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A standard mortgage contract provides at least three potential sources of value to a financial institution. Origination fees, cash flows realized from management of the mortgage asset, and servicing fees all offer potential returns. Historically, a depository institution would attempt to realize all three sources of value, but increasingly the component parts are being sold in a secondary market or replaced by other assets or parts of different mortgage contracts. The purpose of this article is to provide an overview of the risk and return factors that managers face in making decisions about how to best manage a portfolio of mortgage-related cash flows. The article also reviews some of the potentially difficult questions regulators may face in this area of bank supervision.

The authors examine data on the growth of commercial banks' mortgage-related activities over the past ten years. They observe that, while the trend has been toward holding securitized mortgage instruments, institutions must balance the benefits of doing so against the fact that they are paying significant fees to purchase those benefits. Both managers and regulators should also be aware that the risks faced by banks engaged in the more fee-oriented aspects of this business may not be as severe as one might imagine when looking at the activities in isolation.

Buy, Sell, or Hold? Valuing Cash Flows from Mortgage Lending

James H. Gilkeson, Paul Jacob, and Stephen D. Smith

A standard mortgage contract provides at least three potential sources of value to a financial institution. The first arises from the creation of the mortgage obligation. Origination fees are designed to cover administrative costs and to compensate institutions for so-called pipeline risk. Given a commitment rate to the borrower, there exists the risk that interest rates will rise during the commitment period. A second source of potential value arises from holding the rights to receive the periodic cash flows promised in the mortgage agreement—that is, from owning the mortgage asset. Because of the possibility of prepayment or default, the cash flows realized from this contract may vary considerably from those promised at the time of issue. Thus, the value of the mortgage contract will depend on both the promised cash flows and the risk that borrowers will exercise their option to either pay early, typically when market rates are low, or not pay at all. Finally, servicing the mortgage agreement offers potential gains through fees designed to offset the costs associated with collecting payments and providing other documentation services. These fees are received, of course, only as long as the mortgage obligation is outstanding. The valuation of servicing rights is therefore a difficult exercise, even less straightforward than valuing the mortgage itself.

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Historically, a depository institution would attempt to realize all three sources of value by originating the mortgage, holding the mortgage obligation on its books, and servicing the contract in-house. Increasingly, however, one finds the component parts being sold in a secondary market and replaced by other assets or parts of different mortgage contracts. Such "unbundling" of contracts, caused in large part by increasing competition from nonbank sources for both lending- and deposit-related activities, has become commonplace in the area of financial services. Furthermore, technological advances have allowed institutions to engage in the secondary market trading of more exotic instruments. In any case, managers of financial institutions now have to deal with a more complex set of questions concerning how to best manage this portfolio of returns that arises when a consumer wishes to borrow funds for purposes of purchasing a home.

In the current environment, the answer to "what to keep and what to sell?" is driven in part by capital constraints and other regulatory guidelines confronting various financial institutions dealing in mortgage products. Indeed, these may be the dominant variables for institutions whose activities are at or close to levels defined by various regulatory constraints. However, many institutions face a relatively unrestricted choice set in this area of investing. For these institutions, the question of how best to manage a portfolio of mortgage-related cash flows cannot be viewed in isolation. Generally speaking, other asset returns or funding costs are correlated to the return on at least one component of the underlying mortgage contract. To the extent that this is true, bank managers and other investors face a more complex set of calculations than that associated with finding the expected return and risk of each component part of the mortgage.

The purpose of this article is to provide an overview of the return and risk factors that managers may want to consider when trying to develop a decision-making framework: (1) the volume of mortgage originations, (2) what to do with the proceeds from the sale of the originated mortgage assets, and (3) whether to retain the servicing rights to the mortgage rather than sell them in the secondary market. Given the growth in securitized mortgage-backed instruments (securities issued that are collateralized by mortgages) and the growing secondary market for mortgage servicing rights, it is important to emphasize that any given bank has the option to choose to engage in only one (or two) of these three businesses. For example, a bank manager may want to be involved in mortgage origination and servicing but may not (perhaps because of interest rate risk) want to carry the mortgage asset itself on the books. As noted earlier, in the not too distant past these decisions could not be separated because there was no active secondary market for whole mortgages. Now bank managers can choose to specialize in one or more parts of the mortgage business should they decide that such a strategy is in the best interests of their shareholders and meets the needs of their customer base.

Regulators should have some interest in these mortgage-related issues since the actual risks associated with holding versus securitizing mortgage-related cash flows may be quite different from those assumed for risk-based capital guidelines. Indeed, a number of researchers (including Richard C. Breeden and William M. Isaac 1992) have argued that these risk-based guidelines have been at least part of the reason for the alleged credit crunch of the late 1980s and early 1990s. While most (see, for example, Allen N. Berger and Gregory F. Udell 1994) have yet to find any strong statistical linkage between the two, the broader policy questions associated with encouraging particular asset allocations in the banking system are still open. At a more immediate level, on-site supervisory personnel must deal with new mortgage "instruments" and related agreements whose risks are becoming more difficult to assess using conventional regulatory measurement tools. Therefore, this article is also intended to provide an overview of some of the potentially difficult questions regulators may face in this area of bank supervision.

As a foundation for the discussion, the first section provides data on the growth of commercial banks' mortgage-related activities over the past ten years and presents some alternative rationales for these growth patterns. These mortgage data are examined in a variety of ways in order to investigate, for example, whether the major component of growth has come from mortgage-backed securities or whole mortgage loans and whether mortgage holdings are relatively constant across banks of different asset sizes. The second section considers the risk and return factors faced by an institution actively engaged in the mortgage origination process. The next section deals with the question of whether an institution should hold the whole mortgage (defined as a standard fixed-rate mortgage contract) on the balance sheet. Alternatives to this strategy are discussed, including securitizing the loan and reinvesting the proceeds in a variety of assets (for example, a commercial and industrial loan or mortgage-backed security). The risk and return issues relating to retaining or selling the mortgage servicing rights are discussed in the fourth

section. The conclusion provides a summary and some thoughts on potential regulatory issues.

Trends in Mortgage and Mortgage-Backed Security Holdings

Commercial bank holdings of mortgage assets, including whole loans and mortgage-backed securities, have risen dramatically over the last decade. Using quarterly data from 1985 to 1994, this section discusses this increase and offers several alternative, though not necessarily mutually exclusive, explanations for the change.

Chart 1A shows total residential mortgage holdings of all commercial banks in the United States as a percentage of total assets over the 1985-94 period.[1] The chart compares unsecuritized whole mortgage and mortgage-backed security components. Total mortgage holdings grew from 8.28 percent of total assets in the first quarter of 1985 (85:1) to 18.40 percent in the second quarter of 1994 (94:2). Chart 1B presents this same information for all banks in the Sixth Federal Reserve District, which includes Alabama, Florida, Georgia, and parts of Louisiana, Mississippi, and Tennessee. Holdings in the Sixth District have been consistently larger than for the country as a whole, growing from 9.72 percent in 85:1 to 23.30 percent of total assets in 94:2. Although unsecuritized mortgages still dominate mortgage-backed securities in terms of volume, it is not surprising that the growth in mortgage-backed security holdings has been substantially larger over this ten-year period. While whole mortgage holdings for all U.S. banks roughly doubled over the period, mortgage-backed securities increased almost 500 percent. Chart 1B displays a similar pattern for Sixth District banks. The charts also show that most of the growth in mortgages and mortgage-backed securities occurred in the mid- to late 1980s.

Charts 2A and 2B provide a comparison of mortgage asset holdings across banks of different sizes. Chart 2A indicates that holdings of whole mortgage loans vary considerably according to bank size. In particular, medium-sized institutions ($50-$500 million in total assets) have consistently maintained the largest percentage holdings, followed by small institutions (up to $50 million in total assets). As Chart 2B shows, mortgage-backed security holdings also vary somewhat across banks of different sizes—with small banks holding the largest percentage—until 1994. By 1994 the level of mortgage-backed securities as a percentage of assets seems unrelated to bank size. The data in this chart provide some evidence against the notion that smaller institutions are less able or less likely to acquire such "nontraditional" assets for their portfolio holdings.

A number of explanations for the growth in mortgage asset holdings are consistent with the data presented here. One distinct factor has been the continued decline in asset holdings by savings and loan institutions (S&Ls). These institutions have historically held large portions of their assets in mortgages. However, in the last decade many failed, failing, and even healthy S&Ls have been merged with or rechartered as commercial banks, and the data reflects commercial banks' acquisition of these additional mortgage assets. It is interesting to note that passage of the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA) provided strong incentives through the "qualified lender provision" for S&Ls to once again hold most of their assets in mortgages. The timing of this act is consistent with the flattening out of the growth in bank mortgage holdings in the 1990s.

A second argument, put forth by Breeden and Isaac (1992) and others, is that risk-based capital guidelines have forced capital-constrained banks to move away from assets with high capital requirements, such as commercial and industrial loans, toward those requiring lower capital, such as whole mortgages and government-insured mortgage-backed securities. Finally, it may be that the more advantageous liquidity and funding costs provided by mortgage-backed securities have in themselves caused banks to shift into these assets and away from less liquid investments like commercial and industrial loans. Combined, these arguments are consistent with both the time series and composition of mortgage-related asset holdings as outlined in Charts 1 and 2.

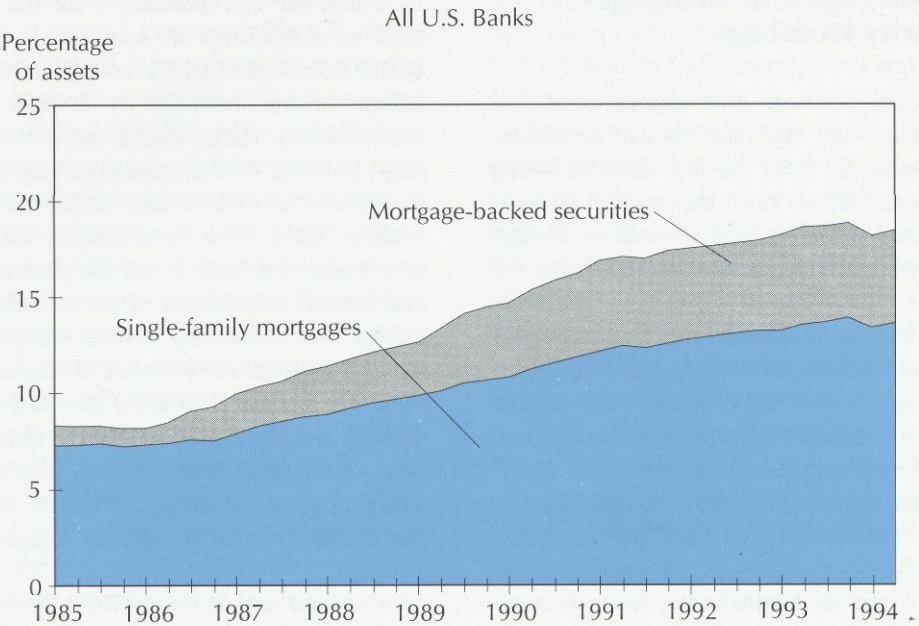
Risks and Returns from Mortgage Originations

Widespread mortgage securitization has allowed banks to consider the mortgage origination business as separate from that of managing a portfolio of loans on the balance sheet. Indeed, banks' fiercest competitors in loan originations are mortgage bankers, who specialize in originating loans *without* maintaining them on the balance sheet.

Mortgage origination, when considered apart from ownership of the mortgage asset, is a "fee-oriented"

Chart 1
Mortgage Asset Holdings

A



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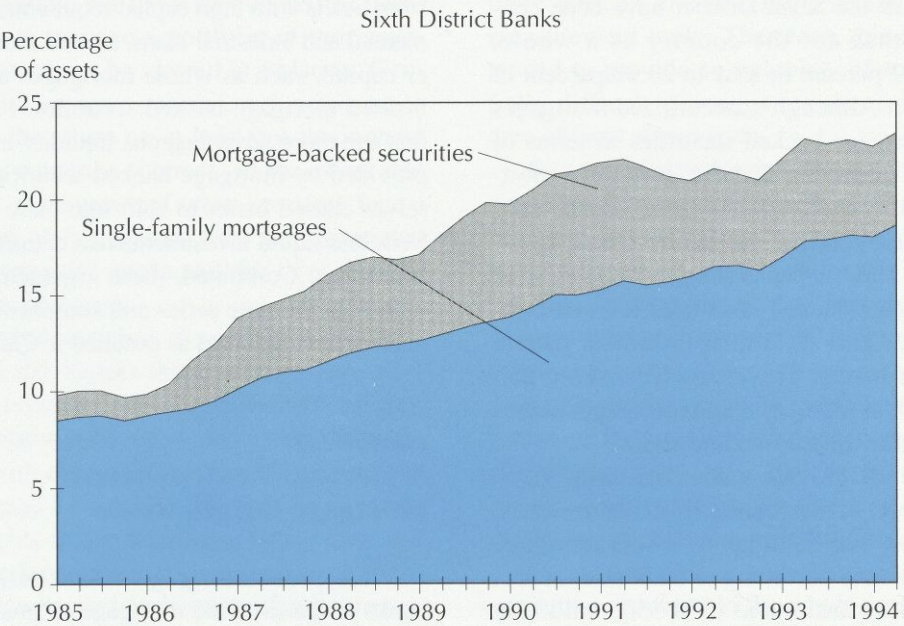
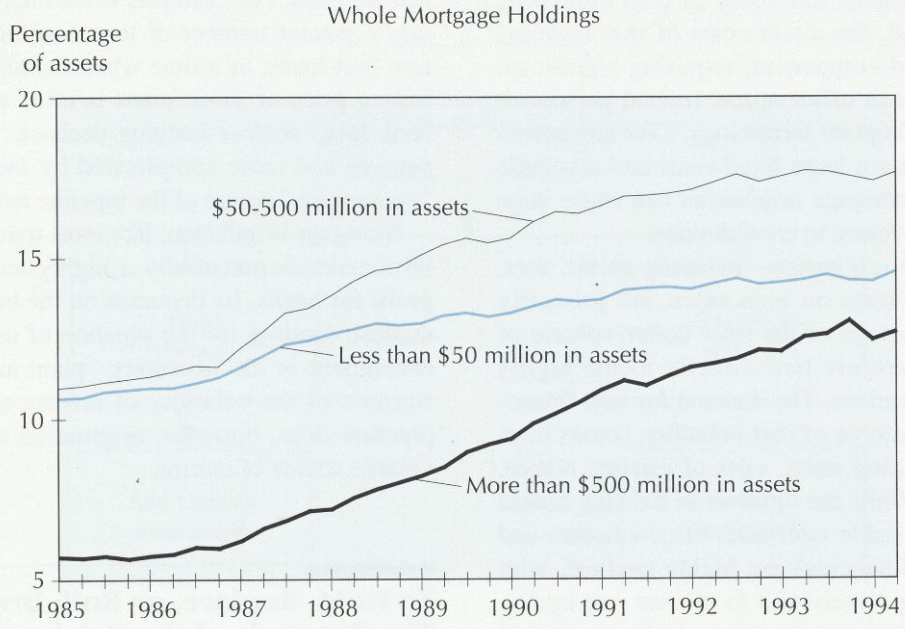


Source: Computed by the Federal Reserve Bank of Atlanta from data in "Consolidated Reports of Condition for Insured Commercial Banks," 1985-94, filed with bank regulators.

Chart 2
Mortgage Asset Holdings by Bank Size
(All U.S. Banks)

A



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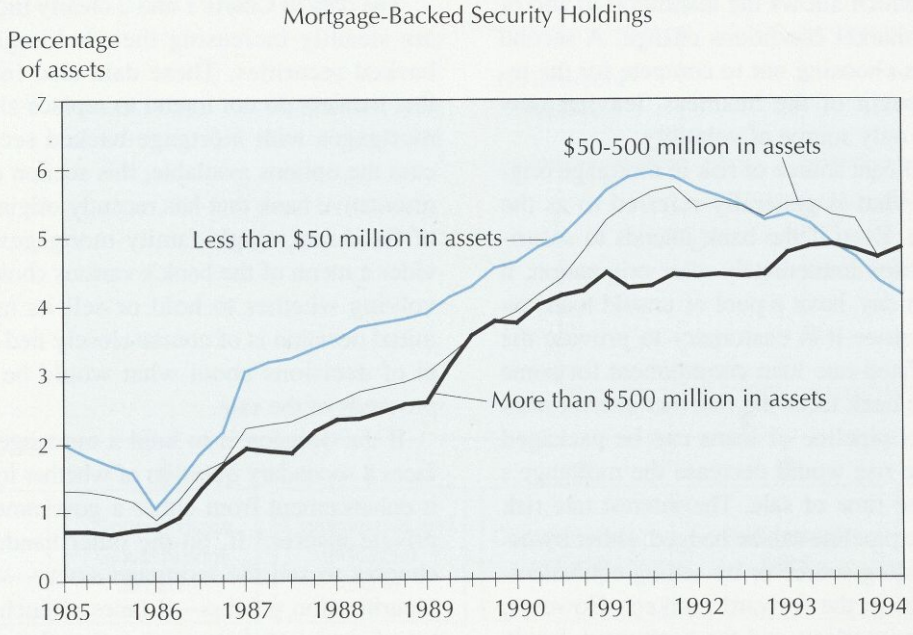


Source: Computed by the Federal Reserve Bank of Atlanta from data in "Consolidated Reports of Condition for Insured Commercial Banks," 1985-94, filed with bank regulators.

activity. Revenues come primarily from points and fees charged in the lending process and the potential profit on sale of the mortgage or its servicing rights. Like many other transaction-oriented businesses, mortgage originations can provide the bank with revenue without tying up capital that could be used elsewhere. On the other hand, the direct costs of this business have a large fixed component, requiring significant capital investment in office space, trained personnel, and specialized computer technology. Like any activity for which there are large fixed costs and a volatile revenue stream, mortgage origination can cause large fluctuations in the return to equityholders.

Revenues from origination, including points, fees, and profits and losses on loan sales, are primarily earned as a percentage of the total dollar volume of loans and are therefore tied directly to the highly volatile housing markets. The demand for new financing, which is the source of that volatility, comes from three sources: housing starts, sales of existing homes, and refinancing. While the turnover of existing homes occurs at a fairly stable rate, sales of new homes and the volume of refinancings are highly cyclical, with refinancings being closely tied to interest rate cycles. Banks can attempt to manage this volatility in several ways. One approach is to emphasize cost control and labor flexibility, which allows the institution to add or shed capacity as market conditions change. A second approach involves choosing not to compete for the refinancing component of the business, leaving new home sales as the only source of volatility.

The other significant source of risk in mortgage origination involves what is generally referred to as the mortgage pipeline. Even if the bank intends to securitize and sell its loans immediately after origination, it will, on any given day, have a pool of unsold loans on hand. Moreover, since it is customary to provide the borrower with a fixed-rate loan commitment for some period of time, the bank faces the risk that interest rates will rise before its pipeline of loans can be packaged and sold. This rate rise would decrease the mortgage's market value at the time of sale. The interest rate risk associated with the pipeline can be hedged, either by using a matched funding source or by selling equivalent-duration Treasuries in the forward markets. However, hedging is far from costless, and the bank must decide whether to incur costs likely to affect profitability in order to guard against events that may or may not occur.

As noted earlier, the mortgage rate commitment period is a major factor in asset/liability risk. By tradition and competitive necessity, the mortgage originator offers a "locked-in" fixed rate to the borrower for a one- to three-month commitment period. In doing so, the bank agrees to take on the interest rate risk of the loan. However, the potential borrower may or may not ultimately take out the loan, and interest rate movements during the commitment period influence that decision. For example, when interest rates are rising, a greater number of loan commitments actually turn into loans, at a time when the need to hedge the selling price of those loans is most acute. Thus, the bank faces another hedging decision, made more expensive and more complicated by the contingent, or "option-like," nature of the pipeline risk.

Mortgage origination, like most transaction-oriented businesses, is potentially a highly levered source of profit for banks. Its demands on the balance sheet are modest: funding for the pipeline of unsold loans and investment in the necessary "plant and equipment." Because of the volatility of revenues, as well as the pipeline risks, however, origination can be a highly volatile source of returns.

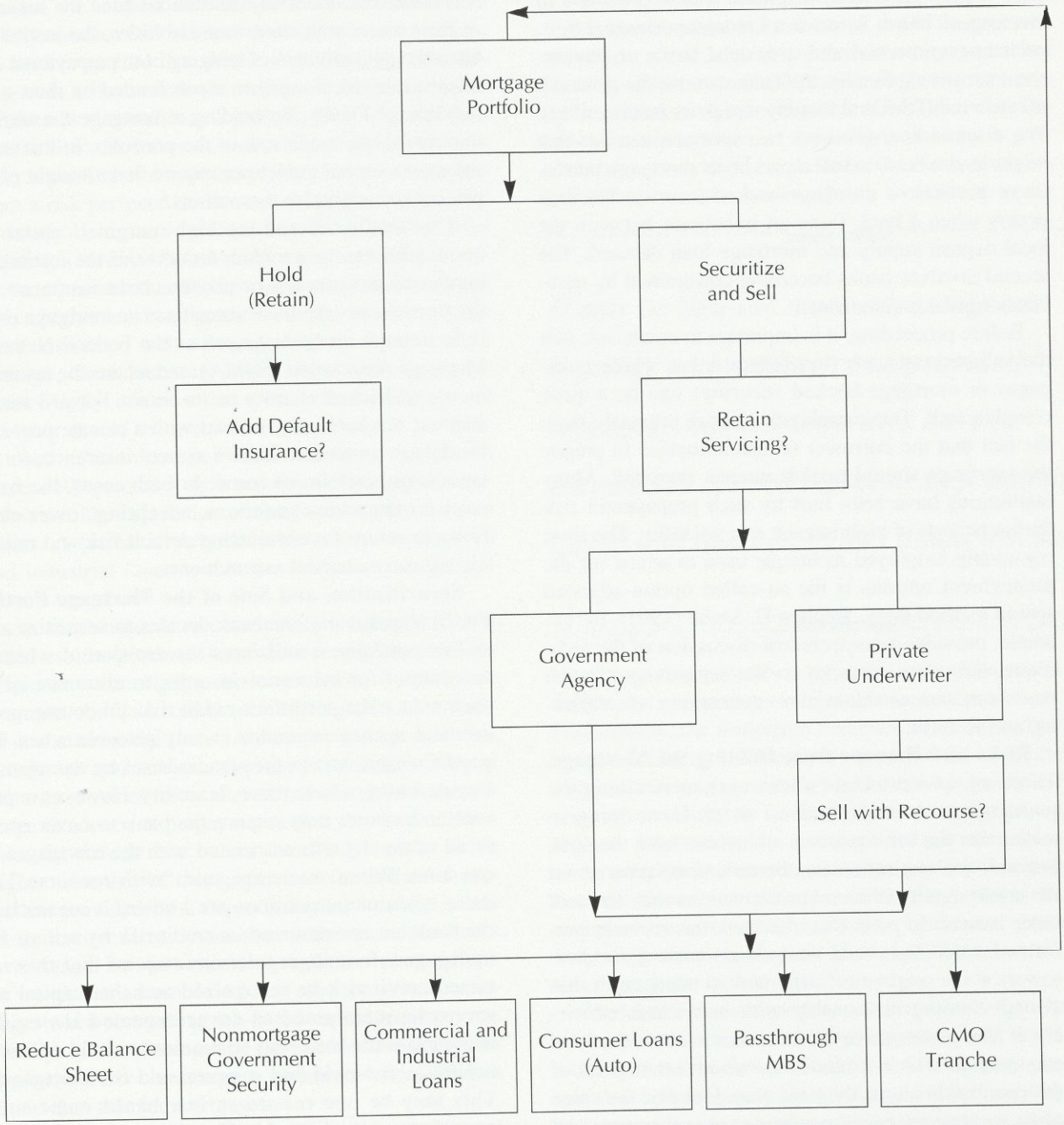
To Hold, Replace, or Roll: Investing The Proceeds of the Origination

The data in Charts 1 and 2 clearly indicate that banks are steadily increasing their holdings of mortgage-backed securities. These data also indicate, though, that bankers do not intend to replace all of their whole mortgages with mortgage-backed securities. To discuss the options available, this section considers a representative bank that has recently originated a portfolio of fixed-rate, single-family mortgages.[2] Chart 3 provides a menu of the bank's various choices, the first involving whether to hold or sell its mortgages. This initial decision is of course closely tied to the final level of decisions about what would be done with the proceeds of the sale.

If the decision is to hold a mortgage, the institution faces a secondary question of whether to purchase credit enhancement from either a government agency or a private insurer.[3] If, on the other hand, the institution chooses to sell the mortgage assets—say, through the securitization process—it faces a much more complex set of decisions.[4] Assuming that the mortgage assets conform to agency requirements, the next choice concerns whether to sell the mortgages through a government agency or a private underwriter.

If the mortgage portfolio is securitized and sold, the bank must consider what to do with the proceeds of the sale. As mentioned, this decision is integral to the

Chart 3
Options Available to the Holder of a Mortgage Portfolio



initial "hold or sell" decision. The discussion considers four general alternatives for use of the funds accruing from sale of the mortgage portfolio. First, the bank can use the proceeds to purchase a mortgage-backed security (or set of mortgage-backed securities). Second, it may choose to originate a new portfolio of mortgages. Third, it can acquire nonmortgage assets, such as commercial and industrial loans or government securities. Finally, the bank can use the proceeds to retire liabilities and thereby shrink its balance sheet. The discussion also covers two special situations that might lead a bank to sell a part of its mortgage portfolio or purchase a mortgage-backed security. The first occurs when a bank faces an imbalance between the local deposit supply and mortgage loan demand. The second involves banks becoming constrained by regulatory capital requirements.

Before proceeding, it is important to emphasize that the valuation of cash flows from either whole mortgages or mortgage-backed securities can be a quite complex task. The complications arise primarily from the fact that the borrower retains an option to prepay the mortgage should market interest rates fall. Many institutions have been hurt by such prepayment risk during periods of high interest rate volatility. The most commonly employed technique used to adjust for the prepayment options is the so-called option-adjusted spread methodology. Stephen D. Smith (1991), for example, provides a nontechnical discussion of the technique and some remarks on the sensitivity of such models to various assumptions concerning rate volatility, and so forth.

Risks and Returns from Holding the Mortgage. There are two principle advantages to retaining the mortgage pool on the balance sheet. First, doing so means that the bank receives all income from the pool. Second, the institution has better information about the credit quality of its own originations than those of other issuers. In particular, the bank has recently performed a detailed credit analysis on each of the borrowers at the origination stage and, in many cases, has a long-standing relationship with individual borrowers. It also possesses better information about the local economy in which it lends than about other parts of the country. In short, the bank may feel that the value of its mortgages, based on their expected returns and risks (including defaults or prepayments), is significantly higher than what the market is willing to pay for them after securitization.

There are, of course, substantial disadvantages to holding a locally originated mortgage portfolio. One is that such a portfolio is not geographically diversified. Vulnerability to fluctuations in the local economy could be avoided by holding, for example, a selection of mortgage-backed securities originated in different parts of the country. Another disadvantage is that holding a mortgage means that the bank retains prepayment risk. Moreover, because many institutions fund the majority of their assets with short-term liabilities, the institution faces the dual problem of hedging both prepayment and interest rate risk (long-term assets funded by short-term liabilities).[5] Finally, by holding a mortgage the institution retains the credit risk of the portfolio. In this case, risk-based capital guidelines require that a weight of 50 percent be assigned to these assets.[6]

This credit risk and the high marginal capital requirements can be avoided, however, if the institution purchases government or private credit insurance. In the former case, the bank securitizes its mortgage portfolio through an agency, such as the Federal National Mortgage Association (FNMA), and retains the resulting mortgage-backed security on its books. For private insurance, the bank can contract with a private provider for default protection, known as pool insurance, for its unsecured portfolio of loans. In both cases, the bank pays an insurance premium, accepting lower cash flows in return for eliminating default risk and reducing regulatory capital requirements.

Securitization and Sale of the Mortgage Portfolio. If, alternatively, the bank decides to securitize and sell its portfolio, it still faces the decision of whether to contract for insurance in order to eliminate or at least reduce the portfolio's credit risk. Of course, government agency insurance is only possible when the portfolio conforms to the standards set by the agency. Private insurers have more flexibility. However, a private underwriter may require the bank to cover some or all of the defaults associated with the mortgages in question. When assets are sold "with recourse," as these types of transactions are known, it means that the bank has not removed its credit risk by selling the mortgages. Indeed, regulations require that this retained credit risk be recognized and that capital reserves be maintained to cover expected losses. In many cases the bank will be required to hold as much capital as it would had it never sold the mortgages. This may be one reason so few banks enter such agreements, as indicated in Charts 4a and 4b. Sales involving recourse seldom make up more than 0.5 percent of assets for banks across the United States or in the Sixth District.[7]

Replacing the Mortgage Portfolio. Having sold the mortgage portfolio, the bank could, in principle, use the proceeds to purchase any nonmortgage-related assets.

For example, new commercial and industrial loans could be originated. One of the advantages of such a strategy is that commercial and industrial loans face no prepayment risk. Floating rate loans of this nature also significantly reduce or eliminate asset/liability mismatches because the interest rate risk of these contracts more closely matches that of short-term deposits. In addition, the bank may find that developing a lending relationship with a business leads to sales of other profitable services (additional loans, payroll, cash management, and the like). However, commercial and industrial loans carry a number of disadvantages that are also important from a risk perspective. For one thing, these loans will generally be no more geographically diversified than the bank's current whole loan mortgage portfolio. In addition, commercial and industrial loans typically present both a higher level and greater volatility of defaults than those associated with mortgage lending. Moreover, on average, these loans are much larger than mortgage loans. Finally, it is clear that overall credit risk exposure is higher should the proceeds of the mortgage portfolio be used in this manner. For these reasons, regulators place a 100 percent weight on commercial and industrial loans in the calculation of risk-based capital requirements. A further drawback to turning to commercial and industrial loans is that the secondary market for them is very thin.[8]

As an alternative to commercial lending, the bank could use the proceeds from the mortgage portfolio to originate nonmortgage consumer loans. To pick one example, the bank could seek to originate a portfolio of new automobile loans. Although most car loans are fixed-rate and subject to prepayment, their shorter maturity provides lower interest rate risk and a lower average incidence of prepayments than mortgages. However, the default rate on car loans is generally much higher than that of mortgages, and the collateral protection provided by a depreciating automobile is less likely to cover loan losses than is the home that backs a mortgage. For these reasons, regulators place a higher weight on automobile loans than on whole mortgages when computing risk-based capital requirements. Finally, while a secondary market has developed for these and other nonmortgage consumer loans, it is less liquid than that for mortgages.

Another available option involves the purchase of nonmortgage government securities, such as Treasury notes. In this case the bank retains interest rate risk (if the bond is funded short-term) but avoids credit and prepayment risks. Implicit in this strategy is that there exists a "liquidity premium" for holding long-term securities when compared with short-term instruments.[9] This same idea underlies the notion that it is cheaper to fund assets using short-term, rather than long-term, deposits. It is important to keep in mind that even if such a premium exists, it is doubtful that a bank can provide such a "pure" maturity intermediation service at a lower cost than a low overhead mutual fund.

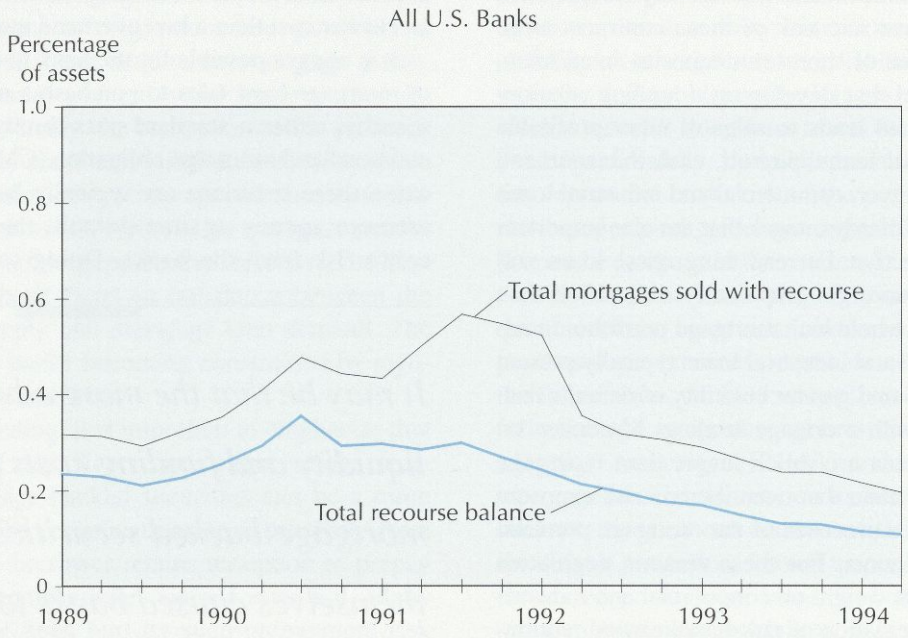
It is always possible for the bank to use the proceeds of mortgage loan sales to purchase a mortgage-backed security, either a standard pass-through security or a collateralized mortgage obligation (CMO) tranche. Because these securities are typically backed by a government agency against default, the bank removes credit risk from the books. Doing so leads to much lower capital requirements (typically a 0 to 20 percent weight) in comparison with a whole mortgage loan. Furthermore, the institution becomes more diversified in terms of both credit and prepayment risks, since the original mortgages underlying the mortgage-backed security are likely to be from different geographical regions. Obviously, the mortgage-backed security is also more liquid than the mortgage portfolio, in part because there exists an active secondary market for mortgage-backed securities. Finally, banks can obtain very inexpensive funding for mortgage-backed securities through the repo market.[10]

It may be that the more advantageous liquidity and funding costs provided by mortgage-backed securities have in themselves caused banks to shift into these assets and away from less liquid investments.

The above discussion may seem to imply that the bank, should it choose to hold mortgage-related assets, would always be better off from a risk/liquidity perspective by purchasing the mortgage-backed security. However, the risk reduction and liquidity enhancement are not costless. The cash flow received from a mortgage-backed security is reduced by transactions costs, insurance fees, and servicing costs. Since the so-called all-in costs (which do not include transaction costs) of insurance and servicing may be as high as 50 basis points, a bank with, say, a 10 percent equity-to-asset

Chart 4
Mortgages Sold with Recourse

A



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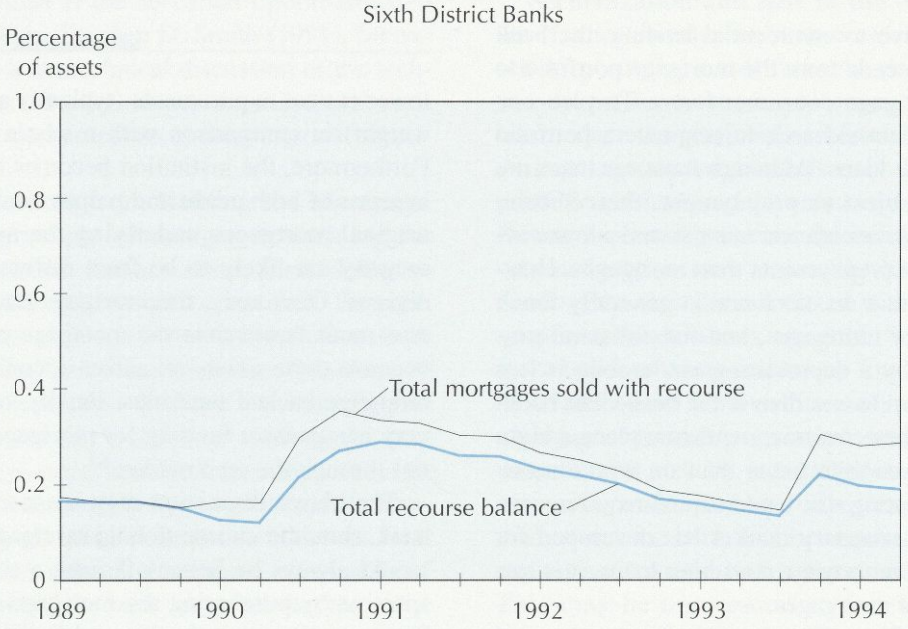

Source: Computed by the Federal Reserve Bank of Atlanta from data in "Consolidated Reports of Condition for Insured Commercial Banks," 1989-94, filed with bank regulators.

ratio is potentially reducing the return to equityholders by 5 percent (that is, .005/.1 = .05).

Two final options are available to the bank once it has decided to securitize and sell the portfolio. First, it can use the proceeds to retire liabilities or buy back equity shares. There are at least two reasons why this strategy might make sense. As mentioned earlier, removing these mortgages reduces both prepayment and interest rate risk and therefore provides for lower capital requirements. Another rationale involves the fact that the bank may simply have a pool of such high-cost deposits that it is difficult to find assets that can earn a return sufficient to justify keeping these liabilities on the books. The second option, discussed earlier, is to use the proceeds to originate a new portfolio of mortgages.

Special Situations. The discussion so far has been based on the assumption that the bank currently holds adequate capital and a deposit supply that matches the demand it faces for mortgages and other loans. If these assumptions are not the case, the bank may have additional incentives to securitize and sell its mortgage portfolio. Lacking adequate capital, the bank can lower its risk-based capital requirements by selling whole mortgages and replacing them with agency-insured mortgage-backed securities. If deposit supply exceeds local loan demand, the bank will have an incentive to keep its original mortgage portfolio as well as purchase some additional assets. Conversely, in situations in which loan demand is high relative to deposits, the bank has more of an incentive to "roll" the mortgage pool, acting as what amounts to a mortgage broker.

Review. Table 1 presents a comparison of holding the current fixed-rate mortgage pool without default insurance and various alternatives discussed earlier. The comparison is made across eight risk and return characteristics, including credit, interest rate, geographic and prepayment risks, expected cash flow, capital requirements, liquidity dimensions, and borrowing costs. For each category, it is indicated whether the asset leads to a higher, lower, or similar level than the whole, unenhanced mortgage option. As an example, consider the CMO tranche asset choice. Credit risk is lower because a mortgage-backed security incorporates default insurance, while interest rate risk is lower because the maturity of the CMO is, presumably, better matched with the bank's liabilities. Geographic risk is lower because it is assumed that the bank has purchased from one or more pools that originated outside the region, but prepayment risk is the same because the CMO is still backed by whole mortgages. Expected cash flow is lower because the CMO's returns are reduced by insurance and servicing costs. Marginal capital requirements are lower because government- or agency-insured mortgage-backed securities have risk-based capital standards of 0 percent or 20 percent, respectively, as opposed to 50 percent for uninsured, whole mortgages. Finally, liquidity is higher because a ready secondary market exists for mortgage-backed securities but not for unsecuritized whole loans.

Adjustable Rate Mortgages. Adjustable rate mortgages (ARMs) have been used increasingly by banks over the past fifteen years in an effort to reduce their exposure to interest rate risk. It is possible to construct a table, similar to Table 1, contrasting the risk and return tradeoffs associated with ARMs with those arising from alternative investments. The main difference in the two tables would come from the fact that ARMs obviously carry less interest rate risk than fixed-rate loans but generally have lower expected cash flows. Credit risk for ARMs is higher because borrowers may not be able to afford the higher payments associated with an increase in interest rates. While maximum rates, or "caps," are written into ARM agreements in order to guard against this problem, caps leave the financial institution holding some residual interest rate risk. Moreover, because ARM rates decline as market interest rates fall, the holder of an ARM may be somewhat less exposed to prepayment risk. Prepayment risk still exists, however, to the extent that in low-rate environments borrowers prepay their ARMs and refinance with a fixed-rate mortgage. Finally, it should be noted that ARM contracts also contain interest rate "floors." Therefore, ARM holders could, in principle, face some prepayment risk if the index on which the ARM is based is "sticky." That is, if rates on the ARM held by the bank change less quickly than market rates on new mortgages, investors may have an incentive to prepay when market rates fall below the floor. Of course, even in this case, the prepayment risk is less than that on a fixed-rate mortgage because the ARM carries a rate close to current market rates.

The Business of Mortgage Servicing

A third source of value created by mortgage lending is the mortgage servicing function. The servicing business is similar to origination in that it is fee-oriented, with heavy investments in labor, plant, and equipment and relatively little use of the balance sheet. And like origination, the servicing business can contribute to the bank's overall risk and return with an impact far beyond its slender use of assets. However, servicing

Table 1
Comparison of Retaining Whole Mortgage Portfolio to Other Asset Options
(Assumes no credit enhancement)

Asset Options	Credit Risk	Interest Rate Risk	Geographic Risk	Prepayment Risk	Expected Cash Flow	Capital Requirements	Liquidity	Borrowing Costs
Retain Mortgages with Default Insurance	lower	same	same	same	lower	lower	higher	same
Reduce Balance Sheet	unclear	lower	same	eliminated	lower	lower	higher	NA
Nonmortgage Government Securities	lower	lower	lower	eliminated	lower	lower	higher	lower
New Commercial and and Industrial Loans	higher	lower	same	eliminated	unclear	higher	lower	same
Consumer Loans (e.g., Automobile)	higher	lower	same	lower	unclear	higher	lower	same
Passthrough Mortgage-Backed Securities	lower	same	lower	same	lower	lower	higher	lower
CMO Tranche	lower	lower	lower	same	lower	lower	higher	lower
New Whole Mortgages	same	same	same	same	unclear	same	same	same

differs from origination in important ways. The primary source of revenue from a servicing portfolio is the servicing fee—a part of the monthly mortgage payment withheld by the servicer before the balance of the cash flows is passed on to the loan's owner. The servicer is paid with a fixed percentage of each loan's outstanding principal balance, and not with a flat per loan fee. Servicing can also provide several sources of secondary revenue, including the float on the mortgage payment itself, interest on escrow accounts maintained by borrowers to cover property taxes and insurance, late payment fees, and cross-selling of other financial services.[11] Banks involved in the mortgage business have three options in handling servicing rights: to sell them on loans they have originated, to hold the rights to servicing these loans and collect the fees, or to purchase servicing rights on mortgages that others have originated.

The direct costs incurred in the servicing business come primarily in transaction processing and accounting. From a cost accounting perspective, most of the costs of servicing can be seen as constant variable costs per loan (that is, servicing costs are similar whether a mortgage's balance is $50,000 or $200,000). Therefore, there exist substantial economies of scale in the business of mortgage servicing. Also, unlike in origination, there is no up-front marketing component to servicing costs. The servicer is, in effect, simply processing mortgage payments. Indeed, because standard servicing fees are well in excess of the costs of servicing, the right to service a mortgage is a valuable asset. As a result, a substantial market has developed for the trading of servicing rights.

The asset value of servicing rights is the present value of fees collected minus costs. This difference is commonly referred to as "excess servicing." By far the biggest risk to this value arises from prepayment risk. In fact, the prepayment risk of servicing is typically much higher than that of the underlying mortgage asset. This follows from the fact that, should prepayment occur, the holder of the underlying mortgage has the prepaid principal to reinvest, while the holder of the servicing asset has nothing. That is, once prepayment has occurred, all of the promised cash flows from the servicing contract disappear, but some of the promised cash flows on the underlying mortgage are recovered. It should be noted, however, that if the prepaid mortgages are reoriginated at the same bank, the servicing income will be maintained.

Since servicing fees may be viewed as a form of interest, mortgage servicing rights behave very similarly (in terms of prepayment risk) to "interest only" (IO) strips. IOs entitle the holder to receive the interest component of the mortgage payment without principal. Both servicing and IOs can generate positive cash flows only while the mortgage contract is outstanding. Therefore, sharp declines in interest rates, or any other factor that causes prepayments to be more sensitive to interest rate movements, such as streamlined refinancing programs, will cause large declines in the value of servicing rights. Conversely, rising interest rates can cause prepayments to slow, thereby increasing the value of servicing rights. This quality of mortgage servicing rights—that they increase in value if interest rates increase—can be useful for purposes of diversification since the value of most fixed-rate securities (including term loans) moves inversely to interest rate changes.

Because of the acuteness with which prepayment risk is felt on a servicing portfolio, the successful manager must pay a great deal of attention to the likelihood of prepayments. The risk/return qualities of a servicing portfolio depend primarily on the interest rates of the underlying loans relative to current mortgage origination rates. As interest rates move, this risk/return profile can dramatically change. The extremely high volatility of servicing income makes the analytical costs and analytical risks of this business even higher than for management of the mortgage asset.

Conclusion

Table 2 summarizes the discussion concerning risks, returns, capital commitments, and costs associated with the three components of mortgage lending: origination, the mortgage asset, and servicing. The key to interpreting this table involves recognizing that these three investment decisions are separable. For example, an institution may choose to originate mortgages, securitize and sell the resulting portfolio, and retain the servicing rights. In this case there are revenues from points/fees on the front end of the contract and cash flows from servicing the contracts as long as they are outstanding. Expenses are almost exclusively those associated with labor and the fixed costs of setting up operations. Equity commitments are low. Risks include revenue instability in the origination function associated with volatility in the housing market and substantial prepayment-related risk inasmuch as the value of servicing rights is much more sensitive to prepayments than the value of the underlying mortgage portfolio.

Table 2
Summary of Cash Flow and Risk Characteristics of Mortgage-Related Activities

	Origination	Mortgage	Servicing
Sources of Revenue	Points/fees from lending Profit on sale of mortgage or mortgage-backed security Interest on loans in pipeline	Return on assets	Servicing fees (percentage of loan balances) Float on mortgage payment, escrow accounts Late payment fees
Expenses	Origination costs Funding costs for pipeline Hedging costs for pipeline	Funding costs Hedging costs for asset/liability management Portfolio management expenses	Servicing costs
Capital Commitment	Low	Moderate	Low
Risks	Revenue instability from volatile housing market Market risk on pipeline assets before sale Market risk on fixed-rate loan commitments Fraudulent or careless origination practices	Default risk on nonagency whole loans Fixed-rate mortgage: prepayment risk, interest rate risk Adjustable rate mortgage: prepayment risk, rate cap risk Asset/liability management: interest rate risk mismatch	Prepayment risk on loans backing servicing portfolio Loss of revenue from delinquencies and foreclosures Streamlined refinancing programs increase prepayment risk

Ultimately, the answer to the question of what parts of the mortgage contract a bank should hold and what portions it should sell off depends on a variety of risk/return factors. This discussion has provided an overview of some important aspects of the decisions facing bankers in this important and growing area of bank-related activities. While the trend has been toward holding securitized mortgage instruments, the added liquidity, geographic diversification, and lower capital requirements must be balanced against the fact that institutions that are typically earning no more than 1 percent return on assets are paying nontrivial fees (up to 50 basis points) to purchase these benefits.

At a general level, both managers and regulators should also be aware that the risks faced by banks engaged in the more fee-oriented aspects of this business may not be as severe as one might imagine when looking at the activities in isolation. In particular, the value of servicing rights behaves much like that of interest-only strips, which rises with an increase in interest rates. When viewed in a portfolio context, such an instrument may help diversify the interest rate–related risks faced by a bank that is simultaneously engaged in originations, since the revenue stream from this latter activity tends to be inversely related to fluctuations in interest rates. Finally, it may be appropriate, given the low levels of default on whole mortgages, to reconsider the differential capital requirements on securitized agency instruments and locally originated mortgages held on the balance sheet.

Notes

1. This paper has ignored holdings of collateralized mortgage obligation (CMO) tranches when counting total mortgage assets or total mortgage-backed security holdings. Because CMO holdings reported on the call reports filed with bank regulators include securities backed by both residential and commercial mortgages, it is impossible to isolate residential CMOs. The figures for whole mortgages are for one- to four-family residential dwellings only.
2. Adjustable rate mortgages (ARMs) are discussed separately in a later section.
3. Within this article, the term *government agency* includes both "full faith and credit" agencies such as the Government National Mortgage Association (GNMA) and government-sponsored enterprises like the Federal National Mortgage Association (FNMA) and the Federal Home Loan Mortgage Corporation (FHLMC).
4. It is assumed that the bank will always pool its mortgages into a portfolio prior to selling, whether or not it is securitized. While it is possible to sell individual mortgages, the market is quite illiquid, and buyers of single loans require high risk premiums.
5. For a more detailed discussion of the relationship between prepayment risk and mortgage funding, see Gilkeson and Smith (1992).
6. See "Risk Based Capital Guidelines for Bank Holding Companies," Appendix A to Regulation Y, *Bank Holding Companies and Change in Bank Control*, 12 CFR 225 as amended September 2, 1994.
7. For a more thorough discussion of the regulatory perspective on sales with recourse, see Boemio and Edwards (1989).
8. One exception may be commercial mortgages (collateralized commercial real estate loans). Increasing securitization and a growing secondary market for commercial mortgages has substantially increased their liquidity.
9. See Smith and Spudeck (1993) for a review of the liquidity preference theory of the term structure of interest rates.
10. A repurchase agreement, or *repo,* is a money market transaction in which one party sells securities to another while agreeing to repurchase those or similar securities at a later date for the same price plus interest. It is widely used for inexpensive short-term collateralized borrowing.
11. Fabozzi and Modigliani (1992) provide an elaboration concerning the potential secondary sources of revenue associated with providing the mortgage servicing function.

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Revisions to Payroll Employment Data: Are They Predictable?

Andrew C. Krikelas

Nonfarm payroll employment data provide one of the most important sources of current information on economic activity at the national, state, and local levels. Collected and published monthly by the Bureau of Labor Statistics (BLS), these data provide not only a timely picture of overall employment conditions but also detailed information on trends at the industry level. In addition, these data focus on an economic variable that is of interest to the general public as well as to fiscal and monetary policymakers. The monthly release of nonfarm payroll employment statistics therefore affects both the public's perception of current economic conditions and the decisions of national, state, and local policy authorities who seek to influence economic activity at all levels.

Unfortunately, while the survey methodologies used to produce preliminary estimates of total and industry nonfarm payroll employment identify current employment trends reasonably well, they do not do this job perfectly. Payroll employment statistics are revised on an annual basis, and sometimes these revisions can be quite large. For example, substantial downward revisions to preliminary employment estimates for both 1990 and 1991 revealed that the 1990-91 recession was more severe than survey data originally indicated (see Table 1). However, these revised statistics were not available for analytical purposes until after the nation already was out of that recessionary period, far too late to have value for fiscal or monetary policy action.

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The importance of monthly payroll employment statistics to both business decisions and economic policymaking—and the fact of their revision on an annual basis—raises the following question: Is there any way to predict the direction and magnitude of industry payroll employment revisions? Research by David Neumark and William L. Wascher (1991) indicates that, at the national level, the answer to this question is yes. Recent research conducted by this author confirms Neumark and Wascher's results and further suggests that, in most cases, revisions to preliminary state payroll employment estimates may also be predictable. In presenting the new research, this article discusses the process by which revised data replace preliminary survey data at both the state and national levels, confirms Neumark and Wascher's (1991) results, and extends these results to demonstrate that it may also be possible to predict annual revisions to preliminary state employment statistics.

Table 1
Preliminary and Final BLS Estimates of Total U.S. Nonfarm Employment: 1976-93
(Annual March employment, in thousands)

Year	Preliminary Estimate	Final Benchmark	Size of Revision
1976	77,906	78,092	186
1977	80,547	80,493	–54
1978	83,734	84,607	873
1979	87,346	88,654	1,308
1980	89,960	90,253	293
1981	90,720	90,371	–349
1982	89,679	89,566	–113
1983	88,172	88,232	60
1984	92,234	92,587	353
1985	96,045	96,042	–3
1986	98,617	97,987	–630
1987	100,462	100,202	–260
1988	104,161	103,535	–626
1989	107,017	106,624	–393
1990	109,581	108,606	–975
1991	108,147	107,507	–640
1992	107,359	107,300	–59
1993	108,672	108,935	263

Source: Calculated by the Federal Reserve Bank of Atlanta using data from the Bureau of Labor Statistics, U.S. Department of Labor.

*P*ayroll Employment Data: The Establishment Survey

Each month, the BLS releases detailed industry information on employment, hours, and earnings in its publication *Employment and Earnings*. Although most of the statistics focus on national industry variables, state industry data also are reported.[1] As will be discussed, the preliminary estimates of current state and national employment, hours, and earnings reported in this publication are based on information derived from a survey of approximately 370,000 business establishments. The survey is designed to provide an accurate measure of state and national industry trends, but these preliminary estimates always are subject to revision, and such revisions are made only with a substantial lag. These realities pose difficulties for timely and effective decision making.

A second complication with respect to these data is the fact that state and national industry statistics are not directly comparable. National data, both pre- and postrevision, are derived primarily from survey information. By contrast, although survey information is used to produce preliminary state payroll employment estimates, final revised state industry data are derived from a nearly complete census of local employers.[2] Therefore, in order to be clear about the relationships that exist between the preliminary and revised versions of state and national industry statistics, it is necessary to consider the sources of this information in some detail.

As mentioned earlier, at the national level preliminary monthly estimates of industry employment levels, hours worked, and wages earnings are derived from a survey, known as the establishment survey, of approximately 370,000 U.S. business establishments. The sample of firms surveyed each month ranges from goods-producing mining and construction companies, to service-producing wholesale and retail sales establishments, to local, state, and federal government agencies. The collection and analysis of these survey results is a collaborative effort between the BLS in Washington and state administrators of federally mandated unemployment insurance (UI) programs, most of whom are employed by their respective state's department of labor.

In accordance with the mandates of this program, all firms paying social security taxes on their employees must file a detailed quarterly statement, an ES-202 report, with state UI program administrators. The report requires firms to provide a monthly summary of their

average employment levels, the total number of hours worked, and the dollar value of wages paid to employees. Approximately 98 percent of total nonfarm employees in the United States are covered by the provisions of these UI programs so that when the states compile the monthly information contained in these quarterly reports, they obtain a virtual census of state nonfarm employment. However, the fact that the reporting procedure is quarterly causes delays, as does the need to clean up the data before they can be published. The result is a substantial lag in availability of data.[3]

To produce more timely preliminary estimates of state and national employment, the BLS created the establishment survey. Unlike the quarterly ES-202 reports required of all employers, monthly surveys, known as the BLS-790 reporting form, are collected from a small sample of state firms. The sample is stratified according to firm size and industry type and usually includes a nearly complete accounting of the largest employers in the state. Each month, state UI administrators must collect the completed BLS-790 surveys, compile their results, forward a copy of the data to the BLS for its use in deriving national industry statistics, and retain a copy for deriving state industry estimates.

Of concern to users who wish to analyze national employment trends is the fact that the national and state preliminary estimates differ in the quality of the survey information used to depict current economic activity and in the methodology used to analyze the results of monthly surveys. First, state-level survey sample sizes are too small, in general, to produce reliable industry estimates below the two-digit SIC level of disaggregation. By contrast, for the nation the complete sample is large enough to produce industry estimates at the more disaggregated three- and four-digit SIC code level. As a result, the national survey produces a more finely tuned picture of current economic activity.

Second, substantial methodological differences characterize analysis of the monthly survey results at the state and national levels. The BLS produces preliminary national industry statistics using information from the entire sample, which is stratified according to industry type and firm size and designed to provide reliable estimates of nearly 1,700 categories of firms, classified according to approximately 250 industry types and nine size classes.[4] The BLS uses BLS-790 survey results to produce estimates for each of the categories and then sums the appropriate elements of the resulting matrix to produce monthly estimates of total, sectoral, and industry employment levels, hours, and earnings for the nation.

Before releasing the data to the public, however, the BLS adjusts these industry statistics to account for cyclical variations in industry employment trends. During the course of the business cycle, firm births and deaths generally occur at varying rates. During periods of economic recovery and expansion, new firms tend to develop in relatively large numbers, thereby boosting employment totals; in contrast, during periods of economic contraction, existing firms tend to go out of business in relatively large numbers, resulting in job losses. Because delays in reporting firm births and deaths can skew the representativeness of the sample at any given time, the BLS has developed a procedure known as bias adjustment to account for such cyclical variations. The BLS began calculating bias adjustment factors in the early 1980s, and BLS estimates of employment at cyclical turning points have subsequently more closely matched revised data.

At the state level, the relatively small size of the survey samples makes it impossible for UI program administrators to adopt the BLS methodology in its entirety. In particular, the states do not attempt to replicate the BLS matrix nor its four-digit level of detail but instead produce estimates at the more disaggregated two-digit level. In addition, although the states do calculate bias adjustment factors in order to account for cyclical variations in industry employment, the small size of the state samples introduces greater variability in these factors than occurs at the national level. The statistical properties of each of the state samples are different enough that it is inadvisable to add up preliminary state industry estimates for purposes of analyzing national employment trends. The BLS warns its readers not to do so, and none of its published reports include sum-of-states variables, preliminary or revised.

Within six weeks of the initial data collection, BLS officials and state UI program administrators are able to release to the public a wide range of current national and state industry statistics. Preliminary national industry statistics for any given month are released on the first Friday of the month subsequent to the collection of survey data, and preliminary state data are released during the last week of that same month. These survey-based preliminary estimates are generally reliable indicators of state and national industry trends. Because all preliminary estimates are revised at least twice, however, the result may be substantial changes that are significant for the perception and analysis of economic trends, as mentioned above. The first of these data revisions occurs in the month immediately subsequent to their initial release. At this time, additional information

obtained from late or corrected survey responses is added to the original sample, and estimates are recalculated. Like the data that they replace, therefore, these revised preliminary estimates are based solely upon information contained in BLS-790 surveys.

By contrast, the second and theoretically final set of revisions also incorporates information from quarterly ES-202 reports.[5] In general, the states collect, clean up, and compile the results of quarterly ES-202 reports within a one-year period. As previously indicated, the quarterly ES-202 reports provide a virtual census of local nonfarm payroll employment. Approximately 2 percent of total state nonfarm employment, however, is not covered by the mandates of the unemployment compensation program, and instead state administrators tap alternative data sources in order to obtain estimates of this employment. Nevertheless, at the state level, final revised monthly industry statistics are derived from something that is very close to being a complete census of local nonfarm business establishments.

The BLS has developed a hybrid approach that combines information from both ES-202 reports and BLS-790 surveys to produce final revised national statistics. The BLS collects complete ES-202 data from each state only for the month of March. These state data are summed to create national totals for each of the 1,700 series previously estimated using BLS-790 survey data alone. The appropriate cells in this matrix are again aggregated to produce national statistics for total, sectoral, and industry variables. However, this time the national totals derived by summing state ES-202 data produce March population benchmarks for each of these series.

Once established, March population benchmarks are compared with revised preliminary March estimates for each of the firm types tracked. This comparison determines both the direction and the magnitude of the revisions required to bring each pair of series—preliminary and final—into line. As illustrated by the sectoral data presented in Table 2, some preliminary estimates may be adjusted upward and others downward. In the aggregate, of course, total U.S. nonfarm payroll employment revisions will be either positive or negative. The upward revision of 263,000 to total employment in the most recent rebenchmarking of data for March 1993 was the first such upward adjustment since March 1984 (see Table 1).

In the final step of this process, the BLS uses a "wedge-back" procedure to distribute industry revisions back through the preliminary data to April of the previous year.[6] Accordingly, one-twelfth of the benchmark revision is added to the revised preliminary estimate for April of the preceding year; this fraction then increases monthly until eleven-twelfths of the revision is added in February of the benchmark year.

In contrast, then, to state final revised estimates, which are derived primarily from the information contained in ES-202 reports, final revised national industry statistics are derived from a hybrid of census and survey information. On the one hand, census information is used to derive March benchmarks for all industry variables and to adjust the levels of these series for the period between March benchmark observations. On the other hand, in this intervening period BLS-790 survey information still largely determines the month-to-month changes in industry variables. Therefore, even in their final revised form, national industry statistics incorporate a great deal of information obtained from monthly surveys.

Table 2
Benchmark Revisions to Sectoral Employment: March 1993
(Employment in thousands)

Sector	Preliminary Estimate	Final Benchmark	Size of Revision
Mining	590	603	13
Construction	4,109	4,177	68
Manufacturing	17,768	17,974	206
Transportation, Communication, and Public Utilities	5,662	5,720	58
Trade	25,228	25,036	–192
Finance, Insurance, and Real Estate	6,533	6,633	100
Services	29,612	29,647	35
Government	19,170	19,145	–25
Total	108,672	108,935	263

Source: Calculated by the Federal Reserve Bank of Atlanta using data from the Bureau of Labor Statistics, U.S. Department of Labor.

Characteristics of National and State Payroll Employment Revisions

The key to more accurately predicting payroll employment revisions lies in understanding some important characteristics of these revisions. These characteristics

and their interrelatedness can be illustrated best by comparing the two sets of preliminary and revised March data for the 1976-93 period reported in Table 3, as well as two other variables that can be derived from these data. The two primary series reported in this table include total U.S. nonfarm payroll employment as published by the BLS along with the alternative national total that can be derived by summing state-level data. The two additional variables that can be calculated from these data include the revisions made to each of the preliminary totals and the gap between the two national series, preliminary and revised.

The preliminary totals reported in Table 3 are identical to the revised preliminary statistics originally reported by the BLS in their publication *Employment and Earnings*.[7] By contrast, the "final" revised data reported in the table represent the latest revisions made to official payroll employment statistics. Several significant revisions have been made to these series over the years, and only the latest version of these data were examined in this research.[8] Therefore, the revised values reported in Table 3 generally are not the same as those originally published by the BLS.[9]

An examination of the two sets of data presented in Table 3 reveals several interesting relationships. First and foremost, perhaps, is the fact that the stories told by each of the revised national total employment series are quite similar. Since 1976 the U.S. economy has been through two complete oscillations of the business cycle, both of which are reflected in these series. In particular, each of these national totals captures a period of expansion (1976-81) and recession (1981-82) followed by a second period of expansion (1983-90) and recession (1990-91). In fact, as the year-over-year growth rates reported in Table 4 indicate, the two final revised series provide nearly identical pictures of annual employment trends. Although this result might be expected given that the March values of the series are so closely related, it is important to note that the annual averages calculated from all of the available monthly data reveal a similarly close correspondence between year-over-year growth rates.[10]

In contrast to the relatively tight relationship that exists between the year-over-year growth rates implicit in the revised data, growth rates calculated from preliminary estimates of both of these series often differ, sometimes quite substantially. In some cases, in fact, these different estimates can lead to very different assessments of the overall health of the national economy. For example, while preliminary national data for March 1992 seemed to indicate a deceleration of employment losses associated with the 1991 recession, the preliminary sum-of-states total appeared to indicate a deepening of the recession. The release of final data revisions demonstrated that the recovery already was underway, however, and that it was much stronger than originally suggested by the preliminary data in both cases. In general, preliminary national data offer a more precise picture of current economic activity than the sum-of-states alternative. The BLS's decision not to provide sum-of-states totals in their publications therefore appears reasonable.

Given the way in which preliminary national and state estimates are derived, it is not surprising that the average size of the sum-of-states revision is significantly larger than its national counterpart. Measured in relative terms, the average size of the national revision during the period studied was 0.53 percent of the contemporaneous national total. The average size of a similar measure of revisions to the sum-of-states total was a much higher 0.88 percent, reflecting revisions for individual states that ranged from a low of 0.72 percent for Minnesota to a high of 2.88 percent for Wyoming. As these percentages show, revisions to preliminary national totals are substantially smaller than those for either the sum-of-states variable or for any of the states individually.

In addition to being large relative to their national counterpart, the revisions to the sum-of-states variable also appear to have a cyclical pattern. Although the states do calculate bias adjustment factors to account for cyclical differences in the rate of firm births and deaths, the relatively small size of the state survey samples introduces greater variability in these bias adjustment factors than is the case at the national level. As a result, preliminary estimates of the sum-of-states total still tend to be revised upward during periods of recovery and expansion (as was the case in 1976, 1978, and 1984) and revised downward during recessionary periods (as in 1982, 1990, and 1991).

The final variable presented in Table 3 is the gap variable, which measures the difference between the national and sum-of-states employment totals. One of the most interesting features of the data in the table is the fact that the gap between the two revised national totals is consistently negative throughout the seventeen-year period under examination. On the one hand, this relationship highlights the fact that there is a fundamental difference between the way in which the states and the BLS define total nonfarm employment, with the gap apparently identifying approximately 300,000 federal employees counted by the states but not recognized by the federal government. On the other hand, the relatively tight relationship that is apparent in the

Table 3
Total Nonfarm Payroll Employment
Preliminary and Revised National and Sum-of-States Totals, 1976-93
(Annual March observations, in thousands)

Year	BLS National Total		Size of Revision	Sum-of-States Total		Size of Revision	Gap between Two Totals	
	Preliminary	Revised		Preliminary	Revised		Preliminary	Revised
1976	77,906	78,092	186	77,083	78,352	1,268	823	–260
1977	80,547	80,493	–54	80,061	80,850	789	486	–357
1978	83,734	84,607	873	83,359	85,033	1,674	375	–426
1979	87,346	88,654	1,308	88,111	89,045	933	–765	–391
1980	89,960	90,253	293	90,483	90,572	89	–523	–319
1981	90,720	90,371	–349	90,737	90,761	24	–17	–390
1982	89,679	89,566	–113	90,286	89,860	–426	–607	–294
1983	88,172	88,232	60	88,499	88,617	118	–327	–385
1984	92,234	92,587	353	91,688	92,967	1,279	546	–380
1985	96,045	96,042	–3	96,081	96,182	102	–36	–140
1986	98,617	97,987	–630	98,594	98,198	–396	23	–211
1987	100,462	100,202	–260	100,523	100,426	–97	–61	–224
1988	104,161	103,535	–626	103,502	103,802	300	659	–267
1989	107,017	106,624	–393	106,401	106,765	364	616	–141
1990	109,581	108,606	–975	109,031	108,850	–181	550	–244
1991	108,147	107,507	–640	109,097	107,607	–1,490	–950	–100
1992	107,359	107,300	–59	107,357	107,633	276	2	–333
1993	108,672	108,935	263	108,682	109,217	589	–10	–336

Source: Calculated by the Federal Reserve Bank of Atlanta using data from the Bureau of Labor Statistics, U.S. Department of Labor.

two revised national employment totals provides an indication that these two variables might be cointegrated, a statistical relationship that by definition would imply a stable, long-run correlation between these two series. In an important article in the econometrics literature, Robert Engle and Clive W.J. Granger (1987) prove that if such a cointegration relationship can be demonstrated to exist between two or more variables, this information can be used to improve forecasts of each variable. In particular, their research suggests that the long-run restriction implied by such a relationship can be incorporated within the context of an error-correction model, which can then be specified and estimated to generate improved forecasts of the cointegrated variables.

In terms of its overall structure, an error-correction model is quite similar to a vector autoregression: lagged values of each of the dependent variables in a system of equations enter each equation as explanatory variables. In an error-correction model, however, an additional variable, an error-correction term, is added to each equation in order to impose the restriction that there exists a long-run relationship between these cointegrated variables. Given that statistical tests performed on the revised national and sum-of-states data series indicate that these variables likely are cointegrated, econometric theory suggests that an error-correction model might be useful for predicting each of these revised employment totals.[11] Indeed, recent research conducted for the present study indicates that such models can be used successfully to predict both the sign and the magnitude of revisions to national, sum-of-states, and the majority of individual state employment totals. Because this approach appears to outperform an alternative model developed and tested by Neumark and Wascher (1991), the final section of this article will compare these two forecasting methodologies.

Predicting Revisions to National and State Employment Totals

Although the precise question addressed by Neumark and Wascher (1991) differs somewhat from the one explored in this article, their results are reported in

Table 4
Year-over-Year Growth Rates Implicit in Preliminary and Revised National and Sum-of-States March Employment Totals
(Percent change)

March of	Preliminary Data		Revised Data	
	National	Sum-of-States	National	Sum-of-States
1977	3.39	3.86	3.07	3.19
1978	3.96	4.12	5.11	5.17
1979	4.31	5.70	4.78	4.72
1980	2.99	2.69	1.80	1.73
1981	0.95	0.28	0.13	0.21
1982	–1.25	–0.50	–0.91	–0.99
1983	–1.68	–1.98	–1.52	–1.38
1984	4.61	3.61	4.90	4.91
1985	4.13	4.79	3.68	3.46
1986	2.68	2.61	2.15	2.10
1987	1.87	1.96	2.26	2.27
1988	3.68	2.96	3.33	3.36
1989	2.74	2.80	2.98	2.85
1990	2.40	2.47	1.86	1.95
1991	–1.31	0.06	–1.01	–1.14
1992	–0.73	–1.60	–0.19	0.02
1993	1.22	1.23	1.52	1.52

Source: Calculated by the Federal Reserve Bank of Atlanta using data from the Bureau of Labor Statistics, U.S. Department of Labor.

such a way that comparisons can be made between the two research efforts. Neumark and Wascher asked the following question: Can the BLS improve on its preliminary estimates of month-to-month changes in nonfarm payroll employment by using additional information available at the time of initial release of the estimates? Their statistical tests answered this question positively. In particular, Neumark and Wascher found that three pieces of labor market information—changes in household employment as measured by the Current Population Survey (CPS), changes in the number of persons receiving unemployment insurance benefits, and changes in the number of initial claims filed for such benefits—appeared to contain information that could improve the accuracy of BLS preliminary employment estimates.

Neumark and Wascher then conducted an out-of-sample forecasting competition in which they used their statistical model to produce forecasts of the BLS final data revisions. In their single-equation model, the authors regressed observed revisions to total employment against a set of explanatory variables that included, in addition to the three labor market series described above, the BLS preliminary employment growth estimate and a constant. They used this model to forecast BLS data revisions, one to twelve months into the future, and compared these forecasts with actual revisions reported by the BLS. Neumark and Wascher found that they were able to improve upon the accuracy of the preliminary growth estimates by 22 percent (that is, on average their forecasts were 22 percent closer to the final revised growth rates than the preliminary estimate) as well as correctly to predict the direction of these final revisions (upward or downward) relative to preliminary figures 77 percent of the time.

Whereas Neumark and Wascher focused on predicting revised BLS employment growth estimates (month-to-month changes in the levels of total employment), the focus of the present research has been on the prediction of revised national and state employment totals—total employment levels, not growth rates. Another significant difference in the two studies is that while the data Neumark and Wascher analyzed in their study were seasonally adjusted, the data examined in the present study were unadjusted.[12] In addition, whereas Neumark and Wascher adopted a single-equation modeling strategy for producing employment growth forecasts, the error-correction models estimated in the present study represent a system of equations: one two-equation system for predicting revised national and sum-of-states employment totals and fifty-one separate three-equation systems for predicting revisions to individual state employment totals.[13] Despite these differences, the results of out-of-sample forecasts produced by these error-correction models can be reported in such a way that the forecasting methodologies can be compared.

Design of the Research Models. Prior to conducting the out-of-sample forecasting competition that forms the basis of the present research, two questions had to be resolved concerning the exact specification of these models. First, given the fact that each equation in an error-correction model contains lagged values of each variable in the system as explanatory variables, the appropriate number of lags to include had to be specified. And second, because Neumark and Wascher's (1991) research demonstrated that models that inclued additional labor market information could produce significantly better forecasts of BLS data revisions, it seemed reasonable to investigate whether such variables ought to be included in the error-correction models as well. In order to resolve these two issues, preliminary in-sample tests were conducted on seven alternative model specifications. Of these, three represented pure error-correction models, differing only in terms of the lag structure of the right-hand variables (*ECM*), and four represented augmented error-correction models, which in addition to exploring different lag structures also included CPS measures of household employment and unemployment as explanatory variables (*ECM + LF*).

According to the specification search employed in this research, seven alternative models were estimated to produce in-sample forecasts of revised total employment for the nation, the sum-of-states variable, and each of the states. Four sets of one- to twelve-month forecasts were calculated for the forty-eight month period between April 1984 and March 1988. The results of each of the alternative forecasting models were compared with final revised BLS data, and the models were ranked according to their accuracy in predicting the final revised employment totals and the direction of these revisions relative to the preliminary BLS estimate. Using this dual set of selection criteria, fifty-two models, one for both the national and sum-of-states data and fifty-one individual models for each of the states, were chosen for a second, out-of-sample forecasting competition. Of the fifty-two models, twelve were pure error-correction models, and forty were augmented error-correction models.

Results of the Forecasting Competition. A second forecasting competition was performed for the sixty-month period between April 1988 and March 1993. Five sets of one- to twelve-month forecasts were calculated for each employment total. Once again, two

measures of success were calculated to assess the relative accuracy of these models. The results are reported in Table 5. The first two columns identify the models. The fourth column reports the mean absolute percent difference between the model forecast and the actual revised BLS total, which can be compared with the size of the actual data revisions reported in the third column.[14] The fifth column reports the results of this comparison, indicating the percentage of improvement, if any, relative to the preliminary estimates. The final column reports the percentage of the sixty months under examination in which the models' forecasts correctly predicted the direction of the final revision relative to the preliminary estimates.

Evaluation of the Results. An examination of the results presented in Table 5 yields the following observations. First, as indicated above, the augmented error-correction model specified for the national and sum-of-states variable produces results that are superior to the single-equation model specified by Neumark and Wascher (1991): their forecast errors were 22 percent smaller than the actual BLS revisions, and this alternative specification generated forecast errors nearly 40 percent smaller. Similarly, the Neumark and Wascher model predicted the direction of the BLS final revision 77 percent of the time; this alternative methodology does so more than 83 percent of the time for both variables. It is also important to note that the period over which Neumark and Wascher ran their forecasting experiment, March 1985 to March 1989, contained no cyclical turning points. The period covered in the present forecasting experiment included such a turning point, the 1990-91 recession. In many respects, therefore, the superior results of the current experiment were gained over a forecast period that provided a much greater challenge to the competing models.

At the state level, thirty-four of the fifty-one models examined produced forecast errors that were smaller, often substantially so, than the BLS revisions. Of the thirty-four, twenty-seven recorded reductions in forecast errors of over 20 percent, twenty-one recorded reductions of more than 30 percent, fourteen recorded reductions greater than 40 percent, and seven recorded reductions in excess of 50 percent. In addition, twenty-nine of these models were able to predict the direction of final BLS revisions correctly at least 75 percent of the time, twenty-two did so at least 80 percent of the time, and six were able to do so at least 90 percent of the time.

Examining the results for the seventeen states for which the specified models failed to improve on the preliminary BLS estimates leads to several observations. First, when all states are ranked according to the size of their actual revisions over this five-year period, eight states (DE, DC, IN, MN, NY, ND, UT, and WV) rank among the nine having the smallest actual revisions. Kansas was the only state for which the model did better than state estimates. For these states with small revisions, preliminary BLS employment estimates already were relatively good, and the models, which were designed to improve upon these estimates, clearly were unable to do so. Second, of the remaining nine states that showed no improvement over the preliminary BLS estimates, four were specified as pure error-correction models (ID, NJ, NC, and VA). Because augmented error-correction models generally performed better than pure ECM models, it is possible that an augmented error-correction model specification for these states might have produced better results than those that were reported.

The monthly release of nonfarm payroll employment statistics affects both the public's perception of current economic conditions and the decisions of policymakers at all levels.

Finally, the uniquely poor performance of the models specified for Alaska and West Virginia provide a clue to an alternative modeling strategy. In each of these states, resource extraction industries play an unusually large role in determining the performance of the state economy. Disaggregation of total employment into its sectoral or industrial components, therefore, likely would help improve the estimation of total state employment. The modeling strategy discussed above can be modified to produce forecasts at the industry level, and previous research (Andrew C. Krikelas 1991) indicates that such a strategy probably would help improve forecasts of total state employment.[15]

Predicting Final Revisions for 1993-94. Despite the fact that models specified for seventeen states did not perform well in this particular competition, the

Table 5
Results of Out-of-Sample Forecasting Competition: Actual and Forecast Revisions, April 1988-March 1993

State	Model	Actual Revision (Percent)	Forecast Error (Percent)	Improvement (Percent)	Correct Sign (Percent)
US	ECM+LF	0.66	0.41	38.19	86.67
USS	ECM+LF	0.67	0.42	37.63	83.33
		States Showing Improvement			
AL	ECM+LF	1.43	0.68	52.39	90.00
AZ	ECM+LF	1.23	0.74	40.08	86.67
AR	ECM+LF	0.92	0.86	6.74	80.00
CA	ECM+LF	1.95	0.42	78.70	95.00
CO	ECM+LF	1.72	1.24	27.82	81.67
CT	ECM+LF	1.68	0.92	44.97	81.67
FL	ECM+LF	1.14	1.07	6.43	73.33
GA	ECM+LF	1.08	0.83	22.92	80.00
HI	ECM+LF	1.49	0.84	43.86	93.33
IL	ECM+LF	1.12	0.70	37.18	88.33
IA	ECM+LF	0.81	0.53	34.85	83.33
KS	ECM+LF	0.77	0.59	22.51	71.67
KY	ECM	1.39	1.35	2.83	75.00
LA	ECM+LF	1.54	1.06	30.80	68.33
MD	ECM	2.02	1.13	43.93	76.67
MI	ECM+LF	1.37	0.84	38.75	83.33
MS	ECM	0.85	0.63	26.04	85.00
MO	ECM+LF	1.45	0.96	33.81	76.67
MT	ECM	2.07	1.30	37.10	80.00
NE	ECM+LF	1.81	1.08	40.17	86.67
NV	ECM+LF	1.23	1.01	17.66	75.00
NM	ECM+LF	1.54	0.62	59.47	90.00
OH	ECM	0.98	0.91	7.35	71.67
OK	ECM+LF	2.09	0.83	60.26	93.33
PA	ECM+LF	0.80	0.44	44.57	83.33
RI	ECM+LF	1.67	1.53	8.71	70.00
SC	ECM+LF	1.25	1.00	19.78	78.33
SD	ECM+LF	2.10	1.14	45.93	80.00
TN	ECM+LF	2.00	0.68	66.09	78.33
TX	ECM+LF	1.10	0.52	52.59	81.67
VT	ECM+LF	1.45	1.02	29.64	80.00
WA	ECM+LF	0.84	0.42	50.67	90.00
WI	ECM+LF	1.09	0.66	39.33	81.67
WY	ECM+LF	2.00	1.49	25.57	76.67

Continued on next page

Table 5 continued

State	Model	Actual Revision (Percent)	Forecast Error (Percent)	Improvement (Percent)	Correct Sign (Percent)
		States Not Showing Improvement			
AK	ECM+LF	1.73	2.14	–23.17	75.00
DE	ECM+LF	0.78	1.54	–97.07	63.33
DC	ECM	0.56	1.17	–108.05	68.33
ID	ECM	0.98	1.20	–22.33	70.00
IN	ECM+LF	0.56	1.02	–81.59	65.00
ME	ECM+LF	1.24	1.82	–47.10	61.67
MA	ECM+LF	1.00	1.40	–40.15	56.67
MN	ECM+LF	0.42	0.58	–39.67	58.33
NH	ECM+LF	1.22	2.16	–76.27	65.00
NJ	ECM	1.44	1.72	–19.61	68.33
NY	ECM	0.58	0.98	–71.22	48.33
NC	ECM	1.11	1.26	–13.54	90.00
ND	ECM+LF	0.38	0.57	–50.19	68.33
OR	ECM+LF	0.93	1.34	–43.71	81.67
UT	ECM+LF	0.42	0.69	–65.85	63.33
VA	ECM	1.02	1.32	–28.97	68.33
WV	ECM	0.50	2.02	–302.49	48.33

Source: Actual revisions calculated by the Federal Reserve Bank of Atlanta using data from the Bureau of Labor Statistics, U.S. Department of Labor. Forecast errors derived by the author from the models described in the text.

modeling strategy outlined appears to have potential for predicting annual revisions to payroll employment data. If so, one important question remains: What do these forecasting models have to say about employment revisions for the period between April 1993 and March 1994? Although it would be unreasonable to supply point estimates because such forecasts obviously are subject to forecast error, the following more general observations concerning the forecasts derived from this research can be made: (1) monthly employment totals for the nation likely will be revised upward, and by an amount that is larger than last year's revisions; (2) the sum-of-states employment total likely will be revised upward by an amount substantially larger than last year's revisions; and (3) at the state level, forty-four states are likely to record upward revisions over the twelve-month period while seven are likely to record downward revisions. As a result, these models suggest that between April 1993 and March 1994 the U.S. economy grew more rapidly than originally indicated by preliminary survey data.[16]

Conclusion

On the first Friday of every month the BLS releases two separate pieces of labor market information that are eagerly anticipated—the national unemployment rate for the preceding month (and related national labor force statistics) and total nonfarm payroll employment, one of the many national industry statistics contained in the establishment payroll report. This set of labor market data includes not only national totals but also employment information for states and industries. It is important because it can directly affect the planning

and policy decisions made by businesses, governmental bodies, and individuals. However, the first reported estimates of total nonfarm employment levels for the nation and for states are subject to revision more than a year after the first estimate. Thus, the question arises whether the direction and magnitude of revisions to national payroll employment statistics can be predicted so as to give a more accurate picture of the economy well in advance of their revision.

The research reported in this article confirms research by Neumark and Wascher (1991) that indicated that the answer to this question is yes. Neumark and Wascher demonstrated that the BLS's preliminary, survey-based estimates of national payroll employment might be improved through the development of forecasting models that incorporate additional but concurrently available labor market information. The research reported here confirms Neumark and Wascher's findings, improves on their projections at the national level, and demonstrates that preliminary payroll employment estimates for a majority of states could also be improved using the forecasting methodology developed for the national data. In future research, it will be important to explore extensions of this model that analyze state and national employment trends at the industry level as well.[17] Given the relatively important role that payroll employment data play in the decision-making processes of private businesses and government policymakers, this and similar research efforts are likely to be of interest to both regional and macro economists for some time to come.

Notes

1. The industry data released in this and other BLS publications are categorized according to the Standard Industrial Classification (SIC) system. This system divides the economy into distinct sectors, the sum of which produces total employment figures for individual states or the nation. These sectors range from highly aggregated one-digit sectors (for example, mining, construction, manufacturing, and so forth) to much more disaggregated four-digit SIC industries (such as, manufacturing firms producing men's and boys' neckwear or retail sales establishments selling household appliances), with the two- and three-digit levels of disaggregation representing levels of industry detail that fall somewhere in between.
2. In addition, state administrators and BLS officials have slightly different definitions of federal government employment. While the states identify federal employees to be those covered by Unemployment Compensation for Federal Employees (UCFE) records, the BLS uses Office of Personnel Management (OPM) records to account for federal employees. This definitional difference drives a small wedge between the BLS and sum-of-states nonfarm employment totals, a fact which will be illustrated later in this article.
3. Each year, the BLS releases revised state and national industry statistics in the June issue of *Employment and Earnings*. In conjunction with this annual release, the BLS publishes an article that explains and analyzes the rebenchmarking procedure that produces these revisions. The information presented in the next few paragraphs represents a summary of BLS methodology as described in four such articles: Cronkite (1988), Getz (1990, 1992), and Roosma (1994).
4. Although the resulting 250 by 9 matrix has more than 2,000 elements, many of these remain blank because some industries such as auto manufacturing are dominated primarily by large firms while others like providers of household services are dominated by small firms.
5. In practice these data may be revised again, as discussed later.
6. For example, with the release of the March 1993 benchmarks, preliminary estimates going back to April 1992 were revised for the last time, thereby closing the books on the year 1992. The preliminary estimates for the months following March 1993 reflect this benchmark revision, but 1993 industry data will not be revised fully until benchmark revisions through March 1994 are released in 1995.
7. For the states, revised preliminary data at the sectoral level are reported monthly in Table B-9 of the BLS publication *Employment and Earnings*. The sum-of-states total, therefore, is derived by adding up these state estimates. Comparable national industry estimates are reported in Table B-2 of this same publication. It should be noted that the BLS changed the numbering of these tables in January 1994. Prior to that time, unadjusted state data were reported in Table B-8.
8. As Tom Plewes, associate commissioner of the BLS, reported in an address to the 1993 annual meeting of the National Association of Business Economists (NABE), further adjustments were required in addition to normal benchmark revisions. These adjustments were required in order to correct past errors introduced by the processing firms that originally compiled the ES-202 report results. According to Plewes, "Nearly 85 percent of this difference was due to subsequently documented problems with payroll processing firms' software" (*NABE News* 1994, 11). Upon recognition of these recording errors, Plewes stated that "it was necessary to 'wedge in' revisions to previous estimates through 1981 to correct the problem" (11).
9. For example, the final revised national total for March 1990 originally was reported to be 109,114,000 in the June 1992 issue of *Employment and Earnings* but has since been re-

vised downward to 108,606,000. Another notable set of revisions was released along with the 1989 annual benchmark revisions. At that time, the underlying set of SIC codes used to categorize the BLS series were updated from their 1972 definitions to the 1987 standard presently in use. As Getz (1990, 6) pointed out: "Approximately two-thirds of the published industry series were unaffected by the SIC revision. There were almost no changes in scope at the major industry division levels, with only very minor shifts between wholesale and retail trade and between the finance, insurance, and real estate division and services. However, there were several significant redefinitions at the 2-digit level."

10. March values for these data are reported rather than annual averages because 1992 is the latest year for which complete revised data are available. By contrast, fully revised monthly data are available through March 1993.
11. Augmented Dickey-Fuller unit root tests were used to test two sets of hypotheses: (1) that the two revised national employment totals do not contain a unit root and (2) that the pair of revised total employment series are not cointegrated. In each case these hypotheses were rejected. Taken together, the results lend support to the alternative hypothesis that the pair of series are cointegrated.
12. Berger and Phillips (1994) have demonstrated that differences in the seasonal behavior between preliminary and final revised BLS data series are responsible for introducing a "blip" in state employment totals that distorts the month-to-month changes in the preliminary series, particularly for the month of January. They describe a methodology for improving the seasonal adjustment of preliminary BLS data. The focus of the present author's research, therefore, has been upon improving the prediction of unadjusted employment totals: the raw data ultimately submitted for purposes of seasonal adjustment.
13. Each of the three variable systems created for the states were unique and included one equation for the national total, one equation for the sum-of-states national total minus the state under examination, and one equation for that particular state. Tests performed on each of the individual states and their three variable triples indicated that, in each case, the three variables likely were cointegrated. In addition to the fifty states, a separate model was developed for the District of Columbia, bringing the total number of states for which models were specified to fifty-one.
14. In each case the size of the relative forecast error was calculated as the absolute value of the following: (Forecast – Actual)/Actual, where the forecasted value was supplied by the model, and the actual value was the final revised employment total reported by the BLS. In the case of the actual revisions reported in third column of Table 5, this measure was calculated as the absolute value of the following: (Preliminary – Actual)/Actual.
15. Krikelas (1991) performed a large number of out-of-sample forecasting experiments on industry employment data for the state of Wisconsin with a variety of multisectoral vector autoregressions. One fairly consistent result of that research was that more highly disaggregated models performed better in these competitions.
16. On November 4, 1994, Katharine G. Abraham, commissioner of the Bureau of Labor Statistics, noted the following in a press release: "Preliminary 1994 first quarter universe tabulations suggest that there was stronger job growth than we previously reported for the 12-month period ending in March 1994. Indications at this time are that the March 1994 payroll employment estimate will be revised upward by approximately 760,000, or 0.7 percent" (4).
17. In fact, this author already has collected one-digit level data for the nation and all fifty-one states and has begun to explore this alternative modeling strategy. Such models will be studied for their performance in comparison with the more highly aggregated models examined to this point.

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Review Essay

Structural Slumps: The Modern Equilibrium Theory of Unemployment, Interest, and Assets

by Edmund S. Phelps.
Cambridge, Mass.: Harvard University Press, 1994.
420 pages. $49.95.

Thomas J. Cunningham

In 1967 Edmund S. Phelps put forth, more or less contemporaneously with Milton Friedman, one of the most useful concepts in contemporary macroeconomic theory: that of the "natural rate" of unemployment. As initially proposed, the natural rate was seen as being the rate of unemployment toward which the economy would tend, regardless of the rate of inflation. The idea is that as the economy's collective inflation forecast errors decline—that is, as everyone in the economy fully understands and correctly anticipates the actual rate of inflation—a natural rate of unemployment results. For example, suppose that the monetary authorities decide, strictly for accounting purposes, to add a zero to all currency on New Year's Day. The consequent adding of zeros to prices produces an extreme rate of inflation; however, if everyone understands that this is simply an accounting change, only prices will adjust, and there will be no real consequences for the rest of the economy, employment included.

In *Structural Slumps*, Phelps returns to the concept of the natural rate. The problem with the idea, as Phelps considers it in this work, is that in a number of cases around the world the long-run level of unemployment seems disturbingly high. Examining certain European countries in particular, Phelps

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observes that this "slump" in an economy may be structural in the sense that there may be some institutional structure—a strong union presence, for example, or minimum wage laws—that is producing a shift in the natural rate of unemployment to a higher level.

While this idea breaks no new ground, Phelps's contribution lies in the fact that he has provided a thorough—and well-crafted—consideration of what causes the natural rate to move around and, especially, what might make it shift to a relatively high level and remain there. His work demonstrates the interactions between labor, goods, asset markets, and the rate of interest, providing an integrated dynamic general equilibrium model that answers questions about the ultimate consequences of policy actions.

The text consists of twenty chapters divided into six sections, plus an introduction. The first and last sections are the most accessible to noneconomists, with the bulk of the book a formal exposition of his model. Phelps sets out clearly in the beginning where the rest of the text is going and what it does once it gets there. His discussion covers policy implications in a similarly clear and nonmathematical fashion, although the final chapter, "Structuralist Economic Policies," contains little that is not covered in the first section.

The sections devoted to the serious economic expositions proceed logically. The discussion in part 2 starts with a closed economy and presents labor and goods markets models. Part 3 develops the true core of Phelps's model, incorporating international linkages into the model introduced in part 2 through investment and capital flows. In part 4 Phelps considers the model and its microfoundations in the context of more neoclassical interpretations. Part 5 offers some empirical tests of the model as well as an interesting evaluation of postwar economic history as seen through structuralist lenses. The concluding section offers some insight into structuralism's place in the history of economic thought and also reviews policy implications of his model.

The Natural Rate and the Phillips Curve

Before the natural rate, mainstream macroeconomics generally embraced the idea of the Phillips curve, which purported to show a systematic long-run trade-off between inflation and unemployment: a higher inflation rate is associated with a lower employment rate and vice versa, so that the "price" of lowering unemployment is a higher, although stable, rate of inflation. For policymakers, it meant it was possible to "buy" a lower level of unemployment at the cost of a systematically higher rate of inflation.

While the Phillips curve seemed to present a set of tough choices, in fact it probably served to simplify policy debates. Rather than considering complex, difficult solutions for reducing sustained unemployment, policymakers could frame debates in terms of simple preferences: "I prefer a slightly higher rate of inflation and a slightly lower rate of unemployment." Much of the debate in the popular press concerning contemporary monetary policy still echoes this approach.

Phelps and his natural rate idea took away this theoretical foundation for policy, however. The seemingly reasonable notion behind the natural rate concept—that fully anticipated accounting changes will have no real effects—contains the relatively dramatic policy implication that there is no exploitable systemic trade-off between inflation and unemployment. In the short run a higher inflation rate may be accompanied by a lower rate of unemployment, but the effect is strictly short-lived. As soon as the economy comes to expect the new rate of inflation, the economy will return to it's "natural" rate of unemployment.[1]

An immediately obvious implication of this result is that monetary policy, in and of itself, cannot be used simply to buy a permanently lower rate of unemployment with more inflation.[2] Monetary policy may be able to engineer a temporary burst of economic activity that would serve to bring down the rate of unemployment, but the effect would last only as long as it took the economy to adjust its expectations to the new policy. In the short run, monetary policy may move the economy along a Phillips curve, temporarily reducing unemployment as real wage rates fall, but eventually wages would catch up with the higher inflation rate and unemployment would return to its natural rate.

This natural rate of unemployment represents an equilibrium outcome in the labor market: fully informed workers and employers supply and demand labor, respectively, and as a result the prevailing wage matches the quantity of labor supplied and demanded. Any measured unemployment is either strictly transitory, or in some way voluntary. Transitory, or "frictional" unemployment represents some form of temporary mismatch in the labor market that is within the normal bounds of business dynamics: the time it takes people with needed skills to move to the location where the jobs are or the time it takes to retrain workers whose skills are no longer needed. "Voluntary" unemployment is not really unemployment at all, specifically in

the sense that those who are not currently working are unemployed by their own choice because they do not care to work at the prevailing wage rather than because there are simply no jobs available at that wage. Involuntary unemployment, on the other hand, is the real cause for worry in dealing with unemployment—those workers who are willing to work at the prevailing wage but for whom there simply are no jobs.

*E*xplaining High Employment

As mentioned earlier, the problem Phelps (and others) perceive with this natural rate of unemployment is that there are lots of examples of places with rates of unemployment that seem to be above any reasonable definition of the "full employment" rate of unemployment. Phelps points in particular to the periphery of Europe, where, in otherwise industrialized countries, sustained high regional rates of unemployment have been observed over the last couple of decades. These high rates have persisted long enough to be reasonably viewed as an equilibrium outcome for the economy. In other words, it seems that the natural rate of unemployment can be undesirably high with the economy in a slump that is not going to be resolved by some sort of movement or transition to a new equilibrium.

Proponents of the Phillips curve—Keynesian economists—have long maintained the possibility of an economy's reaching an equilibrium with less than full employment. But their argument generally relied on assumptions that, over time, have looked less and less palatable: In particular, there has to be some mechanism to prevent wages from falling enough to induce a sufficient employment rate. That is, workers who find themselves unemployed must refuse to lower their wage demands, even though by accepting a lower wage they would induce employers to hire them and thus no longer be unemployed. This notion of "sticky wages" is supported by a variety of institutional arrangements, most notably minimum wage laws and the presence of strong unions, both of which might act to keep wages from falling in the face of sustained unemployment. This is not an especially appealing assumption, however. For one thing, it seems that slumps can occur in the absence of such institutional structures as a strong union presence and binding minimum wage legislation, as in the countries Phelps considers.

Systematic involuntary unemployment has also been explained by "quitting," "shirking," or "efficiency wage" models, which present involuntary unemployment as the outcome of rational market processes. Essentially, the idea is that employers have a variety of motives for paying higher wages than would be the outcome wage rate in a simple model of labor supply and demand. Employers may pay this premium because they wish to keep valued workers from quitting or to give workers an incentive not to otherwise lose their job. Firms may have similar motivations so that all firms end up paying wages above what simple supply and demand would suggest. The higher wage rate induces additional workers to offer their labor services at the same time that the firms paying the higher wage rate have less demand for labor. When the wage rate is high enough to induce workers to offer their labor in spite of being unable to find a job at that wage, the result is systematic involuntary unemployment as a straightforward consequence of individual optimization. This class of models offers a mainstream explanation for a natural rate of unemployment.

Phelps suggests that one major contributor to the problem of sustained high rates of involuntary unemployment are the distortions resulting from certain forms of taxes and transfers. Various direct and indirect forms of taxation on employment, for example, create a wedge between the cost of an employee to the employer and the net benefits received by that employee. At the same time, transfer payments in the form of income supplements may make the cost of unemployment to the worker less than it otherwise would be. Phelps sees the consequence of both of these effects as an increase in the cost of additional employment to employers. The tax portion seems apparent and direct. The income transfer, however, is less so in that it requires firms to offer a wage above the standard "market clearing" wage in order to offer the incentives associated with a premium wage rate at the firm. The overall consequence is a net distortion that changes the natural rate of unemployment. In sum, ill-conceived (nonmonetary) public policies can directly result in a long-term increase in the unemployment rate. This result, by itself, is not especially new.

As discussed earlier, the contribution of Phelps's current work is not that it offers anything particularly new and startling—nothing in the text is, by itself, particularly outside some established lines of literature (although it should be kept in mind that Phelps himself frequently served to help establish those lines). Rather, the work is valuable for integrating an established set of models centered on his alternate view of equilibrium involuntary unemployment into one dynamic general equilibrium framework capturing employment, interest rates, and assets.

Conclusion

Phelps has presented a comprehensive and well-integrated presentation of some popular models that can, and no doubt will, be used to address some of the largest and most perennially nagging questions of macroeconomic policy. Whether or not particular economists agree with Phelps's view of the world, this text is likely to become a standard in the study of macroeconomics—listed frequently in bibliographies for macroeconomics papers and reading lists for graduate macro theory courses.

Notes

1. Closely allied with, but distinct from, the natural rate hypotheses is the concept of the Non Accelerating Inflation Rate of Unemployment (NAIRU). NAIRU and the natural rate are similar in that they both represent an unemployment rate that is not associated with a stable rate of inflation. The NAIRU concept, however, focuses on inflation stability from the perspective of labor markets; if the unemployment rate falls below the NAIRU, the tightness in the labor markets results in upward pressure on wages and therefore prices that will not be relieved until the unemployment rate rises back to the NAIRU. The natural rate, on the other hand, focuses on inflation expectations and the limited ability of the monetary authority to influence real activity when everyone fully anticipates policy.
2. This is not to say that public policy is powerless, however. To the contrary, this issue has become the focus of Phelps's more recent, and certainly this current, work.

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