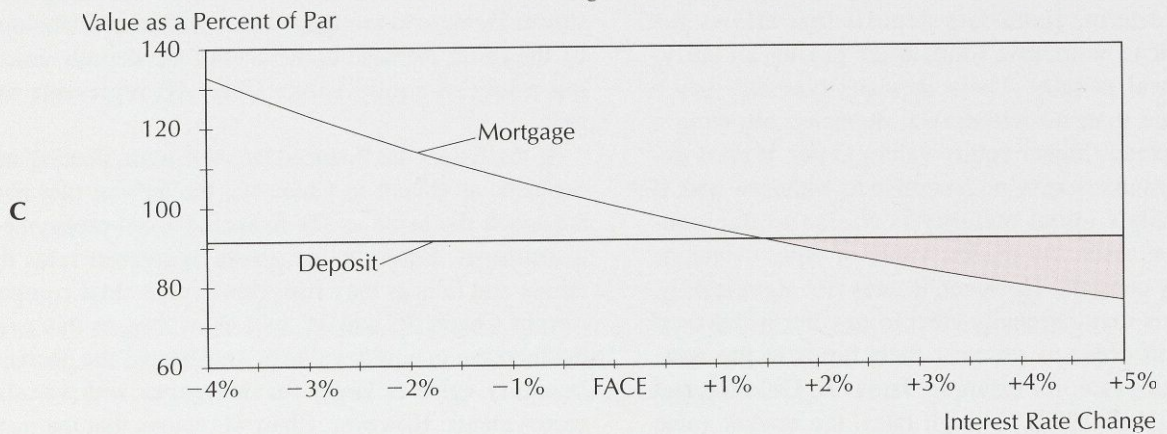
## Chart 3
## Mortgage with Constant Prepayments

### Fixed-Rate Funds
*(no withdrawal option)*

**A**

Value as a Percent of Par



Mortgage

Deposit

Interest Rate Change

### Fixed-Rate Funds
*(withdrawal option)*

**B**

Value as a Percent of Par



Mortgage

Deposit

Interest Rate Change

### Floating-Rate Funds

**C**

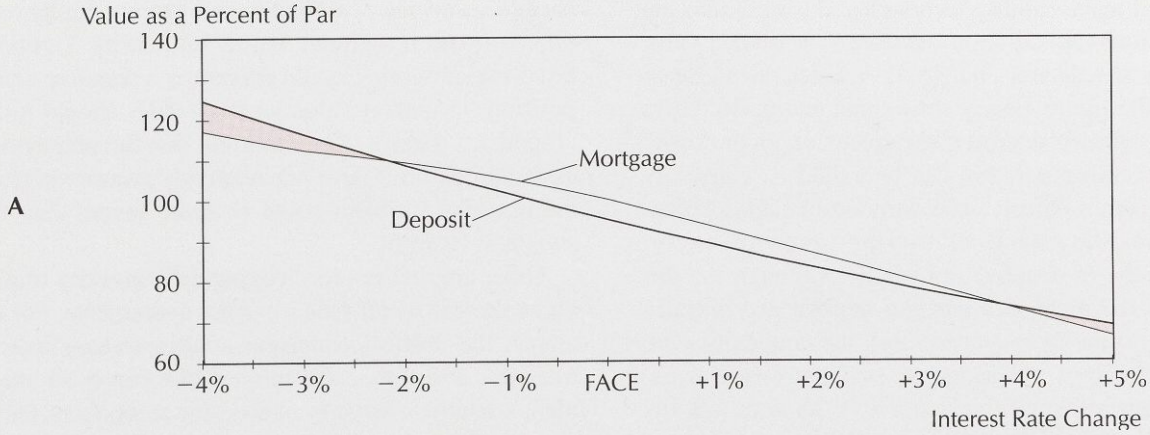Value as a Percent of Par
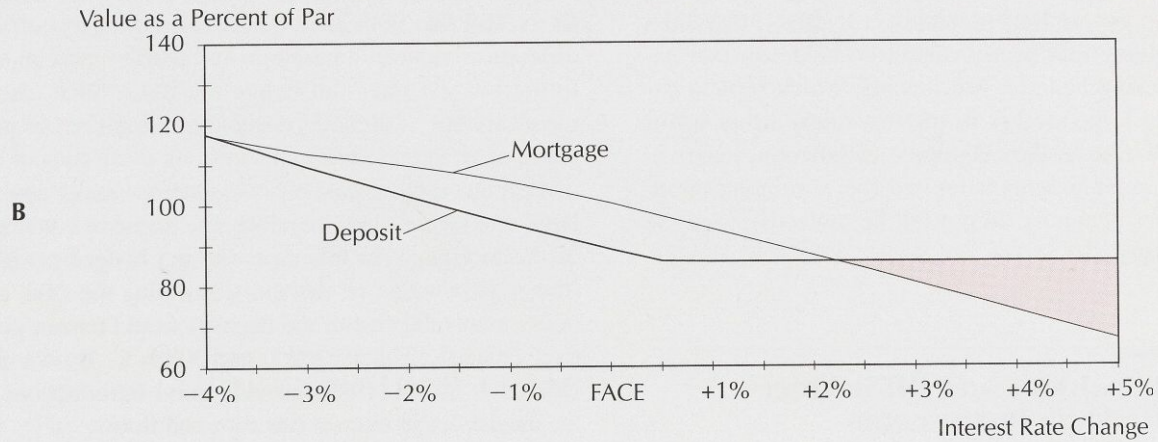


Mortgage

Deposit

Interest Rate Change

Note: Shaded areas represent negative equity.

## Chart 4
## Mortgage with Varying Prepayments

### Fixed-Rate Funds
*(no withdrawal option)*

Value as a Percent of Par

**A**

Mortgage

Deposit

Interest Rate Change

### Fixed-Rate Funds
*(withdrawal option)*

Value as a Percent of Par

**B**

Mortgage

Deposit

Interest Rate Change

### Floating-Rate Funds

Value as a Percent of Par

**C**

Mortgage

Deposit

Interest Rate Change
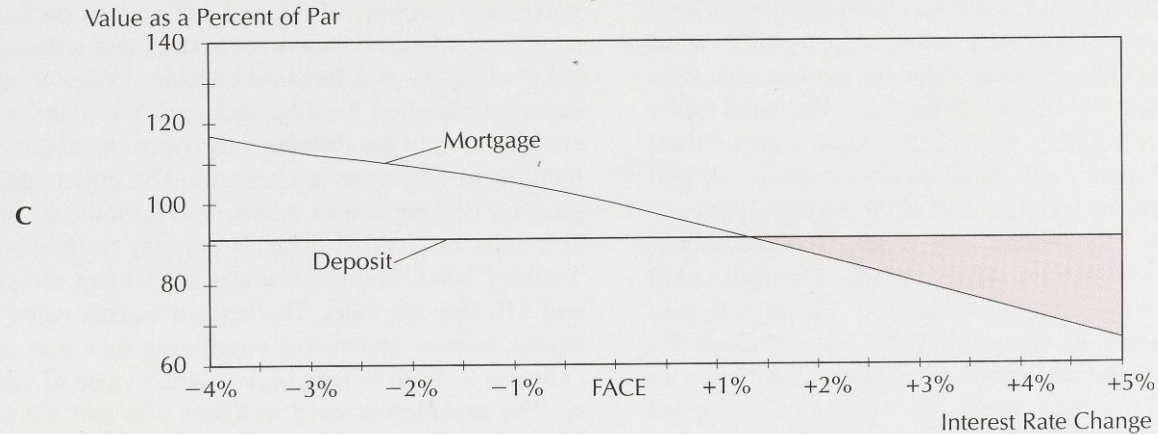
Note: Shaded areas represent negative equity.

## The Convexity Trap

It is worthwhile to take a closer look at the implications of Chart 4A, which demonstrates financing variable-prepayment mortgages with fixed-term deposits. By traditional asset-liability techniques, the asset and liability pictured are duration-matched. The market value of equity should not change as interest rates rise or fall, yet the figure clearly shows that equity decreases under any sizable interest rate movement, up or down.

This seeming paradox can be called a "convexity trap," to coin a phrase.[8] The duration-matching strategy ignores the effects of varying prepayments or, equivalently, of negative convexity. Although the duration of the mortgage and the deposit are initially matched (at the face interest rate), the convexities are of opposite signs (the mortgage is negatively convex, and the deposit is positively convex). As rates fall, the deposit curve becomes steeper as the mortgage curve gets flatter. Similarly, when rates rise, the mortgage curve gets steeper and the deposit curve flattens. The durations are no longer matched at rates other than par, implying that equity cannot be held constant except by using hedging instruments, which protect equity from large swings in interest rates, either up or down. Of course, the magnitude of potential losses in low-rate environments is limited (because nominal interest rates generally do not fall below zero). (See the box on page 23.)

## Equity Cushions and Off-Balance-Sheet Hedging Instruments

Purchasers of mortgage-backed securities can try to protect themselves from losses associated with large interest rate swings in a variety of ways. The most straightforward involves reducing the leverage ratio used to fund the security. In this case, the initial equity cushion is a higher percentage of par value. Charts 5A-C compare three initial equity positions: 10 percent, 5 percent, and 3 percent of the purchase price, respectively. The liability used is the fixed-rate deposit with a no-withdrawal clause, but the same idea would apply with early withdrawal as well. The extreme cases can be seen by comparing Chart 5A with Chart 5C. With a 10 percent initial investment, the bank can withstand rate movements over a 9 percent range and still retain a positive market value of equity. Alternatively, Chart 5C shows that with a 3 percent initial in-
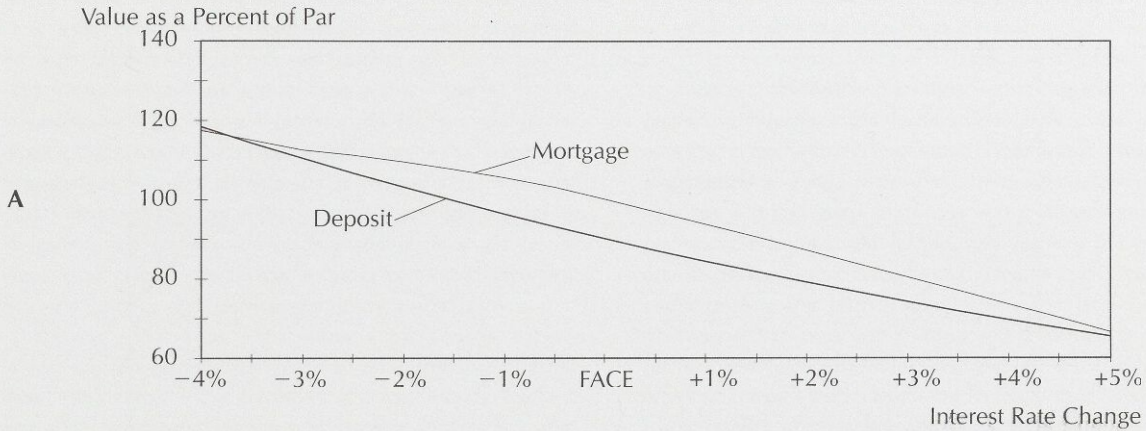
vestment the equity value of the position will turn negative if rates either decline by roughly 1.5 percent or increase by 3 percent. Moreover, as noted earlier, this relatively small rate window would persist even if the original par interest rate were 9 percent or 10 percent. For example, purchasers of 9 percent mortgage-backed securities who fund with 3 percent equity capital, with the remainder being funded by 7 percent fixed-rate liabilities, could encounter a negative equity position (in market-value terms) if rates should fall to around 7.5 percent. Keep in mind that the prepayment assumptions used here are relatively conservative, so the potential problem could be more severe than that shown in Chart 5C.

Other alternatives for hedging the convexity trap involve the use of off-balance-sheet instruments. For example, the portfolio manager could purchase interest rate caps and floors. An interest rate cap is an agreement whereby one party agrees, for an up-front fee, to pay a counterparty the difference between market interest rates and some base rate, in the event that future market rates should rise above the cap rate. Conversely, an interest rate floor can be purchased that pays off the difference between a base rate and market rates should future interest rates fall below the floor. Such instruments are not costless. However, the simultaneous purchase of an interest rate cap and floor at the ends of the interest rate range would provide some insurance against large rate swings and, therefore, the negative convexity of the mortgage. In this case, the net hedged position (the market value of the mortgage plus the caps and floors minus the cost of the deposit) would remain positive. Peter A. Abken (1989) and Keith C. Brown and Donald J. Smith (1988) provide good introductions to the mechanics of interest rate caps and floors.
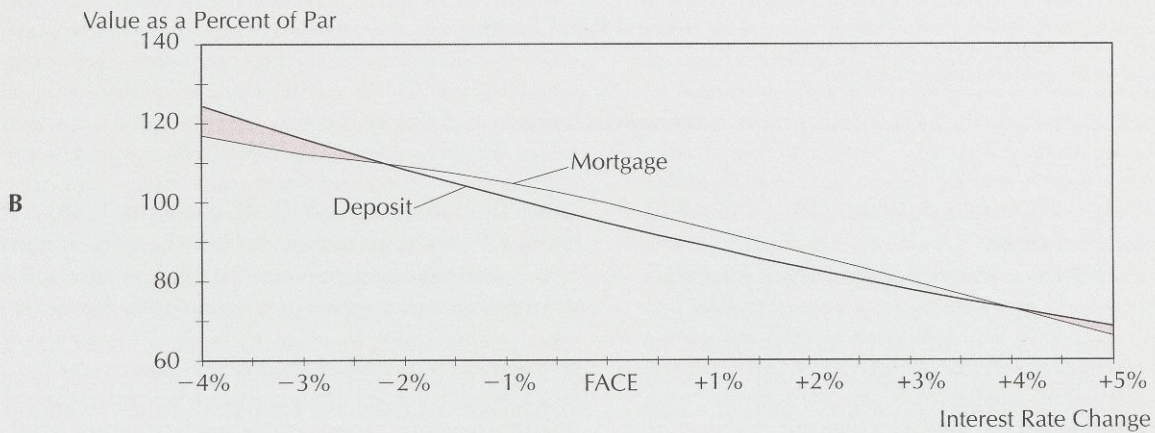
A less esoteric, but potentially useful, approach to hedging these convexity-induced swings in value involves the purchase of put and call options on Treasury bonds. Chart 6 shows the hedged and unhedged value of equity as a function of interest rates for the duration-matched funding strategy. The unhedged curve is simply the difference between the asset and liability value curves in Chart 5B. The initial equity position is 5 percent of assets. The options are puts and calls on a thirty-year, 8 percent coupon-rate Treasury bond. The strike prices are 90 (for the put) and 110 (for the call). The hedged market value of equity function shows that purchasing such puts and calls can be used to lock in the market value of equity. The assumption used in Chart 6 is that the up-front cost of purchasing the options is 1 percent of the mortgage's par value. Therefore, the net market

## Chart 5
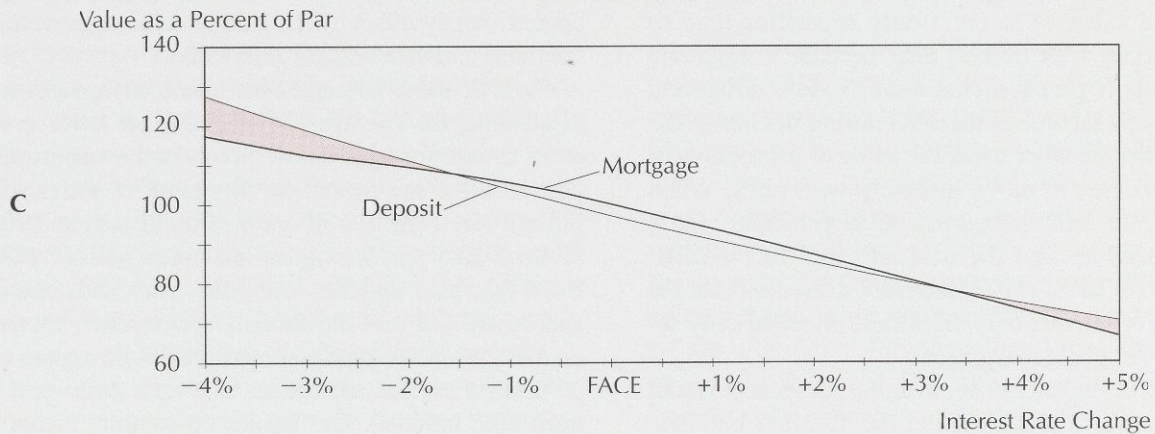## The Convexity Trap under Varying Initial Equity Positions

### 10% Initial Equity

Value as a Percent of Par
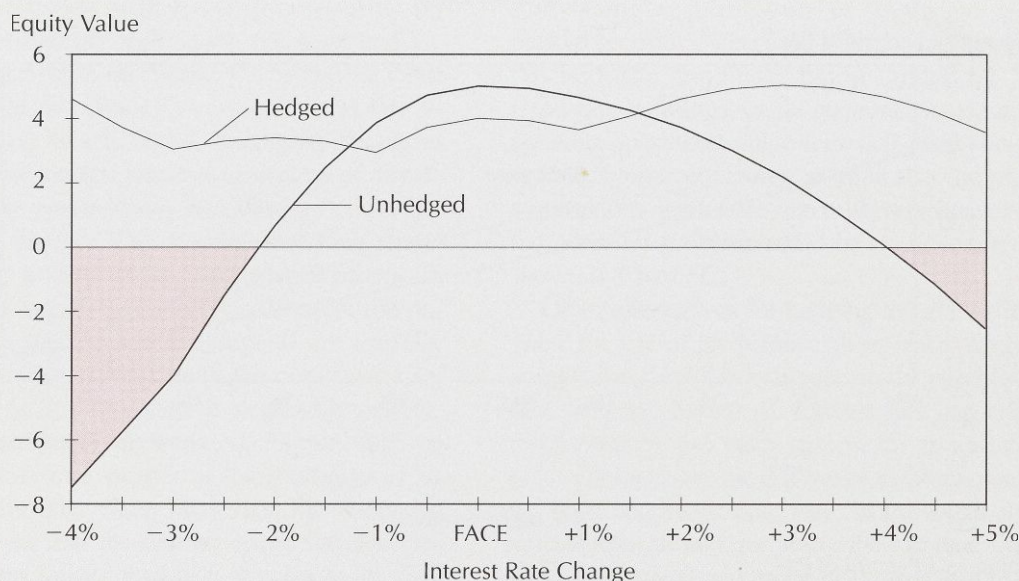
**A**



Interest Rate Change

### 5% Initial Equity

Value as a Percent of Par

**B**



Interest Rate Change

### 3% Initial Equity

Value as a Percent of Par

**C**



Interest Rate Change

Note: Shaded areas represent negative equity.

**Chart 6**
**Market Value of Equity**
(*Hedged versus Unhedged*)

Equity Value



Interest Rate Change

Note: Shaded areas represent negative equity.

value of equity is lower than 5 percent (5% − 1% = 4%) but still roughly constant.

A third off-balance-sheet hedge involves principal-only and interest-only securities. As their names imply, these contracts pay off only as a function of principal and interest payments on the mortgage pool, respectively. When properly priced, the market value of an interest-only security plus that of a principal-only security must equal the value of the mortgage-backed security when purchased alone. Not surprisingly, the value of interest-only securities tend to move directly with interest rates because in high-rate environments prepayments tend to slow down and more interest income is received during the life of the contract. On the other hand, the value of principal-only securities tends to move inversely with rates. When rates fall, the values tend to rise as principal repayments speed up and the discount rate factor falls. Thomas J. O'Brien (1992) provides a discussion of the valuation of interest-only securities, principal-only securities, and whole mortgages.

A final off-balance-sheet hedging alternative would be to create a short position in the Treasury bond futures market. For small interest rate changes it is possible to estimate the change in the mortgage portfolio

value (including the effect of changing prepayment rates) with some precision. As stated earlier, the value of the mortgage portfolio will increase as rates fall and decrease as rates increase. Conversely, the short futures position will increase in value as rates rise and decrease as rates fall. Because futures are not subject to prepayment risks, the change in value given a particular rate movement is known. The proper strategy is to short (sell) a specific number of contracts so that, if rates rise, the loss in value to the mortgage portfolio is approximately offset by the gain in value to the futures contracts and vice versa if rates fall.

Each of these strategies has some advantages and disadvantages. The use of higher capital ratios is the most straightforward, but it involves the opportunity cost of allocating capital for this purpose. Purchasing interest rate caps and floors or T-bond puts and calls is much like purchasing an insurance policy.[9] For a fixed fee, paid up-front, the risks from both upward and downward rate movements are covered. However, these insurance-type contracts present three potential problems. First, because options tend to be short-term (at most nine months), the "insurance contract" must be rewritten in no more than nine months at an unknown future "premium." Second, options can often be the

The graphs presented in this article are constructed using representative mortgage asset and deposit liability pools and a set of conservative mortgage prepayment and deposit withdrawal assumptions. On the asset side, it is assumed that the bank holds a $1 million pool of 8 percent mortgages, all currently at par. For Charts 1 and 3A-C, a constant annual prepayment rate of 6 percent is used. This rate is equivalent to 100 percent of the Public Securities Association rate, a prepayment rate standard developed in the 1970s. Although a constant level of prepayments will cause the mortgage pool to mature faster, the convexity characteristics, as shown in these four graphs, are similar to those of a coupon-paying annuity (that is, they exhibit positive convexity).

Charts 2 and 4A-C incorporate a prepayment schedule in which prepayment rates rise as mortgage rates fall (see, for example, Smith 1991) and vice versa. Table 1 shows mortgage values, as a percentage of par, for various market rate changes. The first column shows the alternative market rates for mortgage-backed securities. Prepayments are assumed to be 6 percent at par. The second and third columns provide the constant prepayment rate and the corresponding market value of the mortgage-backed security (shown in Chart 1). The fourth column shows moderate changes in prepayment rates as interest rates change, and the fifth column provides the corresponding market value. The fifth column is represented in Chart 2. Finally, the sixth and seventh columns show "fast" prepayments and corresponding market values, respectively. If charted, the last column would look similar to Chart 2, differing in that would display more negative convexity.

The convexity trap displayed here is not dependent on mortgage rates falling to 4 percent. Table 1 could be reconstructed using a 10 percent coupon rate and the risk of negative equity would still exist for rate declines of 2 percent

to 3 percent (that is, market rates of 7 percent to 8 percent). It is the market rate relative to the coupon rate, rather than the absolute level of rates, that causes the relationship between prices and rates to be negatively convex.

On the liability side, Charts 3A-C and 4A-C compare the effect on equity of three funding alternatives. In each of the three cases, the market value of the cash flows is calculated using a discount rate equal to the current mortgage rate minus 2 percent (200 basis points). In Charts 3A and 4A, a pool of eight-and-a-half-year, 6 percent interest bank notes, making monthly coupon payments, is considered. These deposits may not be withdrawn under any circumstances. This maturity was chosen because it is duration-matched (when variable prepayment effects are ignored) with the thirty-year, 8 percent mortgage. In Charts 3B and 4B, another pool of eight-and-a-half-year, 5 percent interest bank notes making monthly coupon payments is utilized for funding purposes. These deposits may be withdrawn upon payment of a penalty equal to two years' interest (or 10 percent). Note that the market value of the deposit flattens out at 90 percent of par (which is 100 percent minus the 10 percent penalty for early withdrawal).

Finally, in Charts 3C and 4C, a pool of floating-rate deposits is used. The deposit rate is equal to the fixed-term deposit rate minus 3 percent. Note that the market values of these floating-rate deposits remain constant, at less than par, over all interest rates. These are a cheap source of funds, but they always cost the same relative to the current mortgage rate. In summary, Charts 1, 2, 3A-C, and 4A-C were not constructed using extreme data assumptions. The convexity effects of actual mortgage and deposit prices should be the same or greater than those seen here. For completeness, Table 2 shows the market value of the alternative funding sources as a function of market rates.

most expensive method of hedging interest rate risk. An option, by nature, can never be worth less than zero. The price of the option reflects this limited liability. Finally, as these instruments are based on Treasury rates, their values reflect positive convexity while, as stated earlier, mortgage portfolios often exhibit negative convexity. As can be seen in Chart 6, option-hedged equity values continue to show some volatility. The remaining convexity mismatch can, however, be corrected by purchasing a series of options at different strike prices.

It is often argued that interest-only securities and principal-only securities provide the best protection for prepayment risks because these instruments are subject to the same prepayment effects as mortgage

portfolios. Further, as the interest-only securities and principal-only securities are based on thirty-year mortgage pools, the hedge positions do not have to be frequently rewritten (in contrast to option-based strategies). However, this approach is subject to a somewhat subtle, though quite important, risk. When hedging with options or futures contracts, the only prepayment risk comes from the mortgage portfolio being hedged. While prepayment rates can be estimated for alternative future interest rates, they cannot be exactly predicted. If hedging is undertaken using interest-only securities and principal-only securities, three prepayment rate schedules must be estimated, one each for the mortgage portfolio, the mortgage

## Table 1
### Discounted Present Value of Thirty-Year Mortgage-Backed Security (MBS)
### Cash Flows for Alternative Prepayment Rates
*(8 percent coupon rate)*

| Current Mortgage Rate | Constant Prepayment | | Moderate Prepayment | | Fast Prepayment | |
|---|---|---|---|---|---|---|
| | Rate | MBS Value | Rate | MBS Value | Rate | MBS Value |
| 4% | 0.06 | 132.82 | 0.18 | 117.18 | 0.42 | 108.52 |
| | 0.06 | 127.74 | 0.18 | 114.72 | 0.42 | 107.38 |
| 5% | 0.06 | 122.98 | 0.18 | 112.37 | 0.42 | 106.26 |
| | 0.06 | 118.53 | 0.16 | 110.96 | 0.36 | 105.88 |
| 6% | 0.06 | 114.35 | 0.14 | 109.36 | 0.30 | 105.40 |
| | 0.06 | 110.43 | 0.12 | 107.52 | 0.24 | 104.75 |
| 7% | 0.06 | 106.74 | 0.10 | 105.40 | 0.18 | 103.82 |
| | 0.06 | 103.27 | 0.08 | 102.92 | 0.12 | 102.39 |
| 8% | 0.06 | 100.00 | 0.06 | 100.00 | 0.06 | 100.00 |
| | 0.06 | 96.91 | 0.054 | 96.81 | 0.054 | 96.81 |
| 9% | 0.06 | 94.00 | 0.048 | 93.58 | 0.048 | 93.58 |
| | 0.06 | 91.24 | 0.042 | 90.31 | 0.042 | 90.31 |
| 10% | 0.06 | 88.63 | 0.036 | 87.00 | 0.036 | 87.00 |
| | 0.06 | 86.18 | 0.030 | 83.66 | 0.030 | 83.66 |
| 11% | 0.06 | 83.81 | 0.024 | 80.27 | 0.024 | 80.27 |
| | 0.06 | 81.58 | 0.018 | 76.85 | 0.018 | 76.85 |
| 12% | 0.06 | 79.46 | 0.012 | 73.38 | 0.012 | 73.38 |
| | 0.06 | 77.44 | 0.006 | 69.88 | 0.006 | 69.88 |
| 13% | 0.06 | 75.52 | 0.000 | 66.33 | 0.000 | 66.33 |

pool on which the interest-only security is based, and the mortgage pool on which the principal-only security is based. If actual prepayments vary widely across groups of mortgages the hedge may, on net, be much less effective in practice than alternative strategies.

The principal advantage of hedging with futures contracts is the low up-front cost. Futures positions are always entered into at the current market price so that the only initial cost is the exchange transaction fee. Further, as the risk of upward and downward rate movements is retained, no "insurance" fee is paid. However, futures contracts are marked to market, with the gains or losses paid each day. With options, daily gains and losses are experienced only on paper until the instrument is exercised or sold. A further problem with futures-based hedging, as with options-based hedging, is that the underlying instrument is a Treasury bond, which exhibits positive convexity. As rates change, it is necessary to adjust the hedge ratio (change the number of futures contracts held). Specifically, as rates rise (and T-bond prices fall) it is necessary to

short (sell) additional contracts. Conversely, as rates fall (and T-bond prices rise) the short hedge position must be decreased, requiring that some contracts be bought. Futures-based hedging is often referred to as a dynamic hedging strategy because of the need for continual adjustment of the hedge position. This point brings out a final concern with futures-based or dynamic hedging. What if rates move up and then move back down? According to the strategy, a manager would first short additional contracts (at the low price) and then buy back those contracts (at the high price). Buy high and sell low is not generally a profitable business strategy. A manager must, however, weigh these potential losses against the higher up-front cost of purchasing options.

In summary, there is no clear-cut best hedging strategy. Users must weigh the fixed costs of each choice against the risks of differing prepayments or high interest rate volatility. Finally, transactions and monitoring costs of frequent adjustments to the hedge ratio must be considered.

Table 2
Discounted Present Value of Potential Funding Sources

| Current Mortgage Rate | Deposit Discount Rate[a] | Eight-and-a-Half Year Banknote[b] | Eight-and-a-Half Year Banknote with Withdrawal Provision[c] | Money Market Deposit Account[d] |
|---|---|---|---|---|
| 4% | 0.020 | 131.24 | 123.42 | 96.20 |
|    | 0.025 | 126.78 | 119.13 | 96.20 |
| 5% | 0.030 | 122.48 | 114.99 | 96.20 |
|    | 0.035 | 118.36 | 111.01 | 96.20 |
| 6% | 0.040 | 114.39 | 107.20 | 96.20 |
|    | 0.045 | 110.58 | 103.53 | 96.20 |
| 7% | 0.050 | 106.91 | 100.00 | 96.20 |
|    | 0.055 | 103.39 | 96.61 | 96.20 |
| 8% | 0.060 | 100.00 | 93.35 | 96.20 |
|    | 0.065 | 96.74 | 90.22 | 96.20 |
| 9% | 0.070 | 93.61 | 90.00 | 96.20 |
|    | 0.075 | 90.59 | 90.00 | 96.20 |
| 10% | 0.080 | 87.69 | 90.00 | 96.20 |
|     | 0.085 | 84.91 | 90.00 | 96.20 |
| 11% | 0.090 | 82.22 | 90.00 | 96.20 |
|     | 0.095 | 79.64 | 90.00 | 96.20 |
| 12% | 0.100 | 77.16 | 90.00 | 96.20 |
|     | 0.105 | 74.77 | 90.00 | 96.20 |
| 13% | 0.110 | 72.47 | 90.00 | 96.20 |

[a] It is assumed that the proper discount rate for all liabilities is the eight-and-a-half-year optionless certificate-of-deposit rate.

[b] This is a fixed-term (eight-and-a-half years), fixed-rate (6.0 percent) certificate that cannot be withdrawn.

[c] This is a fixed-term (eight-and-a-half years), fixed rate (5.0 percent) certificate that can be withdrawn. The withdrawal penalty is two years' interest (2 • 5% = 10%). The assumption used is that the balance will be withdrawn and reinvested whenever the discounted present value falls below 90 percent of par.

[d] This is a demand deposit paying the current eight-and-a-half-year rate minus 3 percent (300 basis points).

## Conclusion

Mortgage-backed securities have become popular investment vehicles for managers of financial institutions. Much has been written about prepayment options and how to adjust return measures to reflect this variable. This article has provided an introduction to the interactions between variable prepayments and the choice of liabilities used to fund investments in mortgage securities. The discussion highlights the fact that variable prepayments often cause mortgage durations to react to interest rate changes in a fashion opposite that of a true fixed-income asset. The negative convexity of the mortgage creates a situation in which an institution that funds mortgage purchases with duration-matched liabilities may expose itself to capital losses should rates either increase or decrease dramatically. This convexity trap is contrasted with the alternative strategy, which uses floating-rate securities to fund the purchase of the mortgage-backed security. In the latter case the institution faces losses only if interest rates should increase. The examples presented show the possibility of negative equity values for rate decreases as small as 150 basis points below the face, or par, interest rate. Methods for hedging convexity risks are discussed, and it is shown that increasing capital ratios or off-balance-sheet instruments can offset much of the risk of negative net worth positions in mortgage-related investments.

Managers should be aware that the interest rate risk of funding mortgage-backed securities with fixed-rate liabilities is more, rather than less, complex than using floating-rate securities to fund the same mortgage purchase. This fact does not mean that mortgage-backed securities should be funded short-term and the net position left unhedged, however. Rather, managers should realize that they are carrying up- and downside

risk should they fund the same mortgage-backed security with duration-matched liabilities.

In conclusion, asset/liability decisions should be made jointly. Relative value measures of mortgage-backed securities (such as the option-adjusted-spread measure) assume that the mortgage is duration-matched with some base security. This article shows that, unfortunately, for anything more than very small rate changes, such matching does not lock in the market value of capital for purchasers of variable prepayment mortgage portfolios or mortgage-backed securities. Indeed, in this case the actual return on invested capital in the mortgage-backed security may fall below the expected return in both high- and low-rate environments. Managers should be sensitive to the convexities of alternative mortgage-backed security pools and how much of the reported excess return is compensation for this risk. Likewise, regulators should be aware that a duration-matched investment in mortgage-backed securities does not necessarily reflect the same interest rate risk as, say, a matched position in Treasury bonds.

## Appendix

This appendix contains a simple presentation of the condition necessary for variable-prepayment mortgages to have the negative convexity property discussed in the text. For simplicity, let the term structure be flat and let the expected cash flow per period from the mortgage portfolio be $C_t$. O'Brien (1992), for example, shows what $C_t$ would be in terms of a constant-prepayment rate and a fixed-coupon rate on the mortgage pool. Notice that if the prepayment rate is a function of market interest rates (not a constant), then $C_t$ will vary as market rates change. If the term structure is flat, the mortgage price is just

$$P = \sum_{t=1}^{t=N} \frac{C_t}{(1+r)^t},\qquad(1)$$

where $r$ is the market yield to maturity, $\Sigma$ is the sum operator, $N$ is the maturity, and $P$ is the price.

Because the analysis of duration and convexity are in percentage terms, it is convenient to use the continuously compounded rate $i$, $i = \ln(1+r)$, where $\ln(\cdot)$ is the natural log function. Taking the derivative of $\ln(P)$ with respect to $i$ yields a measure of duration,

$$\frac{d \ln P}{di} = -D = \sum_{t=1}^{t=N}\left[\left(\frac{d \ln C_t}{di} - t\right)w_t\right],\qquad(2)$$

where $D$ is the duration and $w_t$ is the present value of period $t$'s cash flow divided by the sum of the present value of the cash flows (the price). If $(d\ln C_t)/(di) = 0$ for all periods $t$, as would be the case with either no prepayments ($C_t = C$) or a constant prepayment rate, equation (2) is just the standard measure of duration,

$$D = \sum_{t=1}^{t=N}(tw_t).$$

In any case, it is the change in duration with respect to interest rates that is of interest here.[1]

Taking the derivative of equation (2) with respect to $i$ and doing some algebra results in

$$\frac{d^2 \ln P}{di^2} = \sum_{t=1}^{t=N}\left[\left(\frac{d \ln C_t}{di} - t\right)^2 w_t\right] + \sum_{t=1}^{t=N}\left[\frac{d^2 \ln C_t}{di^2}w_t\right].\quad(3)$$

Notice that the first term on the right-hand side is the sum of squared terms multiplied by positive numbers (the $w_t$'s). Therefore, it is always positive. So, unless

$$\sum_{t=1}^{t=N}\{[(d^2\ln C_t)/(di^2)]w_t\} < 0,$$

the mortgage will display positive convexity (similar to a fixed-income security). In order to get negative convexity, the percentage change in the cash flows must, on average (with weights $w_t$) decrease at an increasing rate as interest rates rise. Put another way, the variable-prepayment function must be such that on average the cash flows are increasing at an increasing rate as interest rates fall. This property alone is not enough, of course, because the first term is always positive.

Finally, the fact that the price, $P$, is a monotone increasing function of $\ln P$ and $r$ is monotone increasing in $i$ establishes that the price itself will have the same qualitative properties with respect to $i$ that $\ln P$ does. These facts establish the link between the pictures in the text (relating $P$ and $r$) and equation (3) in this appendix.

### Note

1. Note that the standard duration measure will, however, differ for the zero-prepayment and constant-prepayment rate scenarios because for $C_t = C$ (a constant),

$$w_t = [1/(1+r)^t]/\{\sum_{t=1}^{t=N}[1/(1+r)^t]\},$$

while for $C_t \neq C$,

$$w_t = [C_t/(1+r)^t]/\{\sum_{t=1}^{t=N}[C_t/(1+r)^t]\}.$$

## Notes

1. Because of their tax advantages (as qualifying real estate assets for thrifts) and flexibility, one of the largest growth rates in holdings has come from a particular type of collateralized mortgage obligation—namely, real estate mortgage investment conduits, or REMICS.

2. The terms mortgage portfolio and mortgage-backed security will be used interchangeably when there is no ambiguity.

3. Bartlett (1991, chap. 7), provides an alternative introduction to these concepts in the context of mortgage-related securities.

4. Technically, the slope of the function displayed in the figures is minus the duration multiplied by the price. Duration measures percentage changes.

5. More specifically, a deposit is chosen such that the resulting duration of equity is zero. It can be shown that $D_E = D_A - (L/A)D_L$, where $L/A$ is the liability ($L$) to asset ($A$) ratio in market value terms, $D_E$, $D_A$, and $D_L$ are the duration of equity, assets, and liabilities, respectively. Choosing $D_E = 0$ is consistent with the idea that investors have a very short-term horizon. See, for example, Smith and Spudeck (1993, chap. 8) for a discussion of this point. As an example, consider a fifteen-year, 8 percent coupon mortgage. If prepayments are fixed at 6 percent annually, this asset has a duration of four and three-fourths years, or fifty-seven months. If the initial

equity investment is 5 percent, then $L/A$ equals .95. Setting $D_E = 0$ implies that $D_L$ is equal to sixty months or five years. Therefore, a five-year, pure-discount CD will roughly "duration-match" a fifteen-year mortgage. The result should be a steady equity value, assuming these fixed prepayments of 6 percent annually (similar to that portrayed in Chart 3A). Keep in mind, however, that the durations of amortizing instruments (like mortgages) and nonamortizing instruments (like CDs) change at different rates through time. Therefore, hedges must be periodically adjusted. This scenario is discussed in more detail in a later section.

6. The implicit assumption is that the liquidity preference theory of the term structure is true (see, for example, Abken 1990), indicating that, on average, funding short-term is cheaper than funding long-term.

7. The withdrawal option given to depositors in this case allows the bank to offer a lower rate when compared with the case portrayed in Chart 4A. This provision allows an equity cushion vis-à-vis the no-withdrawal case.

8. The term is used because it seems representative of the price behavior associated with large changes in interest rates.

9. These strategies are almost identical, though the instruments trade on different exchanges.

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# FYI

## *Banking in Georgia, 1865-1929*

Leonard A. Carlson

*I*t hardly needs saying that the United States, indeed the world, is currently going through a period of rapid change in laws governing banking and other financial institutions. Many of these changes reflect technological advances and the globalization of financial markets, interacting with age-old public-policy concerns for financial systems' safety and soundness. The question of what constitutes an optimal set of regulations—that is, those that ensure an efficient, profitable, and safe banking industry—has confronted policymakers throughout the history of U.S. banking. The issue remains unsettled in part because it is extremely difficult to distinguish the effects of the banking system on the overall economy from those of the economy on the banking system.

In the South, banking regulation historically has been criticized for being either too stringent, thereby denying financial services to the economy and slowing growth, or too lax, encouraging too much risky investment, which eventually led to instability and slower growth. For the years from 1865 to 1890, for example, many have concluded that banking laws were too restrictive and that these restrictions placed a particular burden on Georgia and the South. The years from 1890 to 1929, however, yielded the opposite argument: that banking had been allowed to grow too rapidly during the prosperous 1890-1920 period, and the opening of too many small banks made the South vulnerable to the fall in agricultural prices during the 1920s.[1]

The story of Georgia's banking industry from 1865 to 1929, presented in this article, recounts an era noted for the severity and magnitude of its economic shocks and regulatory changes. As such, it provides an opportunity to consider the issues concerning proper regulation of banks. The discussion highlights the effects of interaction between regulation and the economy on

banking in Georgia during this period. Georgia's experience also provides an example of how banking evolved in a poor state in the late nineteenth and early twentieth centuries.

## Background

**Before the Civil War.** A few, relatively large banks served the needs of the South's plantation economy prior to 1860. It is generally thought that these banks, which were engaged primarily in financing the marketing of the cotton crop, were well equipped to offer adequate financial services during the late antebellum period (Roger L. Ransom and Richard Sutch 1972, 643).

However suited to its time, this system was virtually wiped out by the end of the war. The war cost southern banks all assets they had invested in the Confederate currency. Furthermore, under the National Banking Act southern banks had to reorganize with federal charters, a requirement that proved especially burdensome.

**The National Banking Act.** Congress passed the National Banking Act in 1863 both to finance the war and to reform banking and monetary practices. Banks chartered under this act—national banks—were required to deposit U.S. government bonds with the Treasury and in return received bank notes for issue to the public in amounts equal to 90 percent of bonds deposited.[2]

As an incentive for state banks to become part of the national system, notes issued by state banks were subjected to a 10 percent tax, effectively taxing such notes out of existence. Because bank customers in Georgia—and other southern states—used bank notes more widely than demand deposits (checking accounts), the tax made it especially difficult to operate or open a state-chartered bank in Georgia. By 1864, most U.S. banks had joined the national banking system (Gary M. Walton and Hugh Rockoff 1990, 408-9).

The requirements of the National Banking Act limited southern banks in other ways. Banks newly chartered under the act were subject to high minimum capital requirements—ranging from $50,000 for banks in towns with fewer than 6,000 people to $200,000 for those serving populations larger than 50,000 people. These were substantial sums in an era when the average manufacturing wage was between $1.00 and $1.50 per day (Walton and Rockoff 1990, 388). In addition, the act's prohibition on real estate loans severely restricted rural banks in the South. An indirect effect of

the act, the growth of unincorporated banks—also called private banks—presented competition for financial services. In Georgia these banks operated largely in small towns to provide credit and other financial services to merchants and large local planters (Ransom and Sutch 1977, 110-16).

## Georgia Banking, 1865-1890

In 1865 Georgia was a poor state, and along with other states in the Deep South it remained poor relative to the rest of the country for decades. As shown in Chart 1, per capita incomes in Georgia in 1880 were less than half the national average, and even less in 1900. Recent research has focused on three structural explanations—none of them related to the banking system—for the slow recovery of the South in the years from 1865 to the turn of the century: the destruction wrought by the Civil War, the disruption in production that followed the end of slavery, and the slow growth of world demand for cotton. Other researchers hypothesize that institutional factors also retarded development in the South. One institutional hypothesis, discussed in what follows, suggests that the high minimum capital requirements of the National Banking Act hindered economic growth in southern states by limiting the entry of new banks in the South.

Although the physical destruction caused by the war was devastating, it was perhaps the easiest of the disasters from which to recover. By 1870 southern cities, rail lines, and factories had been repaired. On the other hand, emancipation meant that black women and children no longer worked in the fields, and the same freedom that improved their lives meant that there was a fall in labor supply and output (Ransom and Sutch 1972).

A third factor contributing to the South's sluggish recovery on which recent research has focused was the diminished growth in world demand for cotton. The South was the major world supplier of cotton, and from 1820 to 1860 world demand had grown at roughly 5 percent per year (Gavin Wright 1978, 92). After the war, however, growth in demand for cotton slowed to 2.7 percent per year, a rate that barely kept pace with the 2 percent annual growth in population in the South (Wright 1986, 56).

Despite this sluggish growth in cotton prices, Georgia farmers in the late nineteenth century increased their production of cotton and grew relatively less of other crops. They did so because cotton was the only

**Chart 1**
**Per Capita Income in Georgia, 1880-1930**
*(Percentage of U.S. Average)*

Percent
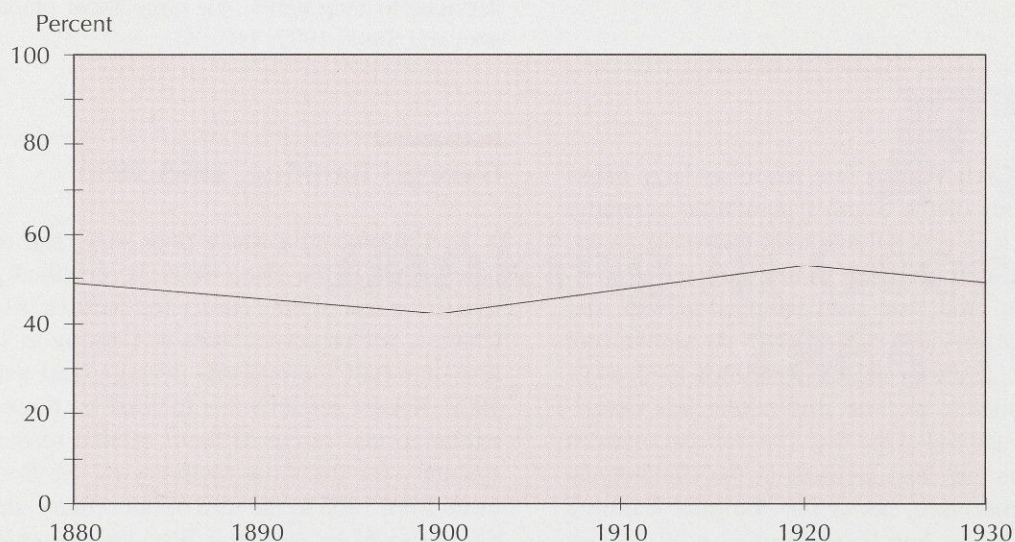


Source: Easterlin (1957, 753) and U.S. Department of Commerce (1975, 243).

reliable cash crop, and a secure income was necessary as they faced considerable debt (Wright 1978, chap. 6). More importantly, the expansion of the railroad system made it possible to ship cotton from North Georgia directly to northern markets. This development made it profitable to grow cotton in that region, and much of the increase in cotton production in the second half of the nineteenth century occurred in North Georgia (see David F. Weiman 1985).

Georgia showed some signs of progress outside of agriculture, however. Manufacturing, especially of cotton textiles, grew rapidly, as did the number of cities and the urban population (see Wright 1986, chap. 2).

Agriculture's slow recovery in the South seems to have made the first years after the war difficult ones for bankers. A few banks opened immediately after the war, and some even honored prewar debts, but by 1876 only twelve national banks were operating in Georgia (see Jack Blicksilver 1987, 49; Robert M. Young 1961, 11).[3]

Growth in demand for banking services picked up along with growth in Georgia's economy and major changes in cotton marketing in the 1880s.[4] An issue subject to ongoing debate in southern economic history is whether different (less restrictive) federal or state banking laws would have allowed greater response to growing demand for financial services and hastened

the recovery of the banking system and economic stability in the quarter-century after the Civil War.

Several studies have centered on the role of high capital requirements imposed by the National Banking Act as a barrier to entry for new banks in the South during the economy's slow recovery between the Civil War and the 1890s. For example, Richard Sylla (1969) concluded that the high capital requirements for national banks discouraged the opening of new banks, limiting competition between banks in the rural South. In Sylla's view it was not until the passage of the Bank Act of 1900, lowering capital requirements for national banks, that banking expansion began in rural areas and eliminated local bank monopolies. John A. James (1976, 1981) also found that bank monopolies existed, but in his opinion the monopolies were weakened by the passage of state general incorporation laws in the 1890s, especially in the South, that led to the entry of new state banks into rural areas.[5] Contradicting Sylla and James, however, John J. Binder and David T. Brown (1991), using new econometric evidence, rejected the hypothesis that minimum capital requirements were a significant barrier to entry in the years from 1869 to 1914.[6]

**State-Chartered Banks.** Although national banks were the predominant form of bank in 1865, state-chartered banks slowly regained importance. Over

time, demand deposits replaced bank notes as the usual means of payment. (Nationally, by 1900 the value of demand deposits exceeded the value of bank notes four to one.) The wider acceptance of demand deposits made it possible for state-chartered banks to avoid the 10 percent tax imposed by the National Banking Act on notes and to compete with national banks. The number of state banks grew steadily after 1890 (Walton and Rockoff 1990, 408-9).

In Georgia the number of state-chartered banks in operation increased from 26 to 102 during the period from 1880 to 1892. In 1892 state banks had assets totaling more than $33 million, more than twice those of the sixteen national banks' $15 million in assets (Young 1961, 11; Robert T. Van Orden 1985, 61-62). However, despite this growth in the number of banks in Georgia, as late as 1892 eighty-three counties in Georgia did not have a bank (see Van Orden 1985, 58). There was one incorporated bank for every 19,135 people in Georgia in 1890 versus one for every 10,983 nationally.[7]

## 1890-1914

In the late nineteenth and early twentieth centuries commercial banking in the South increased in sophistication through a widespread system of correspondent banks. The antebellum practice of holding deposits with large banks in regional financial centers had been formalized by the National Banking Act, and rural banks in Georgia, like those in other parts of the nation, increasingly held deposits with correspondent banks in both regional and national financial centers specified as reserve cities.

This arrangement meant that rural banks were able to offer more highly developed financial services. For example, through their separate credit departments established in the late nineteenth century, banks in reserve cities could check the general creditworthiness of borrowers for respondent banks. New York City banks also acted as agents for rural respondent banks using the New York money markets. Reserve-city banks benefited from the correspondent bank relationship by having the rural banks as a source of deposits. As James (1977, 123) has pointed out, the system also provided a way for city banks to reach customers in every part of the United States.

The period from the late 1880s through the First World War saw both increasing economic recovery and the founding of a number of the most important modern banks in Georgia. Citizens and Southern Bank (C&S), for example, (recently merged with NCNB to form NationsBank) was founded in Savannah in 1888 as Citizens Bank. Trust Company Bank, now operating as a subsidiary of SunTrust Banks, was founded in Atlanta in 1891 as the Commercial Travelers Savings Bank. The modern Bank South began as Fulton National Bank of Atlanta in 1909 (Blicksilver 1987, 50).

Economic recovery was not the only change affecting Georgia banking, however. The Bank Act of 1891, the state's first general banking law, also changed the environment. Along with amendments in 1893, the law made it possible to establish a bank without a special act of the legislature. Beginning with Mississippi in 1890 and ending with Alabama in 1901 and Virginia in 1902, all states in the South adopted such general banking acts.

The expansion in Georgia that followed passage of the Bank Act of 1891 lends support to James's argument about the importance of general incorporation laws, permitting lower capital requirements and thereby making it easier to charter state banks. In Georgia the minimum capital required to open a state bank was $25,000, although a bank could open its doors with only $15,000 paid in (Young 1961, 14). By 1896 the number of banks in the state had increased to 186 with a total of $52 million in assets (Board of Governors 1959, 274-85).

The next two decades or so were prosperous ones for agriculture in Georgia. According to Wright, "After 1900, cotton demand accelerated to 3.5 percent (per year) as textiles led the expansion of world trade and the Southern economy picked up its pace" (1986, 56). Charts 2 and 3 show that the number of banks and the value of bank assets began to grow greatly about this time, apparently driven by increased demand for bank services. By 1914, 801 incorporated banks with assets of more than $252 million operated in Georgia, and only one county in the state was without a state-chartered bank (Van Orden 1985, 58).

## 1914-1920

As is well known, the creation of a central bank for the United States in 1913, with passage of the Federal Reserve Act, generally changed the shape of banking and finance in America. The Federal Reserve System was tailored by Congress to correct the perceived ills of the national banking system. Reflecting in part Atlanta's increasingly important role as a key financial center for the Southeast, Atlanta was chosen as the site of the

**Chart 2**
**Incorporated Banks in Georgia, 1896-1930**

Number of Banks
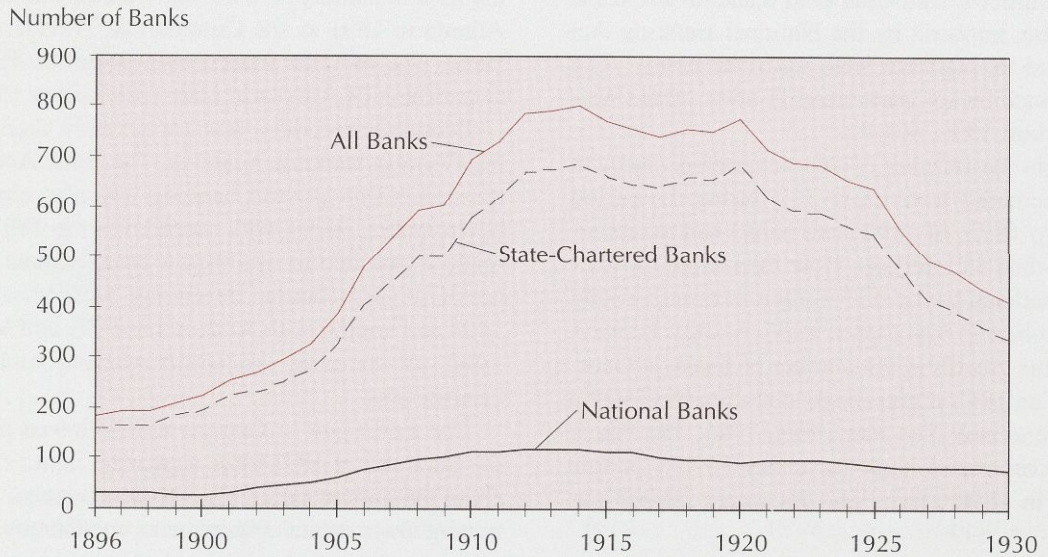


Source: Board of Governors (1959, 274-85).

**Chart 3**
**Total Bank Assets in Georgia, 1896-1930**
*(Assets in Constant Dollars, 1900=1)*

Millions of Dollars
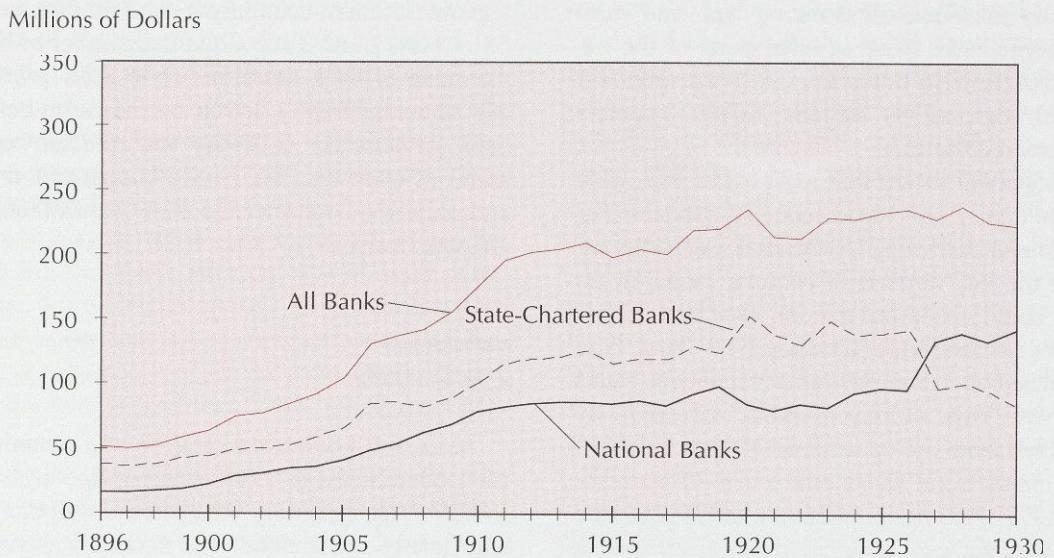


Source: Board of Governors (1959, 274-85); deflated using consumer price index from U.S. Department of Commerce (1975, 211).

Sixth District Federal Reserve Bank (see Kerry Odell and Weiman 1992). By this time, the banking system in the South had become more developed and was a greater aid to the growth of business in the South.[8]

Among other provisions, the Federal Reserve Act removed the restrictions that had prevented national banks from making real estate loans. The act also established facilities to clear checks without fee to either the writer or the receiver. National banks were required to join the Federal Reserve System, but state-chartered banks had the option to join or not. The framers of the Federal Reserve System hoped to induce state-chartered banks to join the Federal Reserve and thus end the dual banking system with some banks subject to federal regulation and others subject to state regulation. It was also hoped that when state-chartered banks joined the system the Federal Reserve would take over the check clearing and other services for banks (see Eugene Nelson White 1983, 108-15).

Despite pressure, most state-chartered banks in the Sixth District, including those in Georgia, refused to join the Federal Reserve System, and the check clearing services of the Atlanta Federal Reserve Bank were little used (Richard H. Gamble 1989, 21, 48). Two important sources of banks' revenues stood in the way. State-regulated banks could hold more of their reserves in interest-earning accounts at their correspondent banks, for one thing. More significantly, they could practice nonpar check clearing—that is, the practice of clearing checks at less than their face value. The Federal Reserve System required that member banks clear checks at par. Many state banks in Georgia (and elsewhere in the South and West) commonly remitted slightly less than the face value of checks written by their depositors (usually one-eighth of a percent of the checks' value) as an exchange fee for the transaction (White 1983, chap. 3).

The refusal of a number of smaller banks to join the system meant that the dual banking system continued and that regulation of banks remained spotty and uncoordinated. Many have concluded that the mix of federal and state regulation that existed after 1900 led to too many small banks, endangering the safety of the system. For example, Herman E. Kross and Martin R. Blyn conclude that "the formation of new banks, especially in the South and West, in the first decade of the century had been excessive by nearly all standards" (1971, 158).

Another, related controversy in these years, and later, concerned restrictions on branch banking. Many rural bankers feared competition from larger city banks. These bankers, along with organizations like the American Bankers Association that were dominated by banks in states that did not allow branches, actively lobbied Congress and many state legislatures to outlaw branch banking. They succeeded on the national level and in many states (White 1983, 156-65). The National Banking Act of 1864 was interpreted by the Comptroller of the Currency in 1865-68 as forbidding branches, and the American Bankers Association successfully resisted a proposal by the Federal Reserve Board to allow branching by national banks in 1915. In 1918 national banks were given limited rights to have branches—for example, when a national bank consolidated with a state bank (White 1983, 161). The McFadden Act of 1927 permitted limited branching by national banks, subject to state laws.

One consequence of unit banking was that banks in small towns, where their primary business was located in the immediate area, were typically small and had undiversified portfolios. Georgia, however, had historically been relatively liberal with respect to branching by state-chartered banks. The state's Bank Acts of 1891 and 1893 had not explicitly forbidden the opening of branches, and the laws were interpreted to allow branch banking. For example, C&S Bank purchased the National Bank of Augusta in 1912, thereby establishing its first branch outside Savannah, and later opened offices in Macon (1917) and Atlanta (1919). The Bank Act of 1917 in Georgia had specifically allowed branching as a way of increasing the number of banks serving rural areas. By 1926 a number of the larger city banks in Georgia had branches (Young 1961, 27).

Another important feature of the period was the growth of bank chains and groups. Bank chains were groups of nominally independent banks owned by one or more individuals (Kross and Blyn 1971, 160). In some areas chains were an alternative to branch banking. Although most chains were typically small, there were exceptions. One of the largest was the Witham chain, which at its peak in 1922 controlled 175 banks in Georgia and Florida (Kross and Blyn 1971, 160). Because banks that were members of Georgia chains remained small, local, and separate, each bank had its own portfolio, and, hence, chain banking did not allow for the diversification that true branch banking might have allowed.

Despite relatively liberal branching and the existence of chains, most state-chartered banks in Georgia were small, with the average assets of all state banks being less than $500,000 in 1919.[9] The system seemed to be stable as long as agriculture was prosperous, as it continued to be in the years from 1910 to 1919, when the average yearly price of cotton rose from 13.9 cents to 35.34 cents per pound (U.S. Department of

Commerce 1975, 517). The expectation of continued prosperity was capitalized into the price of farm land, which rose in value by 152 percent from 1910 to 1920. Farmers in Georgia, faced with rising land prices, took on mortgage debt to buy more land and equipment, and farm debt in Georgia increased by 474 percent from 1910 to 1923 (Lawrence A. Jones and David Durand 1954, 98).

## *1920-1929*

The period of prosperity and rising prices came to an abrupt halt in 1921 when Georgia farmers experienced a double calamity: rapidly falling prices and the spread of the boll weevil in Georgia. Cotton prices declined in the recession of 1920-21 from 38.5 cents per pound in April 1920 to 9.5 cents a year later (Jones and Durand 1954, 95). Cotton prices recovered somewhat after 1921 but never reached their wartime levels in either real or nominal terms during the 1920s. World demand for cotton actually declined about one-half of 1 percent per year from 1920 to 1930 (Wright 1986, 56-57). Meanwhile, the boll weevil, which had been spreading north from Mexico since the 1890s, reached Georgia almost simultaneously with the fall in prices.

The arrival of the boll weevil may have been predicted, but apparently the severity of the pest's impact in Georgia was not foreseen. The boll weevil proved to be especially hard to eradicate in the humid climates of Georgia and South Carolina. One study estimated that the reduction in Georgia's cotton yield in 1921 that was attributable to weevil damage was 45 percent (while overall cotton production in the United States remained high as production shifted to drier states farther west) (Jones and Durand 1954, 100). Some areas of the state were very hard hit, and many farmers defaulted on their mortgages. Furthermore, farmers in some of the hardest-hit sections of Georgia found it difficult to shift to other crops, such as peanuts and tobacco, because of unfavorable soil and climate (Jones and Durand 1954, 101). Textile manufacturing also entered a period of slower growth in the 1920s, so the two major pillars of Georgia's economy were in distress.

The state's economic distress is reflected in the experience of Georgia banks. As shown in Charts 2 and 3, the number of banks and their assets fell in the 1920s, and, as shown in Chart 4, there were a large number of bank suspensions. In all, about 45 percent of banks in Georgia failed from 1921 to 1929, although

**Chart 4**
**Bank Suspensions in Georgia, 1921-1930**

Number of Banks
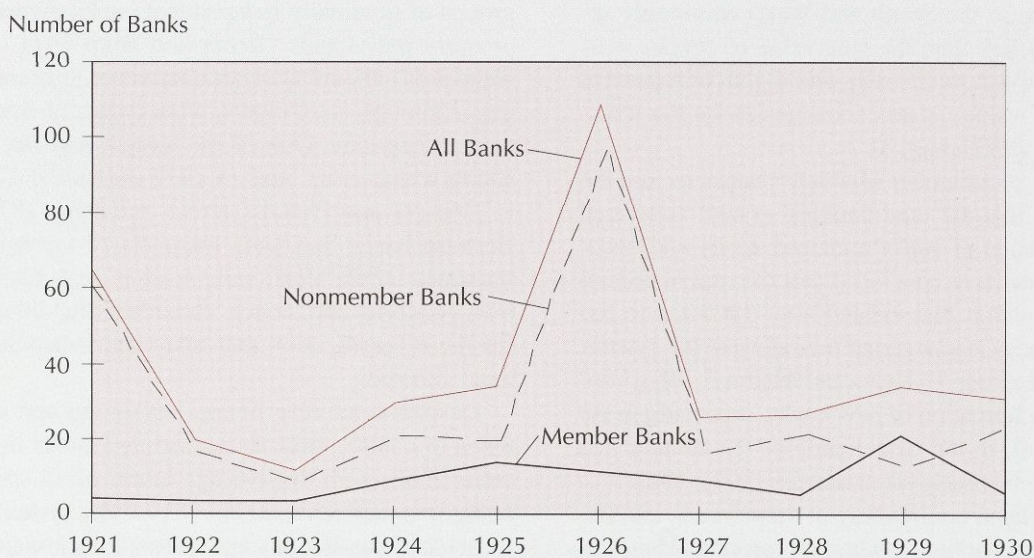


Source: Board of Governors (1943, 283-90).

most of these were small state-chartered banks. The unresolved issue is whether a set of regulations allowing banks more opportunities to diversify their asset portfolios might have produced a banking system better able to function under this stress.

The worst year for banking in Georgia was 1926. Triggered by especially low cotton prices, the Witham chain of banks failed along with the Bankers Trust Company, which provided services to banks in the chain. While each of the banks in the chain was supposedly independently operated, each was also subject to overall corporate direction, and the chain's failure was accompanied by findings of financial irregularities. The Witham chain's failure led to calls for reform, and the state legislature responded by passing the Bank Act of 1927.

One notable feature of the act was that it prohibited opening new branches. Although the failures of the Witham chain and the Bankers Trust Company were seemingly unrelated to branch banking, the small rural banks in Georgia, fearing competition from larger urban banks, used the opportunity to obtain restrictions on branch banking (see Young 1961, 26). It is interesting to note that 1927 was the first year since the early 1880s that the total assets of national banks in Georgia exceeded the assets of state-chartered banks (see Chart 3). Thus, at a time when the rest of the country was moving toward fewer restrictions on branching, Georgia added restrictions. (Some exceptions to the new law allowed banks in Atlanta and Columbus to establish branches in those cities.)

Economic shocks to the state's agriculture interacted with regulation to increase Georgia's banking troubles. Although the difficulties in the 1920s were more severe than in most states, other predominantly agricultural states, most with small rural banks, also experienced hard times. Nationally, the number of commercial banks declined from 30,000 in 1921 to 25,000 in 1929, with approximately 20 percent of all banks failing in those years (Kross and Blyn 1971, 158). Most bank failures occurred in the agricultural areas of the Midwest and South. As in Georgia, most of the failed banks were small, rural, state-chartered banks.

As is well known, the Great Depression, which began with a downturn in industrial production in Au-

gust 1929 and the stock market crash of October 1929, marked a fundamental watershed in American banking. Georgia in the 1930s, unlike some other southern and midwestern states, was spared major bank crises, but banks in Georgia faced runs and experienced hard times as did banks in other parts of the country.[10] After 1933 banks in the United States operated under new federal regulation that significantly changed the rules of the game. The changes set in motion by the Great Depression and the New Deal set the tone for banking for the next four decades at least and deserve a separate treatment that looks at the performance of Georgia banks and banking.

## Conclusion

The history of banking in Georgia shows the close link between the state's banks and the state's economy. In the late nineteenth century, banks in Georgia were part of a slowly recovering agricultural region, and some researchers have concluded that restrictions on the formation of banks may have hindered the economic recovery of Georgia and other southern states.

In the first two decades of the twentieth century Georgia's banking system expanded along with the rest of the state's economy as agriculture and industry prospered, but the development was subject to laws that fostered many small, local banks. This expansion was followed by two decades of economic hardship, in which many banks failed. Although the decline was clearly caused in part by a decline in agricultural prices and the arrival of the boll weevil in Georgia, the structure of banking, which promoted small local banks, may have contributed to the instability of the banking system and possibly reinforced economic hardships. These episodes have not been completely researched, and they deserve more attention. In an era in which Congress is forced to consider banking reform and countries in Eastern Europe are trying to erect new banking institutions, there may be useful lessons to be drawn from the history of financial institutions in Georgia and the South.

# Notes

1. See, for example, Davis (1965), Sylla (1969), and James (1976, 1977, 1981) for the view that restrictive banking laws hindered the South. See Kross and Blyn (1971, 158) for the view that growth in banking was too rapid after 1900.
2. In addition, the value of notes outstanding could not exceed the value of the banks' capital (Walton and Rockoff 1990, 408).
3. One early bank was the Atlanta National Bank (predecessor of the First National Bank of Atlanta, now part of Wachovia), which was formed in 1865 (Blicksilver 1987, 49).
4. Before the Civil War, cotton factors had handled most cotton sales through port towns, and they had largely resumed that role after the war (Woodman 1990, chap. 2; Ransom and Sutch 1977, chap. 6). But the spread of cotton production to northern Georgia shifted cotton marketing to inland merchants, who in turn needed commercial credit (Woodman 1990, chap. 23; Weiman 1985).
5. In contrast, the findings of Campen and Mayhew's (1988) analysis of banking in Knoxville, Tennessee, indicate that entry was relatively easy and a number of new banks were established in the 1880s, before any changes in banking laws. They conclude that this increased competition led to low-er interest rates. However, the evidence from Knoxville's experience as an urban area does not directly refute James's results, which refer primarily to rural areas.
6. Additional issues concerning interest rates are not considered here. The view that interest rates in the South and West were higher than justified by costs or risks associated with high minimum capital requirements can be found in Sylla (1969) and James (1976, 1977, 1981). See Campen and Mayhew (1988) and Binder and Brown (1991) for a dissenting view. Davis (1965) was one of the first to consider regional interest rate differentials.
7. Calculated from data in Van Orden (1985, 50, 52), Walton and Rockoff (1990, 409), and U.S. Department of Commerce (1975, 14, 26).
8. Odell and Weiman (1992) conclude that development in the South in the late nineteenth century was inhibited by its undeveloped banking sector. The growth and increasing sophistication in the banking system in Georgia in the first two decades of the twentieth century were key to the subsequent development of the South.
9. Calculated from Board of Governors (1959, 274-85).
10. See Roberds (1990) for an interesting discussion of one response to crisis: the creation of private money.

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# *R*eview Essay

## *Doing Business in Eastern Europe And the Newly Independent States: Information Sources to Get Started*

**Jerry J. Donovan**

*T*he countries formerly called the Eastern Bloc, with 400 million or more inhabitants, now constitute enticing marketing and investment opportunities for industrial nations.[1] However, there is much to learn about transacting business and making a profit in Eastern Europe and the newly independent states, especially in the face of the rapid change resulting from democratization and privatization since late 1989.

A body of literature is emerging that is designed to meet the needs of investors, businesspeople, and policymakers who wish to understand the economies of the former Eastern Bloc in order to provide goods and services and make profitable investments in these new and expanding economies. Academics, analysts, and librarians will find the increasingly available statistical data and commentary useful both in their own right and as pointers to further information.

Domestic investors or businesspersons who decide to undertake a foreign investment or engage in foreign trade (import or export) must carefully analyze and evaluate "country risk." This risk, sometimes called sovereign risk, is closely tied to political developments that affect a country's stability. Assessing the government's attitude toward foreign loans or investments is particularly important. While many foreign governments encourage the inflow of foreign funds, others make it difficult, setting up obstacles such as wage-price controls, profit controls, additional taxation, and other legal restrictions. In addition, other factors—the expropriation of foreigners' assets, prohibition of foreign loan repayments, rebellions, civil disturbances, wars, and unexpected changes in government or its policies—present hazards in international trade and investment.

Uncertainty about these risks is especially pronounced for investment and business activity in the former Eastern Bloc countries. A general dearth of information hampers informed investment and business decisions. For many years these centrally planned economies controlled—in fact, manipulated—information for their own purposes, sometimes releasing several versions of the same data to meet different aims for diverse audiences.[2] Although current agencies and governments of the former Eastern Bloc countries seem disposed to distribute accurate data freely, users should be mindful that these data still may not be as complete and accurate as those traditionally collected and reported in Western countries. For business-related information, there is considerable evidence of an aggressive about-face in former Iron Curtain countries' attitudes toward releasing data. For example, the flier for the *Russian Business Monitor*, a new Russian newsletter (reviewed below), uses marketing facts to attract business. The flier spells out how the "new" Russians perceive marketing information needs and pledges to provide such information. Still, investors and businesses should continue to evaluate material carefully.

To assist the reader in addressing finance and trade issues for Eastern Europe and the newly independent states, this essay reviews a selection of publications intended for investors, academicians, businesspeople, and policymakers. This listing, which augments those in two previous articles in this *Economic Review* surveying international finance and trade reference sources and periodicals, focuses on government publications, reference books, and directories that cover Eastern Europe and the newly independent states.[3] (The January/February 1993 *Economic Review* will contain a review of periodical literature that covers the same geographic and subject areas.) Most selections are relatively new publications, published since 1990. Some longstanding, well-known publications, such as Dun's Marketing Services' *Exporters' Encyclopaedia,* are not included because they are too broad in geographic focus or so well known as to be self-evident choices.

## *U.*S. Government Sources

**Department of Commerce International Trade Administration**. Besides publishing *Business America: The Magazine of International Trade* and numerous other items, the International Trade Administration of the U.S. Department of Commerce provides aggressive and comprehensive services for Americans wish-

ing to establish business and investment ties with Eastern Europe and the newly independent states. Central to these services are the Eastern European Business Information Center (EEBIC) and the Business Information Service for the Newly Independent States (BISNIS), both of which publish bulletins—*Eastern Europe Business Bulletin* and *BISNIS Bulletin*, respectively.

Both centers serve as information clearinghouses for small and medium-sized American firms needing inexpensive access to commercial and marketing information about the former Soviet Bloc nations. The two agencies, which work closely with other U.S. agencies like the International Development Agency, the Export-Import Bank, and the Overseas Private Investment Corporation, provide information on such items as potential customers and partners, sources of financing, market research, advertising opportunities, upcoming trade missions, the state of trade and investment treaties, and U.S. government programs supporting trade and investment. Both agencies' bulletins offer practical information about specific financial and trade developments, including legal regulations, crucial to international business and finance commitments. The first issue of *BISNIS Bulletin*, for example, announced the authorization of the Overseas Private Investment Corporation of April 1992 to provide loans, loan guarantees, and investment insurance to American companies that invest in Russia and other newly independent states and included a table indicating the status of agreements between the United States and the newly independent states as of June 5, 1992 (updated in the October/November issue; see Figure 1).

In addition to its bulletin, EEBIC offers *News Sources on Eastern Europe and the Baltics*, an exhaustive list of relevant newsletters, periodicals, and directories. Its entries range from the Bureau of National Affairs' *BNA's Eastern Europe Report*, a biweekly newsletter covering changes in policies, laws, and regulations, as well as market deals in Eastern Europe, to *Diena*, a Western-style newspaper published five days a week in Riga, the capital of Latvia, to the Business Foundation's *General Trade Index and Business Guide* (published in Warsaw), which details the intricacies of the Polish legal and tax systems and lists potential Polish trading partners.

Off to good beginnings, as witnessed by their bulletins, both agencies—BISNIS and EEBIC—plan to expand services. It remains to be seen, however, whether they can adhere to their objective of providing inexpensive information access for American business and also

## Figure 1

### STATUS OF AGREEMENTS BETWEEN THE UNITED STATES AND THE NEWLY INDEPENDENT STATES (AS OF NOVEMBER 4, 1992)

| REPUBLIC | TRADE AGRMT | MFN | GSP | OPIC | EXIMBANK |
|---|---|---|---|---|---|
| ARMENIA | YES | YES | NO | YES | NO |
| AZERBAIJAN | PENDING * | NO | NO | YES | NO |
| BELARUS | PENDING * | NO | NO | YES | YES |
| GEORGIA | PENDING * | NO | NO | YES | NO |
| KAZAKHSTAN | PENDING # | NO | NO | YES | YES |
| KYRGYZSTAN | YES | YES | NO | YES | NO |
| MOLDOVA | YES | YES | NO | PENDING # | NO |
| RUSSIA | YES | YES | NO | YES | YES |
| TAJIKISTAN | PENDING * | NO | NO | YES | NO |
| TURKMENISTAN | PENDING * | NO | NO | YES | NO |
| UKRAINE | YES | YES | NO | YES | YES |
| UZBEKISTAN | PENDING * | NO | NO | YES | YES |

\* Negotiations in progress (for OPIC, signing expected shortly; companies are encouraged to register projects with OPIC now).
\# Awaiting ratification by country's parliament.
**MFN**—Most-Favored-Nation status;  **GSP**—Generalized System of Preferences.
**OPIC**—Overseas Private Investment Corporation;  **Eximbank**—Export-Import Bank of the United States.

Source: *BISNIS Bulletin,* October/November 1992, 3. Reprinted by permission of the publisher.

extend substantive services while still operating within shrinking government budget appropriations.

**CIA Publications**. The global information network of the U.S. Central Intelligence Agency (CIA) puts it in a uniquely advantageous position to collect, interpret, and disseminate international information. The CIA publishes several reference tools whose terse style and compact organization will be welcomed by users in marketing management, public policy planning, and consulting who need overviews of consistent international data. Users should also value the "research completion dates" found on the title pages of many CIA publications, permitting assessment of the research's timeliness.

*The World Factbook* (reviewed in an earlier *Economic Review* [May/June 1991, 31]), is the centerpiece of the CIA reference collection. This annual

presents comprehensive information on 247 countries in an easy-to-use "executive summary" format. Three complementary titles round out the CIA's reference list: The *Handbook of Economic Statistics*, *Economic and Energy Indicators,* and *International Energy Statistical Review*, all published by the Government Printing Office. The latter two publications provide monthly updates for the annual *Handbook of Economic Statistics.*

The *Handbook of Economic Statistics* provides economic indicator series of the type needed to make worldwide comparisons. The CIA uses three country data sources: official data from the countries cited, CIA estimates, and estimates made by other organizations, such as the Organisation for Economic Cooperation and Development (OECD). Data for the most recent years are frequently preliminary and subject to

revision. Country data have been adjusted by the CIA for comparability (and thus may differ from data given in original sources). The methodology used to adjust the data is explained in the preface. Data tables (except for distribution of economic aid) in the 1991 edition of the *Handbook* cover three major groupings: OECD nations (including reunified Germany), the USSR and Eastern Europe (USSR/EE), and other nations (China and India). All references to Communist countries, developed countries, and less-developed countries (except for economic aid) have been removed, and new data on high-technology topics and environmental issues have been added.[4]

The *Handbook* is convenient for pulling together worldwide economic data grouped by OECD, European Community, OPEC, G-Six, G-Seven, USSR and Eastern Europe, and Newly Industrializing Economies.[5] The *Handbook* can be of great value—to planners or speech writers, for instance—in making broad comparisons and spotting credible trends. On the other hand, economists and academicians engaged in empirical studies will find the tables lacking; the tables typically present only nine annual observations, precluding detailed statistical analysis, and footnotes (for example, "based on the routine application of standard CIA estimating methods") are sometimes too sketchy to permit serious data analysis.

Two CIA research monographs—*Beyond Perestroyka: The Soviet Economy in Crisis* (Washington: USGPO, June 1991) and *Eastern Europe: Coming Around the First Turn* (Washington: USGPO, September 1991)—provide thoroughly informed backdrops to the economic and political turmoil of their respective areas during the 1989-90 period. Both titles address three fundamental concerns: economic reforms, advances and halts in the reform process, and possible guidelines for restructuring in the new democracies.

Two CIA atlases provide geographical and cultural insight into the new Eastern Europe and the former Soviet Union. The *Atlas of Eastern Europe* (Washington: USGPO, August 1990) profiles that region and its national states with retrospective and current maps, charts, and time lines depicting geographic, socioeconomic, and historical factors. Put in press as German reunification was under way, this atlas helps the reader understand the problems and prospects besetting Eastern Europe in the post–Cold War era. *The Republics of the Former Soviet Union and the Baltic States: An Overview* (Washington: USGPO, January 1992) illustrates key demographic, ethnic and economic aspects of each Baltic state and republic of the former Soviet Union. For each state a pie chart depicts ethnic composition, a paragraph discusses ethnic trends, and a final paragraph explains the state's economic significance.

## General Reference Works

*One Nation Becomes Many: The Access Guide to the Former Soviet Union*, by Stephen W. Young, Ronald J. Bee, and Bruce Seymour II (Washington: Access: A Security Information Service, 1991), provides the names and addresses of resources to help the reader understand the enormous public policy complexities facing the former Soviet Union. The book begins with a chronology of historical events in European Russia dating from the seventh century through April 1992. Factual sketches of all the newly independent states follow, giving location, land area, population, politics, economics, and current issues under consideration. Brief biographical notes on key historic individuals, including Communist luminaries since Lenin, and current leaders of the individual republics form an up-to-date "who's who" for the newly independent states. A section called "Issues for Discussion" elaborates on economic and military change, ethnic unrest, and U.S. policy options for leadership in assisting the newly independent states at the present time. An extensive list of suggested readings arranged by subject shores up this discussion. *One Nation Becomes Many* concludes with a formidable resources section: an annotated bibliography, guides to organizations, texts of key documents and speeches, and a list of government and business assistance contacts for both the United States and the newly independent states.

Resources cited in *One Nation Becomes Many* range from the easily available *Washington Post* newspaper to publications from think tanks like the Brookings Institution and the Rand Corporation, some of which may prove difficult to obtain for readers without easy access to large metropolitan or research libraries.

*The Soviet Economy 1970-1990*, by Dmitri Steinberg (San Mateo, Calif.: International Trade Press, 1990), packs into one volume a plethora of national income and product account data necessary to understanding Soviet economic growth during the 1970-90 period. Steinberg demonstrates that the CIA significantly overestimated this growth and systematically explains the methodology that supports his conclusions.

He discusses Cold War concerns about the real size and structure of the USSR economy and the extent to which the country was militarized. Most informed

study during the 1970s and 1980s relied on CIA reports to the U.S. Congress, reports supposedly based on tested methods and periodically updated by CIA analysts and prominent academic economists. However, confidence in the reports began to erode when "impressionistic accounts" showed the USSR economy to be much smaller and more burdened with military costs than had been supposed. In 1990 Goskomstat, the main Soviet statistical agency, released previously unpublished data, unprecedented in scope and coverage, giving new insights into the size, structure, and growth of the Soviet economy. Steinberg analyzes the new data and attempts to substantiate a number of revisions in the CIA methodology and estimates. He integrates all the available data on production, input-output, national income and financial flows, and capital and labor resources and converts the integrated Soviet national accounts into a GNP format. To assist readers in better understanding the Soviet economic sectors, the study contains a short description of Soviet sectoral activity prepared by U.N. experts. The book also has a scholarly bibliography.

*Soviet Statistics since 1950*, by B.P. Pockney (New York: St. Martin's Press, 1991), is a scholarly compendium that provides selected statistical data through 1988 for five major fields: population and labor, industry, energy, agriculture, and foreign trade, including exports and imports between principal trading partners. The data, derived mostly from Soviet sources, include some Western statistics, all scrupulously referenced. Footnotes accompanying the tables interpret the figures, offer information about background factors not apparent in the tables themselves, and posit reasons for statistical trends.

In the book's introduction Pockney, a professor of Russian Studies at the University of Surrey, England, presents his view of the nature and collection of Soviet data, often withheld or blatantly manipulated to "cover failures and present lackluster performances in a glowing light." Although the questions he raises about the reliability of Soviet data are certainly not new, readers will appreciate the informative overview presented in Pockney's broad outline of data developments from 1950, with particular emphasis on the period since 1987, as *glasnost* progressed.

In addition, Pockney has added to the value of his book by including data resulting from reforms in data collection and dissemination. These kinds of data have been included in either the main tables or accompanying notes. Pockney's historical grasp of statistical developments in Soviet data collection and promulgation,

combined with his elaborate data display, makes *Soviet Statistics since 1950* an imposing statistical work adequate for use as a lone reference for the period it covers.

Karen Anderson and Jonathan J. Halperin, the authors of *Through a Glass Clearly: Finding, Evaluating, and Using Business Information from the Soviet Region* (Special Libraries Association Occasional Papers Series, no. 3, Washington: Special Libraries Association, 1992), point out that Eastern Europe and the newly independent states are now awash in information vendors offering a profusion of publications and services. The purpose of *Through a Glass Clearly* is to help information-seekers ferret out from the horde of offerings the best sources for statistical data, reliable facts, and credible editorial opinion.

To give readers the background upon which they can base judgments, *Through a Glass Clearly* examines the history and development of the information industry in Eastern Europe and newly independent states, paying particular attention to political factors like control in a managed economy, the limited availability of information to people beyond government planners, and harassment of the media (like Gorbachev's attempt in October 1989 to force the resignation of the editor-in-chief of *Arguments and Facts*, which had published the results of a popularity poll omitting Gorbachev). The book provides guidance on the hazards of dealing with both old and new styles of information in the newly independent states: where to find information, how to evaluate it, and how to use it. Detailed sections address each of these considerations, as well as others, such as coping with the language barrier.

Eleven appendixes comprise extensive lists of books and periodicals broken down by genre, such as directories (of products and services, including commercial banks), major newspapers and magazines, government periodicals, and newsletters. Bibliographers and other collection-builders in libraries should find these lists useful.

*Through a Glass Clearly* for the most part achieves its stated goal of helping information professionals identify quality business sources. Occasionally, however, the authors will lapse into observations that are more colorful than practical, such as, "Contrary to Western expectations, things like lists of textile factories handwritten on a cocktail napkin may well be far more useful than government-produced documents." Although the length of the bibliographical appendixes precludes extensive notation, it would have been helpful if brief commentaries had been included along with

the bibliographical information to help readers discern differences (for instance, editorial emphasis or level of readership addressed) among publications grouped together.

*USSR Facts and Figures Annual* (Gulf Breeze, Fla.: Academic International Press; began 1977) already stands in U.S. research libraries' reference collections as a principal source for news about noteworthy Soviet developments. The publication has always recorded the full range of Soviet life in statistical data, discursive factual presentation, and editorial interpretation. The annual derives its contents from an impressive array of sources listed in "Abbreviations of Sources" in Volume 15 (1991) (see Figure 2).

The *USSR Facts and Figures Annual* is in the midst of important changes: a new editor beginning with Volume 17 (1992), a new title, and some adjustments in format. The new title is *Russia and Eurasia Facts and Figures Annual*. The new format will divide the book into two fundamental sections: (1) the Commonwealth of Independent States (CIS) and Georgia and (2) the individual former republics treated separately. To preserve continuity, both sections of the new format will provide much the same information available in Volumes 1-17: facts and statistical data on government, population health and welfare, the economy, and industry.

The book is probably most useful as a reference for current information about the former Soviet Union and its successor entities. Annual volumes may be used to

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**Figure 2**
**Abbreviations of Sources**

CDSP—Current Digest of the Soviet Press

CIA/DIA—"The Soviet Economy Stumbles Badly in 1989," paper presented by Central Intelligence Agency and Defense Intelligence Agency to Technology and National Security Subcommittee of Joint Economic Committee of US Congress (20 Apr 90).

CIR/54—W. Ward Kingkade, Estimates and Projections of Educational Attainment in the USSR to the Year 2000 (Center for International Research Staff Paper No. 54, Mar 1990)

DOD—US Department of Defense, Critical Technologies Plan for the Committees on Armed Services United States Congress (15 Mar 90)

ECONUSSR—The Economy of the USSR: A Study Undertaken in Response to a Request by the Houston Summit: Summary and Recommendations (Washington, D.C., 1990)

FBIS—Daily Report, Soviet Union/Foreign Broadcast Information Service

IEO—US Department of Energy, Energy Information Administration, International Energy Outlook 1990.

NYT—New York Times

RFE/RL—Daily Report/Radio Free Europe-Radio Liberty

SEER—Soviet East European Report/ Radio Free Europe-Radio Liberty

SERS—Sotsialno-ekonomicheskoe razvitie strany v ... goda: ekonomicheskii obzor, No. 6 (1990)

SMP—US Dept. of Defense, Soviet Military Power, 9th ed. (Sep 1990)

SOVMIN—Sovet ministrov SSSR: Spravochnik serii "Kto est kto". Moscow, 1990-.

STNS—Eastern Europe: Long Road Ahead to Economic Well-Being", paper presented by CIA to Subcommittee on Technology and National Security, Joint Economic Committee (16 May 90)

UIF—The USSR in Figures for 1988 (Moscow, 1989)

US CIA DOI—United States, Central Intelligence Agency, Directorate of Information

  DOSO: NO—Directory of Soviet Officials National Organizations (Feb 1989)

  DOSO: RO—Directory of Soviet Officials: Republic Organizations (Nov 1988)

  DOSO: SE—Directory of Soviet Officials: Science and Education (May 1989)

  DEMOGREPS—USSR: Demographic Trends and Ethnic Balance in the Non-Russian Republics (April 1990)

  EEI—Economic and Energy Indicators (16 Nov 90)

  GOVTS—Chiefs of State and Cabinet Members of Foreign Governments (Sep/Oct 1990)

  HOES—Handbook of Economic Statistics, 1990

  IESR—International Energy Statistical Review (30 Oct 90)

  SOVENERDATA—Soviet Energy Data Resource Handbook (May 1990)

  SOVGNP—Measuring Soviet GNP: Problems and Solutions (Sep 1990)

  World Factbook—The World Factbook 1990

US Department of State

Volkov—Demograficheskie protsessy v SSSR: sbornik nauchnykh trudov, ed. A.G. Volkov (Moscow, 1990)

Source: *USSR Facts and Figures Annual*, vol.15 (1991), xviii. Reprinted by permission of the publisher.

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great advantage to compare or expand upon statistical data or other information found in alternative sources. However, it is inconvenient to have to refer to more than one volume to track a substantive issue (there are no cumulative volumes from 1977 forward).[6] Further, if several volumes are consulted for data, the researcher must be on guard against the inconsistencies of data that may not be uniformly rebenchmarked. These drawbacks make the *USSR Facts and Figures Annual* unwieldy for collecting information spanning several years.

*The East European Market: Sources of Information*, by Tania Konn (Glasgow: University of Glasgow Library, 1991), is an exhaustive, scholarly bibliography of market information sources for Eastern Europe. It is divided into sections covering general background information; macroeconomic conditions; handbooks, directories, and reports; industry sectors; statistical data; and on-line data base services, each section subdivided by national entity. Despite the many changes in the Eastern European information universe since the bibliography was published in 1991, this work should prove fundamentally useful to libraries and businesses that wish to build a collection of books and periodicals covering this area. (Librarians and other collection builders, however, will regret the omission of place of publication in citations for the far-flung titles, which necessitates extra bibliographic spadework before placing an order.)

## Directories

The *Directory of Foreign Trade Organizations in Eastern Europe: Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.* (San Mateo, Calif.: International Trade Press, 1990) is an extensive listing of export/import companies in Eastern Europe (including what was then the USSR), as well as government ministries, chambers of commerce, state committees, banks, and other supporting organizations engaged in foreign trade. One section provides useful information from the International Chamber of Commerce.[7] The volume is intended to help manufacturers and international traders in the United States and abroad research local markets, locate clients, and establish direct contacts in Eastern Europe.

The directory's contents fall into three fundamental divisions: (1) an index to manufactures, services, and other activities throughout Eastern Europe based on the United Nations' Standard International Trade Classification (SITC) and a supplement to the SITC to cover services and activities not classified in SITC; (2) a chapter for each country broken out by broad sectors for manufactures, services, and other activities; and (3) a list of International Chamber of Commerce Publications, which includes *Incoterms* (ICC terminology), *Uniform Customs and Practice for Documentary Credit*, and *Uniform Rules for Collections*; an index to the directory; and lists of weights and measures and abbreviations used.

Political and economic upheaval in the former Soviet Union have rendered some parts of the chapter on that area virtually useless because it reflects information no longer accurate. For instance, the publication provides one central Moscow address for foreign trade organizations covering the entire Soviet Union although each independent state currently has its own office for trade relations. Nevertheless, other sections may still be valid, like the one for production enterprises, associations, and scientific production complexes, which includes local addresses throughout the newly independent states. For the most part, the *Directory of Foreign Trade Organizations in Eastern Europe* remains an attractive reference tool for comprehensive, well-organized, and easy access to manufacturers and service organizations.

*SIBD 92-93: The Business Directory for the Soviet Region* (Dnepropetrovsk, Ukraine: IIA Sistema-Reserve, and Washington, D.C.: FYI Information Resources for a Changing World; began 1991) is a two-volume business directory, published annually, with more than 6,500 detailed listings focusing on private businesses across the former Soviet Union. The directory is generated from the IIA Sistema-Reserve data base, which incorporates information from a computer network covering the Ukraine and the other newly independent states. The format of the detailed company listings is reminiscent of *Standard and Poor's Register of Corporations* in the United States (see Figure 3). Alphabetically arranged, the detailed listings for companies compose Volume 1. Volume 2 contains four alternative indexes: business activity (economic sectors), geographic, leaders (decision-makers), and the 500 largest enterprises.

Experienced users of business directories will appreciate the directory's useful identification of companies' "primary business activities," "main products," and "main services." However, some users, accustomed to the ease of the strictly numerical codes of the standard industrial classification systems of the United States and the United Nations, may find the *SIBD*'s

## Figure 3



| Label (left) | Listing content | Label (right) |
|---|---|---|

Database ID # — *S-R-N-S 1172*          EXP    IMP — Importer and/or Exporter Status

Country — Moldova

Ownership Code
Top-500 Symbol — △ ●  **BIOTEKS * Scientific-Research Center** — Company Name

No. of Employees

Date Established:                    3/12/1990 — Date Founded

No. of Employees: 20    Turnover: 1,600,000 — Turnover

Bank Account — Bank Acct:  r/s 608310, Leninsk Branch of ZhSB, Kishinev, MFO 771629

Address: 277043, Kishinev
    ul. Zhukovskogo, 3 p/ya 3168 — Street Address (mailing address is also listed, when different)

Phone, Telex, Teletype, and Fax (as available) — Telephone:  (0422) 57-29-36
Telex:    163118 OMEGA SU
Fax:      (0422) 56-95-42

Key Individuals, Titles, Phone Nos. — General Director          57-29-36
Oleg Vladimirovich Voronin
Deputy Director          26-52-80
Yuriy Antonovich Morozenko

Hard Currency Account — MVES registration:  PR-2801/193,  09/06/1990 — Foreign Trade Registration
Hard Currency Acct:      67080382 in Kishinev Branch of Vneshekonombank

Branches/Subsidiaries:  BIOPROTEX (Kishinev), BIOTEX-MOLDOVA (Kishinev), BIOTEX-N&DEP (Orgeyev), KONKORDIA (Tiraspol') — Branches and Subsidiaries, with Locations

Primary Business Activities — Business Activities:  Biotechnology, virus-free plant growing, crop protection * Radioelectronics * Liquid chromatography

Main Products — Main Goods:  Virus-free planting medium for fruit, berry, and flower growing * Mobile phases for high-sensitivity liquid chromatographs * Injectors for gas chromatographs

Main Services — Main Services: Scientific consulting on chromatography * Virus-free plant growing * Programming * Mathematical modeling * Export and import operations

Actual listing (shown reduced)

Source: From an advertising brochure for *SIBD 92-93: The Business Directory for the Soviet Region.* Reprinted by permission of the publisher.

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alphanumeric codes somewhat awkward. On the other hand, this alphanumeric arrangement reflects an attempt to make the business activity index a better match to the actual economic structure of the former Soviet Union.

The *U.S.–East European Trade Directory* and the *U.S.–Soviet Trade Directory*, both by William S. Loiry (Chicago: Probus Publishing Company, 1991), are comprehensive, handy guides to resources about the markets of East Europe and the newly independent states, written from an American perspective. The contents of the two directories roughly parallel each other, with some variation appropriate to the geographic and political realities of each area.

Both directories have chapters on information sources, whose strong points are extensive listings of hard-copy publications—books and periodicals—

some of which are highly specialized for international trade with the respective areas. The *U.S.–Soviet Trade Directory*'s "Information Sources" chapter includes several "Electronic Information Services" (computer data base services) covering the former Soviet Union (for example, Moscow International Business Network, Boston). Although this data base services feature is not included in the *U.S.–East European Trade Directory*, the Soviet directory list includes Reuters Information Services and the World Trade Center's Washington, D.C., data base (WTCW), both of which offer worldwide coverage.

Of particular interest in each directory are the chapters titled "Consultants and Trading Companies," "U.S. Law Firms, Attorneys, and Legal Organizations," "Finance, Accounting and Auditing," and "Insurance Agencies." They offer specific contacts (primarily

in the United States but also in Brussels, London, Moscow, Prague, Toronto, and Warsaw) for structuring joint ventures, for legal expertise, for loan guarantees (for example, the U.S. Overseas Private Investment Corporation), and for political risk insurance, respectively. Other chapters list the names of research centers, citing their special programs (for instance, the Harvard University Russian Research Center and its joint ventures and other business topics); the names and addresses of individual translators and translating agencies; and conferences, exhibitions, and seminars. Both directories offer "Yellow Pages" sections that alphabetically list every entry in each directory, cutting across groupings by subject heading. Both directories are compact, comprehensive, and affordable.

## Conclusion

These publications make up one arm of the body of economic and business information available for the former Eastern Bloc countries. Consulted along with the periodical literature that will be reviewed in the next issue of this *Economic Review*, they provide investors, policymakers, and other users with unprecedented access to information about this dramatically changing part of the world.

## Notes

1. The Eastern Bloc comprised East Germany and the other countries of Eastern Europe—Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and Yugoslavia—and the Soviet Union (Armenia, Azerbaijan, Byelarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, sometimes referred to as the newly independent states). There is at present no broadly accepted alternative name for the states of the former Soviet Union. *Commonwealth of Independent States* encompasses only some of these nations. The people of the area object to the term *States of the Former Soviet Union*. Hence, following the lead of the U.S. Department of Commerce International Trade Administration, this paper will use the term *newly independent states*, where appropriate, throughout this article to designate the former Soviet Union.

2. Christine N. Donohue, "Eastern European Libraries: Links to Information," in *Information in Eastern and Central Europe: Coming in from the Cold* (papers presented at the Special Libraries Association State-of-the-Art Institute, November 12-13, 1991, Washington, D.C.), 79-88, (Washington, D.C., Special Libraries Association, 1992.)

3. The earlier *Economic Review* articles—"International Trade and Finance Reference Sources" (May/June 1991, 30-37) and "International Trade and Finance Information Sources: A Guide to Periodical Literature" (July/August 1991, 55-64)—emphasized publications with either multicountry (global) or world area (for example, Latin America or Pacific Rim) geographical coverage. Some of the publications with multicountry focus also explore worthwhile topics concerning Eastern European and newly independent states, and readers may wish to consult them for potentially useful references.

4. The format of the 1991 *Handbook of Economic Statistics* reflects the impact of changes in Eastern Europe and Russia. Future changes will be made as regional economic groupings realign themselves.

5. The G-Six countries are Canada, France, Germany, Italy, Japan, and the United Kingdom. The G-Seven consists of the United States and the G-Six.

6. Volume 16 (also published in 1991) is an index to the first ten volumes (1977-86), which are not indexed individually.

7. The International Chamber of Commerce is located in Paris. Its publishing representative in the United States is ICC Publishing Corporation, 156 Fifth Avenue, Suite 820, New York, New York 10010.

# *I*ndex for 1992

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