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Robert R. Bliss and Ehud I. Ronn

Until 1984, the U.S. Treasury typically issued its long-term bonds in callable form. A number of these securities, totaling $93.8 billion in face value, remain outstanding. After a call protection period, usually five years prior to maturity, the Treasury can call the bonds but must give prior notification of intent to call. This article develops a decision rule, which takes account of the prior notification requirement, for when it is optimal to call such bonds.

The decision of whether to call is based on the current level of interest rates and their volatility. For a call to be optimal for the Treasury, interest rates must be sufficiently low (relative to the bond's coupon) and the potential benefits of waiting—on the chance of even lower interest rates—should be insufficient to compensate for the costs of continuing to pay the higher coupon rate for another six months. After developing these ideas, the authors use a numerical example to demonstrate their application. They conclude that, at least in recent years, the Treasury has called bonds optimally. The model they use, which is also applicable to agency, corporate, and municipal callable bonds, specifies conditions under which the Treasury should call outstanding callable bonds in the future.

15 ***M*ergers and Acquisitions in China**
Jie Lin Dong and Jie Hu

Mergers and acquisitions are an integral part of any market economy, enhancing an economy's efficiency by reallocating and recombining production resources for better use. In China, the development of mergers and acquisitions activity has played a positive role in privatizing and revitalizing the country's inefficient state enterprises, attracting foreign investment, and rationalizing the industrial structure. The authors of this article discuss this development in the context of China's market-oriented economic reform and provide an outline of the advantages and disadvantages of the country's approach to mergers and acquisitions.

Three reasons emerge as forces driving mergers and acquisitions activity in China, reasons that are likely to continue fueling its growth: the government's need to restructure and revitalize the state-owned enterprises; the growing needs of enterprises; and the market's potential for attracting more international capital. Because of the importance of the mergers and acquisitions market in restructuring and modernizing the industry of China, the authors expect its development to continue, but they observe that careful handling of many institutional deficiencies and social problems as well as political obstacles will be required to avoid major setbacks.

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30 *FYI*—Monetary Aggregates, Payments Technology, and Institutional Factors
David J. Petersen

Economic theory implies that the quantity of money in the economy is linked both to the Federal Reserve's policy-making instruments and its ultimate objectives and should therefore be useful in formulating policy decisions. The Federal Reserve defines monetary aggregates, composed of financial assets like cash and demand deposits, expressly for this purpose.

Over time, substantial changes have been observed in the close relationships between monetary aggregates and economic activity. Between 1990 and 1994, growth in the Federal Reserve's M2 monetary aggregate was much slower than expected, a development that several academic studies attribute to the proliferation of financial assets that serve as alternatives to M2 components. As a result, the current composition of M2 no longer completely reflects the choice of financial assets available as means of payment or close substitutes. Thus, the aggregate's relationship with expenditure on goods and services may no longer be direct or predictable, and M2 may not now serve as a reliable link between policy instruments and policy goals. In addition, unforeseen instability in the macroeconomic relationships between monetary aggregates and the Federal Reserve's goals raises broader questions about the role of aggregates in policy making.

This article explores how the composition and character of payments assets can change in a dynamic financial system, ultimately influencing the relationships between monetary aggregates and economic activity.

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To Call or Not to Call? Optimal Call Policies for Callable U.S. Treasury Bonds

Robert R. Bliss and Ehud I. Ronn

Until 1984, the U.S. Treasury typically issued callable long-term bonds, a number of which remain outstanding. Corporations and agencies also commonly issue bonds in callable form.[1] Issuing bonds with the "call" option offers the Treasury and corporations the advantage of being able to retire bonds early, thus providing flexibility in their financing, or to refinance at lower rates should interest rates decline. However, this advantage to the issuer is offset by the higher return that bondholders require on callable bonds.

An issuer's decision to call a bond has important implications. In calling a bond, the issuer gives up the option to call it at a later time that may be even more advantageous. By not calling when it should, an issuer pays more in interest than is necessary, yet if the issuer calls too soon, it pays too much to repurchase the bond, thus throwing away money.

There is an extensive literature on how bond issuers should, and in practice do, call outstanding bonds. These works suffer from a generally shared oversight. Jonathan E. Ingersoll, Jr. (1977), Joseph D. Vu (1986), and Francis A. Longstaff (1992), as well as others in the literature, have assumed that bonds are immediately callable, perhaps after the expiration of a call protection period, when in fact Treasury and many other bond calls require prior notification by the issuer of the intent to call. Ingersoll, who looked at calls of convertible corporate bonds, and Vu, who examined nonconvertible corporate bond calls, found that corporations appeared to delay calling their bonds well beyond what they considered the optimal time to do so. Longstaff found that Treasury bonds traded at prices well above what was thought sufficient to trigger a call. However, the notification period required before a call option is exercised renders the naive rules for when to call used in these works incorrect, as shown by Robert R. Bliss and Ehud I. Ronn (1995). Taking the notification period into account explains the puzzling "anomalies" observed by Longstaff. By extension, the observed behavior of corporations in not calling their bonds when

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Ingersoll, Vu, and others thought it rational to do so may be in part an outcome of the same effect.

To decide whether to call, an issuer should consider the current level of interest rates as well as their volatility. For a call to be optimal for the Treasury, interest rates must be sufficiently low (relative to the callable bond's coupon rate) and the potential benefits of waiting—on the chance of even lower interest rates—should be insufficient to compensate for the costs of continuing to pay the higher coupon rate.

Treasury bonds represent a liability to the Treasury. In making an economically rational call decision, the Treasury should act to minimize the net present value of this liability.

Based on Bliss and Ronn (1995), this article develops the arguments underlying these rules in the context of Treasury call decisions and demonstrates their application using a numerical example.

Examination of Treasury call decisions concludes that, at least in recent years, the Treasury has called bonds optimally. The model discussed herein specifies conditions under which the Treasury should call outstanding callable bonds in the future. The approach presented for implementing the decision rule can be used for other deferred-exercise options such as corporate, agency, and municipal callable bonds and may also be applied to the valuation of callable and puttable securities.

The Historical Record

U.S. Treasury callable securities are characterized by several features:

- *Time to maturity*. The Treasury has issued three callable notes with maturities of up to five years and eighty-seven callable bonds with maturities of up to thirty years. The Treasury has also issued a callable perpetuity that was retired in 1935.[2]
- *Call Period*. All such instruments are characterized by an initial call protection period, after which the bonds are callable on any coupon payment date up to maturity. For different callable instruments, this call period has varied from two to fifteen years. Currently, all outstanding callable Treasury bonds have a call period of five years.
- *Prior Notification Period*. All callable Treasury securities require the Treasury to provide prior notice of its intent to call the bond. Excepting a few bonds issued prior to 1922, this notification period has always been four months.

Table 1 displays the eighty-eight callable securities issued by the U.S. Treasury since 1917. It shows that the five-year call period did not become standard until 1962. Issuance of callable bonds ceased with the inception of the Treasury STRIPS program in 1985.[3]

The next callable Treasury bonds to enter their call periods are 8 percent coupon-rate bonds maturing on August 15, 2001, and callable beginning in August 1996—referred to as the 8's of August 1996-2001 (the exact date is implicit since, currently, all outstanding bonds mature on the fifteenth of their respective maturity months). These bonds have a total face value of $1.485 billion. The notification date for the first call opportunity for this bond is April 17, 1996. The remaining sixteen callable issues do not enter their call period until May 2000, and the last callable bond, the 11¾'s of November 2009-14, issued in 1984, is not callable until 2009 and if not called will mature in 2014.

Making an Optimal Call Decision

When the Treasury calls a bond, it has made a decision to exercise the option granted it in the terms of the bond. After reviewing the optimal exercise of standard American options that may be exercised immediately and at will by the optionholder, this discussion turns to the complications resulting from the contractual obligation to provide prior notification of intent to call, which limits the Treasury's rights to call the bond. Box 1 on page 10 works through a numerical example of how to make the call decision and simultaneously determine the bond's fair value.

Early Exercise of American Options. Most options, such as call options on shares of stock, come in one of two forms: a European-style option, which may be exercised only at its expiration date, and an

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American-style option, which may be exercised at any time up to and including expiration. The optimal exercise rule for a European option is trivial: if, at the option's expiration, exercise would result in a positive cash flow to the optionholder, then the option should be exercised. The same rule applies to an American option at its expiration if it has not been exercised.

The question of whether to exercise an American option prior to expiration requires further analysis. The value of an option may be broken down into two parts. The first part is the option's "intrinsic value," which is the immediate exercise value. If the option is "in-the-money"—that is, if the price of the underlying asset is above the exercise price for a call option (below for a put option)—immediate exercise would result in a positive cash flow to the optionholder in the amount of the difference between the value of the underlying asset and the strike, or exercise, price stipulated in the option contract. An "out-of-the-money" option (for which the price of the underlying asset is below the exercise price for a call and above for a put) is one for which immediate exercise would result in a loss to the optionholder. Since the optionholder can choose whether or not to exercise, an out-of-the-money option would never be exercised and thus has an intrinsic value of zero.

However, an option is typically worth more than its intrinsic value. Before an American option expires, the optionholder has a choice, and that choice has value. The value of being able to defer the exercise decision is called the time value of the option. This value is usually positive and never negative since the optionholder has the right to choose whether to exercise. As the option approaches its expiration date, the time value erodes until, at expiration, the time value is zero and the option value equals the intrinsic value.[4]

The total value of an option is the sum of its intrinsic and time values, as Chart 1 illustrates for a call option. For this reason, out-of-the-money options, which would not be exercised at this time, usually still have positive market values. In these cases, the intrinsic value is zero, but the time value is positive because there is some chance that the price of the underlying asset may change so that the option moves into-the-money prior to its expiration. If that chance is small, for instance when the time to expiration is short, then the time value will be commensurately small.

With free-standing (traded separately from the underlying asset) American options, an optionholder can get out of his or her position either by exercising or selling the option. As long as the time value is positive, it is more profitable to sell and the option will not be exercised. But when the time value has been eroded to zero, the option should be exercised if it is both American-style and in-the-money.

Chart 1
Components of the Value of an American Call Option

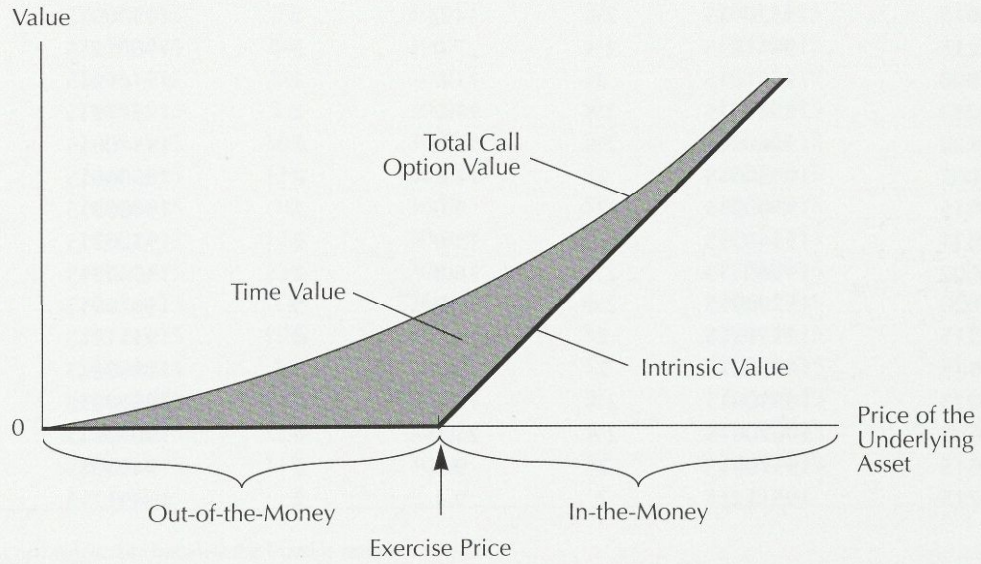

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Table 1
History of Callable U.S. Treasury Note and Bond Issues since 1917

Date Issued (dated date)	Maturity Date	Coupon Rate	Term (at issue)	Call Period (years)	First Possible Call Date	Date Called
19170615	19470615	3½	30.0	15	19320615	19350615
19171115	19421115	4	25.0	15	19271115	19280515
19171115	19470615	4	29.6	15	19320615	19350615
19180515	19421115	4¼	24.5	15	19271115	19271115
19180615	19470615	4¼	29.0	15	19320615	19350615
19181215	19470615	4¼	28.5	15	19320615	19350615
19181024	19381015	4¼	20.0	5	19331015	19351015
19221016	19521015	4¼	30.0	5	19471015	19471015
19241215	19541215	4	30.0	10	19441215	19441215
19260315	19560315	3¾	30.0	10	19460315	19460315
19270315	19320315	3½	5.0	2	19300315	19310315
19270915	19320915	3½	5.0	2	19300915	19310315
19280116	19321215	3½	4.9	2	19301215	19311215
19270615	19470615	3⅜	20.0	4	19430615	19430615
19280716	19430615	3⅜	14.9	3	19400615	19400615
19310316	19430315	3⅜	12.0	2	19410315	19410315
19310615	19490615	3⅛	18.0	3	19460615	19460615
19310915	19550915	3	24.0	4	19510915	19510915
19340416	19460415	3¼	12.0	2	19440415	19440415
19340615	19480615	3	14.0	2	19460615	19460615
19341215	19521215	3⅛	18.0	3	19491215	19491215
19350315	19600315	2⅞	25.0	5	19550315	19550315
19350916	19470915	2¾	12.0	2	19450915	19450915
19360316	19510315	2¾	15.0	3	19480315	19480315
19360615	19540615	2¾	18.0	3	19510615	19510615
19360915	19590915	2¾	23.0	3	19560915	19560915
19361215	19531215	2½	17.0	4	19491215	19491215
19380615	19630615	2¾	25.0	5	19580615	19580615
19380915	19520915	2½	14.0	2	19500915	19500915
19381215	19651215	2¾	27.0	5	19601215	19621215
19391208	19501215	2	11.0	2	19481215	19481215
19391222	19531215	2¼	14.0	2	19511215	19511215
19400722	19560615	2¼	15.9	2	19540615	19540615
19401007	19550615	2	14.7	2	19530615	19530615
19410315	19500315	2	9.0	2	19480315	19480315
19410331	19540315	2½	13.0	2	19520315	19520315
19410602	19580315	2½	16.8	2	19560315	Never
19411020	19720915	2½	30.9	5	19670915	Never
19411215	19551215	2	14.0	4	19511215	19541215
19420115	19510615	2	9.4	2	19490615	19490615
19420225	19550615	2¼	13.3	3	19520615	19540615
19420505	19670615	2½	25.1	5	19620615	Never
19420515	19510915	2	9.3	2	19490915	19490915
19420715	19511215	2	9.4	2	19491215	19491215

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Table 1 *(continued)*

Date Issued (dated date)	Maturity Date	Coupon Rate	Term (at issue)	Call Period (years)	First Possible Call Date	Date Called
19421019	19520315	2	9.4	2	19500315	19500315
19421201	19681215	2½	26.0	5	19631215	Never
19430415	19520915	2	9.4	2	19500915	19500915
19430415	19690615	2½	26.2	5	19640615	Never
19430915	19530915	2	10.0	2	19510915	Never
19430915	19691215	2½	26.2	5	19641215	Never
19440201	19590915	2¼	15.6	3	19560915	19580915
19440201	19700315	2½	26.1	5	19650315	Never
19440626	19540615	2	10.0	2	19520615	Never
19441201	19541215	2	10.0	2	19521215	Never
19441201	19710315	2½	26.3	5	19660315	Never
19450601	19620615	2¼	17.0	3	19590615	Never
19450601	19720615	2½	27.0	5	19670615	Never
19451115	19621215	2¼	17.1	3	19591215	Never
19451115	19721215	2½	27.1	5	19671215	Never
19520301	19590315	2⅜	7.0	2	19570315	19580915
19530501	19830615	3¼	30.1	5	19780615	Never
19600405	19850515	4¼	25.1	10	19750515	Never
19620815	19920815	4¼	30.0	5	19870815	Never
19630117	19930215	4	30.1	5	19880215	Never
19630418	19940515	4⅛	31.1	5	19890515	19930515
19730515	19980515	7	25.0	5	19930515	19930515
19730815	19930815	7½	20.0	5	19880815	19920215
19740515	19990515	8½	25.0	5	19940515	19940515
19750218	20000215	7⅞	25.0	5	19950215	19950215
19750515	20050515	8¼	30.0	5	20000515	n.a.
19750815	20000815	8⅜	25.0	5	19950815	19950815
19760816	20010815	8	25.0	5	19960815	n.a.
19770215	20070215	7⅝	30.0	5	20020215	n.a.
19771115	20071115	7⅞	30.0	5	20021115	n.a.
19780815	20080815	8⅜	30.0	5	20030815	n.a.
19781115	20081115	8¾	30.0	5	20031115	n.a.
19790515	20090515	9⅛	30.0	5	20040515	n.a.
19791115	20091115	10⅜	30.0	5	20041115	n.a.
19800215	20100215	11¾	30.0	5	20050215	n.a.
19800515	20100515	10	30.0	5	20050515	n.a.
19801117	20101115	12¾	30.0	5	20051115	n.a.
19810515	20110515	13⅞	30.0	5	20060515	n.a.
19811116	20111115	14	30.0	5	20061115	n.a.
19821115	20121115	10⅜	30.0	5	20071115	n.a.
19830815	20130815	12	30.0	5	20080815	n.a.
19840515	20140515	13¼	30.0	5	20090515	n.a.
19840815	20140815	12½	30.0	5	20090815	n.a.
19841115	20141115	11¾	30.0	5	20091115	n.a.

Note: "n.a." indicates not applicable because the bond is not yet callable.

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To summarize, for immediately exercisable American options, the two necessary conditions for an immediate exercise are that (1) the option is in-the-money—that is, exercise of the option produces a positive cash flow to the optionholder—and (2) the time value has eroded to zero so that there is no value in delaying exercise of the option.

By comparing the option's market value to its intrinsic value, one can tell if the time value has eroded. If they are identical, then the difference—the time value—must be zero. Because callable Treasury bonds (and most callable corporate bonds) require prior notification before they can be called, even after their call protection has expired, these two simple decision rules must be adjusted to reflect this fact.

The Deferred Exercise Decision. Treasury bonds are callable only on coupon payment dates after the call protection period has passed. The bond's call option is akin to an American-style option in that it may be exercised prior to its expiration at the bond's maturity date. However, it is unlike an American option in that exercise can take place only at discrete times, not continuously throughout the life of the option. Such options are referred to as Bermuda options. For valuation purposes, the distinction caused by the discrete exercise dates is unimportant and, in any case, is accommodated by the technique outlined below. Of greater importance is the notification requirement that results in deferred exercise.

The notification requirement compels the Treasury to announce, 120 days in advance of the coupon payment date on which it will call the bond, that it intends to do so.[5] There is thus a separation in time between the date when the decision to exercise is made and the date when actual exercise takes place.

The naive call strategy is to call the bond if its market price is at or above the call price.[6] The strategy is based on an arbitrage illusion: that by calling the bond one pays less than its market value. This argument ignores the problem of deferred exercise. Interest rates can change in the meantime, and the value at the time the call is completed may be above or below the call price. Because of the deferred exercise and the fact that the call option itself is not separately traded, the rules outlined above for the exercise of an American-style option must be modified.

Treasury bonds represent a liability to the Treasury. In making an economically rational call decision, the Treasury should act to minimize the net present value of this liability. On a call notification date, the Treasury's choices are to either call the bond—in which case it will pay the final coupon and repay the principal at the next coupon date four months hence—or not call the bond, in which case it will still make the coupon payment at the next coupon date and will be left with the callable bond as a continuing liability.

Since the coupon must be paid regardless, the call decision boils down to deciding whether to pay the principal in four months or continue to have the liability of the callable bond in four months. The amount of the principal to be paid, if the bond is called, is known with certainty: Treasury bonds are callable at par. But the value of the not-called callable bond four months hence cannot be known with certainty as of the notification date. Therefore, the Treasury needs to estimate the expected value of the callable bond in four months if it is not called.[7] Doing so requires a method for valuing a callable bond.

A callable bond is a compound security composed of two parts. The first part is a regular, noncallable bond of the same coupon rate and maturity as the callable bond. The second part is the option to call the bond away from the bondholder. The Treasury has, in effect, sold the noncallable bond and purchased a call option on a noncallable bond. Since these two are inextricably linked—that is, the option cannot be split off and traded separately—the option is called an embedded option. The value of the noncallable bond portion depends on the coupon rate, maturity, and the term structure of interest rates. The value of the call option depends on the time to expiration of the option, the value of the noncallable bond, and, most importantly, the volatility of interest rates. The more volatile interest rates are, the more valuable the call option will be to the bond issuer. Volatile interest rates increase the likelihood that the bond issuer may find it advantageous to call the bond, for instance to refinance at a lower interest rate. If the bond is called, it will be to the bondholders' disadvantage: they will have to reinvest at a lower rate than they were earning on the bond that was called away. Therefore, the higher interest rate volatility is, the less valuable the callable bond will be to the bondholder. Thus, valuing the callable bond requires both a model for interest rate movements and an estimate of the volatility of interest rates.

In practice, the two portions of the callable bond are valued by computing the value of the callable bond as of the notification date if it has not been called and then comparing that value with the present value of the principal and next coupon.[8] The present value of the principal and coupon may be computed from the term structure and the known principal and

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coupon amounts.[9] Valuing the not-called callable bond requires an interest rate model and an estimate of the volatility.

Box 1 illustrates in simplified form how to value a callable bond using a binomial tree, given a term structure and a volatility of interest rates. Implicit in this valuation are the optimal call decisions at each node of the tree conditional on the assumed (fixed) interest rate volatility of 20 percent, the time horizon and interest rate at that node, and the assumption that all possible future decisions will be (or would have been) optimally decided. Of course, if it turns out to be optimal to call now, the future decision points will never be reached, but to know if it is optimal now requires looking into the future and seeing what will be optimal then if the bond is not called now. By reworking the problem for a 15 percent volatility, the call decisions change and the current fair value of the bond will rise. One can vary the volatility until the fitted (model's fair value) price equals the desired target value. The volatility that makes the model's value equal to the quoted price is called the implied volatility. The target value the Treasury is interested in is the value of the callable bond if it is called. The level of volatility that makes the value of the callable bond if it is not called just equal the value if it is called is referred to as the threshold volatility.

In order to be able to compute the threshold volatility, the call option must be "in-the-money forward." This term is equivalent to "in-the-money" for a regular, immediate exercise option and implies that the optionholder (bond issuer) will not lose by exercising. In this case, it is "forward" because the determination is done on a forward-looking, risk-neutral, expected-outcome basis. Whether the bond is in-the-money forward is determined by examining the values of two hypothetical bonds, S and L, both noncallable and both with the same coupon rate as the callable bond under consideration. S matures at the next coupon date, and L has the same maturity date as the callable bond. The bondholder can make the callable bond worth S by deciding to call, so the callable bond cannot be worth more than S to the bondholder. Similarly, the bondholder can make the callable bond worth L by simply deciding never to call, so the callable bond cannot be worth more than L to the bondholder. Therefore, the value of the callable bond must be less than or equal to the minimum of the values of these two fictitious bonds: that is, $V \leq \min\{S, L\}$. If $L < S$, it is necessarily the case that V is strictly less than S, the option is not in-the-money forward, and it is impossible to compute the threshold volatility: no matter how low the volatility, how worthless the call option, how valuable the callable bond (to the bondholder), the callable bond can never be worth as much as S. Thus, it can never be optimal to call a bond that is out-of-the-money forward—that is, when $L < S$. If $L \geq S$, the not-called bond can be worth more than S (the value of the called bond), so calling may minimize the value of the liability.

Once it has been determined whether the call option is in-the-money forward, the threshold volatility is used to determine whether the option has any time value remaining. If the true market volatility equals the threshold volatility, the Treasury will be indifferent to calling or not calling, so either action will be rational. If, however, the true volatility is greater than the threshold volatility, then the call option is more valuable than would justify a call; the expected value of the liability is reduced below what is required to pay off (call) the bond; and the Treasury will not wish to call. It would be better to keep the liability than to pay the principal. Lastly, if the true volatility is lower than the threshold volatility, the call option is less valuable than needed to justify a call, the liability is more valuable than the principal needed to pay off the bond, and, hence, the Treasury will wish to call and will issue a call notification to be able to do so.

Examination of Treasury call decisions concludes that, at least in recent years, the Treasury has called bonds optimally.

To determine the true volatility against which to compare the threshold volatility, the Treasury cannot use the implied volatility of the callable bond. The implied volatility is sensitive to the price of the particular bond that may reflect the market's expectation of what the Treasury will do and hence be useless for determining what the Treasury should do. Furthermore, price quotes for individual issues are frequently imprecise. Newly issued "on-the-run" bonds are very liquid but trade at a premium because of this liquidity. Older, seasoned "off-the-run" issues—and all currently callable bonds are off-the-run—are illiquid, so the

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Table 2
Analysis of Threshold Volatilities
(March 1988-September 1994)

Quote Date	Full Price	T_m	S	L	σ_T
		7½'s of August 1988-93			
880331	98.08	5.37	101.31	97.80	OTM
880930	96.31	4.88	100.81	96.20	OTM
890331	93.29	4.37	100.17	93.49	OTM
890929	97.30	3.38	100.65	97.27	OTM
900928	99.15	2.88	100.84	98.94	OTM
910328	101.35	2.38	101.45	101.47	7.5%
910930	102.34	1.88	101.73	103.55	66.2%
Called February 1992				Call was optimal	
		7's of May 1993-98			
921231	101.76	5.37	102.26	104.61	20.3%
Called May 1993				Call was optimal	
		8½'s of May 1994-99			
931231	102.96	5.37	103.04	116.14	62.8%
Called May 1994				Call was optimal	
		7⅞'s of February 1995-2000			
940930	101.83	5.38	101.96	103.59	11.0%
Called February 1995				Call was optimal	

Note: The full price is the market price, including accrued interest. The term T_m is the time to maturity in years. The term S is the present value of an otherwise equivalent noncallable bond that matures in four and one-half months. (The use of four and one-half months, rather than the four months dictated by the 120-day rule, is a consequence of the available data base, which contains end-of-month, rather than the desired midmonth, bond prices.) The term L is the present value of an otherwise equivalent noncallable bond to T_m. The term σ_T is the threshold volatility; a value of "OTM" indicates that the option is out-of-the-money and a threshold volatility could not be computed.

posted quotes may reflect stale information. In order to avoid these problems, what are called normal levels of implied volatilities, aggregated cross-sectionally, are used as a benchmark. Box 2 discusses the implied volatilities for a typical callable bond. The chart shows that normal levels of implied volatilities vary between 7.5 percent and 20 percent. If a currently callable bond's threshold volatility is higher than 20 percent, it is clearly high relative to normal values, so it is likely that the true market volatility is below the threshold volatility and a call is indicated. If the threshold volatility is below 7.5 percent, it is low and the bond should not be called since it is likely the true volatility is above the threshold level. Between 7.5 percent and 20 percent, the analysis produces no clear recommendation. Fortunately, in most cases threshold volatilities are outside this ambiguous range.[10]

In summary, the necessary and sufficient conditions for calling a deferred-exercise callable bond are that (1) the option must be in-the-money forward to guarantee that calling is optimal under at least some volatility, and (2) normal interest rate volatility must

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be low enough relative to the threshold level that the time value has clearly eroded to zero and calling is thus optimal.

Examining the Optimality of the Treasury's Call Decisions

Normal market volatility, which ranges from 7.5 percent to 20 percent, is used to establish the optimality or suboptimality of past Treasury call decisions. It is deemed optimal if the Treasury calls a bond whenever the threshold volatility exceeds 20 percent; conversely, if the Treasury calls when the option is out-of-the-money or the threshold volatility is below 7.5 percent, the call is deemed suboptimal. It is also deemed suboptimal if the Treasury fails to call a bond when the option is in-the-money and the threshold volatility is above 20 percent.

Table 2 reports the empirical results of recent March 1988-September 1994 Treasury call decisions and analyzes these decisions. Three of the four issues were called on their first possible call dates. In the case of the 7½'s of August 1988-93, the call was delayed three and a half years, providing an opportunity to analyze cases in which the Treasury decided not to call a bond when it might have done so.[11]

Table 2 shows that, at least in recent years, the Treasury has called bonds optimally.[12] They did not call the 7½'s of August 1988-93 in the period March 1988 through September 1990, when the intrinsic value was zero, and they did not call prematurely in March 1991, when the threshold volatility was in the "normal" range. However, in September 1991 when both conditions occurred—note that the threshold volatility of 66.2 percent is well above normal—the Treasury did call the bond. For the 7's of May 1993-98 and the 8½'s of May 1994-99, both necessary conditions were met at the first call date, and the bonds were properly called. With the 7⅞'s of February 1995-2000, the analysis is more ambiguous. The option was clearly in-the-money, but the threshold volatility is not above the normal range. On the other hand, neither is the threshold volatility below the normal range, in which case calling the bond would have been clearly incorrect.

Bliss and Ronn (1995) extended this analysis to forty-four callable bonds that had moved beyond their call protection period in the four decades beginning in the 1930s. That study concludes that, while one cannot justify each Treasury call decision, the overall Treasury pattern of call decisions appears consistent with financial principles.

The first notification date for the 8's of August 1996-2001 is April 17, 1996; no Treasury decision is required until that date. If today's (February 1, 1996) term structure remains unchanged on April 17, 1996, the threshold volatility will be 51.3 percent. Thus, if the decision were made in April based on today's term structure, the bond should be called. Indeed, it would take a parallel upward shift of at least 227 basis points in the term structure before the optimal decision would be to refrain from calling the bond (when the resulting threshold volatility is less than 7.5 percent).

Conclusion

As the 8's of August 1996-2001 approach their first call opportunity in August 1996, the requisite notification period implies that the Treasury will have to decide by April 17, 1996, whether to exercise its right to call the bond. This article derives the considerations that go into making an optimal call decision. Taking into account the required prior notification period of intent to call, two criteria must be met. First, the call option must be in-the-money forward, which can be ascertained by comparing the values of two similar-coupon rate, noncallable bonds, one maturing on the next call date and the other on the callable bond's maturity date. If the call option is in-the-money forward, the value of the long bond will exceed the value of the short bond. If that first condition is satisfied, one then determines whether the call option has time value remaining by computing the threshold volatility. Normal market volatilities serve as a benchmark for evaluating threshold volatilities. From 1987 through 1994, these have typically been in the 7.5 percent to 20 percent range. Bonds with threshold volatilities below this normal range should not be called even if the call options are in-the-money.

Using these two criteria, this article examines the optimality of the Treasury's observed call decisions and concludes that, on balance, these decisions have been reasonably correct. Finally, these call-decision criteria can be applied to other securities with delayed-exercise provisions, including callable corporate, agency, and municipal bonds as well as convertible corporate bonds.

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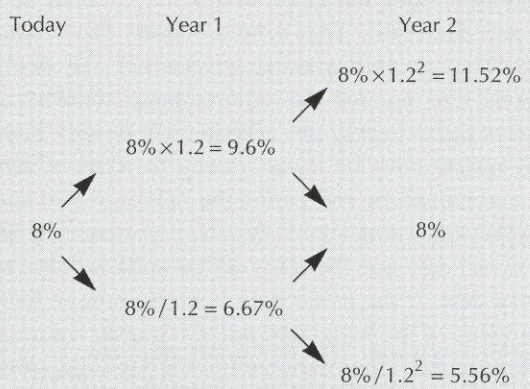
Box 1
Valuation Using a Binomial Tree

The following numerical example demonstrates the requirements for an optimal call policy. To simplify exposition, consider a simple variant of the Treasury callable-bond problem: a three-year 8.5 percent annual-pay coupon bond, which is currently callable with a one-year notification. If notification is given today, the bond will be retired next year; if notification is given one year from today, the bond will be retired in two years' time. Otherwise, the bond will mature in three years' time. Further, assume that the one-year rate of interest is currently 8 percent, with a volatility of 20 percent, and follows a binomial multiplicative random walk. The implication is that, over the next year, the interest rate will either rise to $8 \times 1.2 = 9.6\%$ with a probability of 0.5 or decline to $8/1.2 = 6.67\%$ with an equal probability, and similarly for year 2. Chart A presents the resulting tree in graphical form.

Chart A
The Interest Rate Process



This interest rate tree is consistent with a term structure of interest rates that is virtually flat at 8 percent. Naturally, similar interest rate trees can be constructed to reflect the prevailing yield curve and prevailing volatility of interest rates.[1]

Using this interest rate tree one may value the three-year 8.5 percent coupon bond using backward induction. The principle of backward induction begins by valuing the bond at maturity, then works backward to the present. At each stage, the optimal decision is based on the possible future outcomes, given the current conditions at that time, and the optimal decision for each of those possible outcomes. Backward induction also takes full account of the delayed-notification call option embedded in this bond.

Thus, consider the bond's value at the three possible interest rates at year 2—that is, 5.56 percent, 8 percent, or 11.52 percent. If call notification was not given the previous period, then the bond at year 2 is a one-year 8.5 percent coupon bond. The value of this bond, including the year-2 coupon, is equal to the current $8.50 coupon plus the discounted present value of the $108.50 end-of-year principal and final coupon payment, $8.5 + 108.5/(1 + r)$, where r is the then-prevailing rate of interest (5.56 percent, 8 percent, or 11.52 percent). On the other hand, if notification had been given at year 1, its value at year 2 would simply be the final coupon and principal payments of $108.50.

Stepping back to year 1, recognize that the Treasury has the right to call the bond, with one-year notification. That call should be made only when it is in the Treasury's best interest to do so. The Treasury will choose to do so when such a call minimizes the value of its liability (generally, when interest rates have fallen sufficiently low). Suppose that at year 1 interest rates have risen to the point at which the one-year interest rate is 9.6 percent; the year-1 value of the bond, excluding the current coupon, is given by the lower of (1) the bond's value if notification is given today and the bond is called at year 2, discounted back to year 1 (the value of such a bond is simply the present value of principal and last coupon, or $108.50 discounted at the prevailing 9.6 percent rate of interest: 108.5/1.096 = $99.00) or (2) the expected value of the bond at year 2 if it is not called today, discounted back to year 1. This value is equal to the discounted expected value of the payoffs:[2]

$$0.5\frac{105.79 + 108.96}{1.096} = \$97.97.$$

Since the value (after paying the next coupon) of the bond if called ($99.00) is greater than the value if not called ($97.97), the bond should not be called, and its expected value equals $97.97 or, including the current coupon, 97.97 + 8.5 = $106.47 at year 1 if interest rates rise.

If, on the other hand, interest rates have declined to 6.67 percent next year, the value of the bond if it is called will be the discounted present value of principal and last coupon, or $108.50 at the prevailing 6.67 percent rate of interest: 108.5/1.0667 = $101.72. If call notification is not given at year 1, the bond's year-2 value, discounted back to year 1, will be

$$0.5\frac{108.96 + 111.29}{1.0667} = \$103.24.$$

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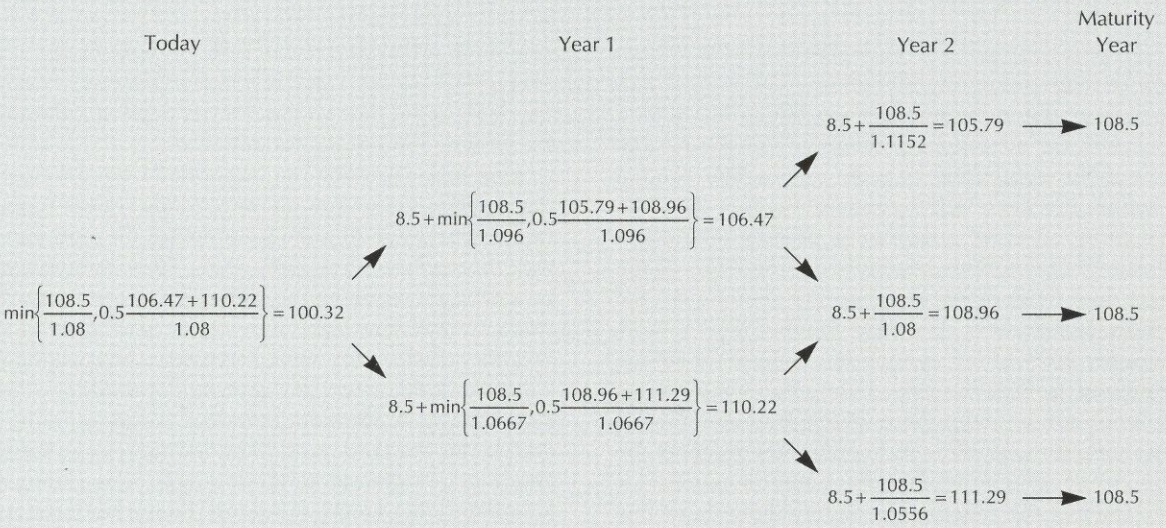
Chart B
Valuation of a Callable 8.5 Percent Bond



In this case the value of the bond if called will be less, so giving call notification at year 1 will be optimal if interest rates drop to 6.67 percent. Including the current coupon, the year-1 value of the bond is $110.22 if interest rates fall.

Finally, stepping back to the present, the Treasury chooses to minimize the value of its liability by selecting the lower of a one-year bond, which would result by its giving notification today (108.50/1.08 = $100.46), or the discounted expected value if call notification is not given—[0.5(105.79 + 108.96)/1.096 = $97.97]. The fact that the value if it is not called is lower implies that the Treasury should refrain from giving the one-year call notification for the bond at this time.[3]

Chart B presents the value of this bond at each node of the interest rate tree. The key ingredients are the use of the prevailing rate of interest in discounting cash flows; the delayed notification period, which causes the bond to be priced as a one-period coupon bond when it is called (the bond's value would equal the option's exercise price of par if there were no delayed notification requirement); and the backward induction valuation process, which sets the bond's value, under a no-call notification policy, equal to the discounted expected value of its payoffs next period.

To see the sensitivity of the call decision to prevailing interest rate volatility, note the impact on the bond's value—as well as the call/no-call decision—if volatility were to fall to 15 percent. In that case, a reproduction of the steps derived above would demonstrate that the bond's value is $100.46, and the Treasury should exercise its right to call the bond.

Notes

1. For the details of constructing a tree to match a given term structure of interest rates, see Appendix B of Bliss and Ronn (1995).
2. In option terminology, this is the discounted expected value using the so-called risk-neutral probabilities.
3. The technique of building an interest rate tree and employing backward induction is used to determine whether the bond should be called at this time. This process also produces a fair value for the bond, given this interest rate model. The model thus indicates whether the market price for the callable bond is "rich" or "cheap." Furthermore, the binomial interest rate tree can be used to value the wide universe of embedded-option bonds, including agency, corporate, and municipal bond issues.

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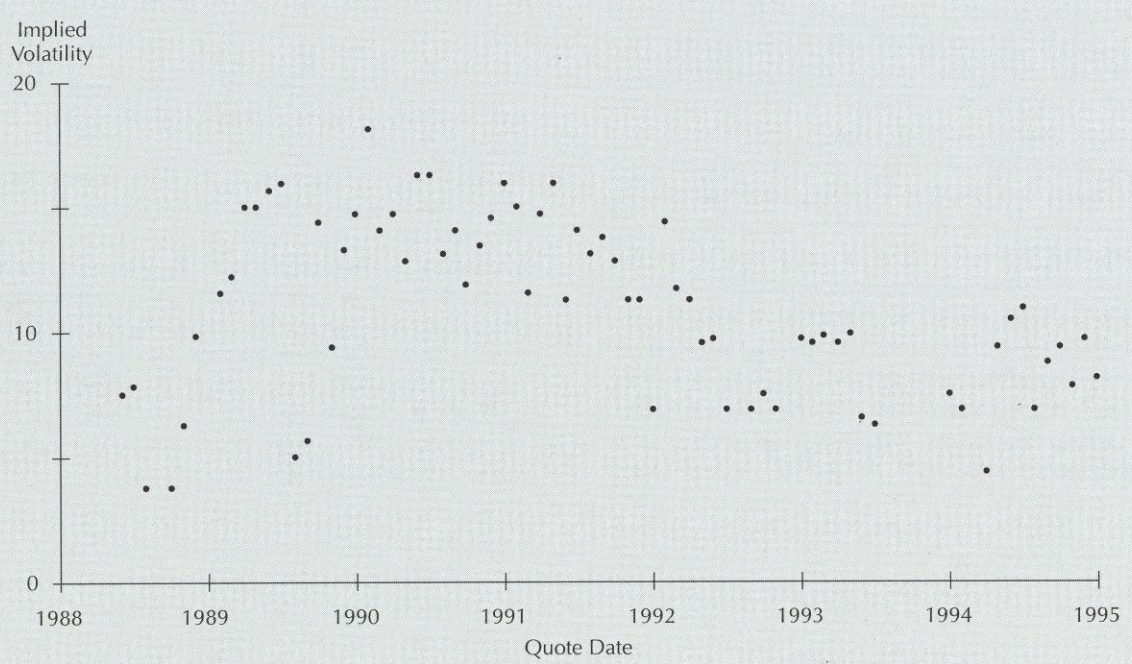
Box 2
Measuring Market Interest Rate Volatilities: The Example of the Treasury 11¾'s of 11/15/2009-14

The previous discussion has motivated the importance of ascertaining the normal level of interest rate volatility priced in the marketplace, which serves as a benchmark for the estimated threshold volatilities. The 11¾'s of November 2009-14 is the only callable bond to be included in the STRIPS program and may therefore have received more attention in pricing than other callable securities. This bond also provides one of the longer time series of implied volatility observations for an individual security. For these reasons, the 11¾'s of November 2009-14 is a reasonable candidate for the estimation of market volatility. Using the twin inputs of (1) the observed market price of this bond and (2) the noncallable term structure of interest rates given by the prices of the C-STRIPS,[1] it is possible to calculate a time series of the volatility implied by the price of this bond. By definition, implied volatility is that value of interest rate volatility that equates the market price of the bond to its fair value under the interest rate process described in the above numerical example.[2] It is also one of the longer time series of implied volatilities for any individual bond. Furthermore, the C-STRIPS prices constitute efficient estimates of the noncallable term structure of interest rates. It is thus of interest to inspect the chart below, which plots these implied volatilities for the post-1988 period for this bond.

One conclusion that can be gleaned from the chart is that implied volatilities on such bonds typically range from 5 percent to 20 percent and lie for the most part in the 10 percent to 15 percent range. These numbers will be useful in examining the optimality of the Treasury's past call decisions since they are an indication of the volatility the Treasury should consider when making the call/no-call decision. The threshold volatility is then compared with normal levels: this is the volatility at which the Treasury would be indifferent about the choice to give the call notice or abstain from calling the bond. Thus, if a bond's threshold volatility is large relative to normal market volatilities, the indication is that there is no time value remaining in the call option and the Treasury should call the bond. On the other hand, if the threshold volatility is small, there must be time value remaining in the option at normal levels of volatility, and the Treasury should refrain from calling the bond.

Implied Volatilities of 11¾'s of 2009–14 Treasury Bond
(Using Treasury coupon STRIPS term structures)



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Notes

1. Strictly speaking, using C-STRIPS causes the term structure of interest rates to be upward-biased relative to the Treasury's true alternative, which is to issue on-the-run bonds whose liquidity enhances their value relative to the off-the-run bonds and STRIPS.
2. Formally, this interest rate process posits a lognormal distribution for the rate of interest. It is a special case of the interest rate processes presented in Black and Karasinski (1991) in that it omits a mean-reversion parameter. Black and Karasinski's interest rate model is able to match the term structure of interest rates as well as the term structure of volatility.

Notes

1. Noncallable, or plain vanilla, bonds pay a fixed, usually semiannual coupon until a stated maturity date when the principal is repaid. The cash flows paid from such bonds to investors are fixed and unchanging. In contrast, the issuer of a callable bond retains the right to redeem (call) the bond at designated times prior to its stated maturity date by repaying the principal, and sometimes for corporate bonds a call premium, after which coupon payments cease.
2. In addition, three puttable securities have been issued, the last of which matured in 1962. All three issues matured without the options being exercised. One of these, the 2's of March 1933, issued in March 1932, paid both principal and interest in U.S. gold coins. Interestingly, another certificate was issued at the same time with the same maturity but without the put option or gold coin payment provisions. This unadorned certificate carried a 3.75 percent coupon.
3. The acronym STRIPS stands for "separate trading of registered interest and principal securities." A stripped bond has the coupon and principal payments unbundled, sold, and subsequently traded separately. The C-STRIPS are the coupon issues; the P-STRIPS refer to the principal or corpus of the underlying coupon bonds. It is also possible to rebundle (or reconstitute) previously stripped bonds. The last callable bond, the 11¾'s of November 2009-14, is eligible for stripping. However, valuing the "tail" of the bond, those cash flows from November 2009 onward proved inconvenient, as the number and timing of cash flows were dependent on future call decisions and were therefore uncertain. These conditions made callable bonds unattractive for stripping. To appeal to the STRIPS market, the Treasury ceased issuing its long bonds in callable form.
4. For deep in-the-money put options and for call options on dividend-paying stocks, the time value may become zero prior to expiration of the option.
5. Treasury could announce a call more than 120 days prior to any coupon payment date in the call period. But the closer the actual exercise (coupon) date, the less uncertainty there is about future interest rates. It is therefore never rational for the Treasury to give notification of intent to call any earlier than it has to (possibly allowing for a few days' delay in promulgating the decision).
6. This naive decision rule has been used by Ingersoll (1977) and Vu (1986) when examining corporate bonds and by Longstaff (1992) for Treasury bonds.
7. It is not that the Treasury should attempt to predict which way interest rates will move or what the price will actually be in four months. Expected value refers to the average of the possible future values that the bond may take on in four months using the risk-neutral probability distribution. Risk-neutral probabilities are a technique for valuing options. The technique is based on the, at least theoretical, ability to "lock in" the risk-neutral expected value by replicating the callable bond using a dynamic strategy of buying and selling noncallable bonds of various maturities. Transactions costs and other market frictions make actual dynamic replication difficult in practice.
8. To see that this procedure is equivalent to deciding on the basis of expected value as of the actual call date, let P be the principal amount, C be the next coupon amount, r be the four-month interest rate, and $E(CB_1)$ be the risk-neutral expected value of the callable bond, if it is not called, in four months. The original rule is "call if the expected value of the not-called bond exceeds the principal," that is, if $E(CB_1) > P$. Adding the unavoidable coupon and taking present values, one gets

$$\frac{C + E(CB_1)}{1+r} > \frac{C+P}{1+r}.$$

   The value at the notification date of the callable bond if it is not called, CB_0, is the present value of its expected value plus the coupon, $CB_0 = [C + E(CB_1)]/(1 + r)$, and the value of a "short bond," S, with the same coupon, maturing on the next coupon date, is the present value of the principal plus remaining coupon, $S = [C + P]/(1 + r)$. Therefore, it follows that $E(CB_1) > P$ is equivalent to $CB_0 > S$.
9. There are numerous ways of measuring term structures (see, for instance, Bliss 1994), but perhaps the simplest is to use the prices of Treasury coupon STRIPS.
10. Bliss and Ronn (1995) provide a means of narrowing down the ambiguous range somewhat by determining the current market volatility rather than relying on averages over time.

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11. The delay also led some investors to be lulled into complacency and then complain that the Treasury had not told them that these issues actually might be called, thus unfairly depriving them of high-yielding investments (*Wall Street Journal*, April 10 and October 10, 1991).

12. In contrast, Bühler and Schultze (1993) investigated the German government's call decisions and concluded that rational call opportunities were frequently missed. They attribute this to a governmental policy not to harm "widows and orphans" by depriving them of valuable investments.

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Mergers and Acquisitions in China

Jie Lin Dong and Jie Hu

In the mid-1980s, China's government experimented with arranging mergers among state-owned enterprises in an attempt to enhance the efficiency of these enterprises. As market-oriented economic reform entered the 1990s, a wave of voluntary mergers and acquisitions involving the state-owned enterprises, collective enterprises, and private enterprises as well as foreign investors has swept the country.

This article provides a detailed description of the Chinese mergers and acquisitions market and seeks to serve two purposes: The first is to provide a starting point for understanding mergers and acquisitions activity in China as it figures into international investment markets. The other is to provide a rudimentary analysis of the advantages and disadvantages of China's approach to mergers and acquisitions, that is, its efforts to transform state-owned enterprises in a centralized planning economy into profit-pursuing firms in a market economy. Given that research in the Chinese mergers and acquisitions market is virtually nonexistent, it would be essentially impossible at this point to present a complete economic analysis regarding the latter issue. The article instead is devoted mostly to the first point—that is, documenting what is taking place in China's mergers and acquisitions market and providing some discussion from the perspective of financial economists.

Turning briefly to evaluating the merits of China's approach seems important, however. While the Chinese mergers and acquisitions market has evolved out of several driving forces and serves multiple purposes, economists have taken a special interest in its role in privatizing or revitalizing state-owned enterprises. Researchers are looking to developments in China as particularly important for a couple of broad reasons. One is that

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the direct political motivation behind the emergence and development of the Chinese mergers and acquisitions market is the need to solve the problems of state-owned enterprises. The other is that the problem of how to revitalize these enterprises inherited from a centralized planning economy is one shared by the countries of Eastern Europe and the former Soviet Union. In light of the importance of this issue, it may be helpful to compare the Chinese mergers and acquisitions approach (along with some other measures) with Russia's privatization voucher program for revitalizing state-owned enterprises. Following that discussion is a description of the mergers and acquisitions market and a discussion of its economic significance in general.

Becoming a Market Economy

For a centralized planning economy to transform itself into a market economy, one of the most difficult tasks is to convert state-owned enterprises into market-oriented, profit-pursuing firms that can contribute to output and productivity growth. While the number of new private enterprises in China is growing fast, that growth is not offsetting the inefficiency of the state-owned enterprises, which are contributing to rising inflation and eating away investment funds that might otherwise be effectively used. Moreover, many state-owned enterprises face possible bankruptcy, which threatens to put workers out in the streets and create accompanying social problems (discussed more fully below).

Developing mergers and acquisitions is one measure China has adopted to solve this problem, an approach that differs from those of East European countries and the former Soviet Union in many aspects. Consider, for example, Russia's voucher program for revitalizing state-owned enterprises. In November 1992 the Russian government decided to privatize its state-owned enterprises by distributing vouchers to its citizens, who would use the vouchers to bid, directly or through investment funds, for a share of the state-owned enterprises when they were put up for auction. The voucher program offered several promising characteristics: (1) It was implemented swiftly, and that swiftness was thought to be a virtue by its promoters following the idea of Poland's "big bang" (Jeffery D. Sachs 1992).[1] In about one year, 7,000 Russian state-owned enterprises were privatized through the voucher auction (Lynn D. Nelson and Irina Y. Kuzes 1994). (2) The program by design aimed at equity, with every citizen given an equal number of vouchers. (3) The program's single purpose was to achieve privatization of state-owned enterprises, with efficiency enhancement expected to follow as a natural result, at least in the long run. However, the voucher program has failed both to revitalize the state-owned enterprises and to achieve and maintain equity, according to some economists (Nelson and Kuzes 1994). Because the voucher auctions have injected neither capital nor better management skills and technologies into the state-owned enterprises, privatization has not improved productivity as expected. The program's failure to maintain equity among the people is, despite all its good intentions, one of its most significant shortcomings (Nelson and Kuzes 1994). Enterprise insiders and voucher speculators have eaten away the lion's share of the state-owned enterprises while common people are left at a great disadvantage. Such a result should perhaps not be surprising in a country lacking established institutions—visible and invisible—essential for a successful market environment.

Unlike the Russian government, which apparently chose the voucher program as a means of achieving radical political goals by demolishing the old economic system swiftly (see Nelson and Kuzes 1994), the Chinese government seems to have more pragmatic considerations. China seeks to combine economic growth with the transformation of state-owned enterprises and has adopted a policy of reforming them gradually, one by one. The idea behind the mergers and acquisitions approach, as well as other measures, is to let the state-owned enterprises be voluntarily acquired by or merged with other, better state enterprises, collective enterprises, private enterprises, and foreign business interests. Such an approach has combined ownership transfer with management adjustments, technology upgrading, and capital injections. While the one-by-one approach may privatize ownership more slowly, it may help avoid the painful shock of finding the economic environment and reformed enterprises abruptly mismatched. The government has more time to rectify problems that arise during the process and to establish a compatible market environment. The disadvantage of this approach may be that the solution will not keep pace with the fast deterioration of the state-owned enterprises. It is too early yet to evaluate the virtues and vices of China's approach. Given the unsatisfactory results of other, speedier approaches in Russia and some other Eastern European countries—for example, Poland—it will be interesting

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to see whether China's gradualism will succeed in reforming the state-owned enterprises.

The discussion that follows focuses primarily on China's mergers and acquisitions market itself—how it has come into existence, what its characteristics are, and how it may develop in the future. The privatization issue will be considered again as appropriate.

A General Background of China's Economy

Economic Reform: 1978-95. The mergers and acquisitions market in China has emerged as a logical outgrowth of the country's economic reform, which began in 1978 in the agriculture sector. The centralized planning economy was on the verge of collapse, and the key idea behind reformation was to replace the existing commune system with the family farming network. The result was dramatically improved agricultural output. In 1984 the government began reforming industrial enterprises as well, with a goal of converting them into profit-seeking units. Unfortunately, high inflation following the political upheaval in 1989 stalled the reform. In early 1992 when Deng Xiao Ping launched a campaign to revitalize the economic reform program, it picked up again and began to extend to other parts of the economy such as the financial sector and the tax system.

China's economic reform has obtained some positive results. In the last seventeen years, China has kept a near double-digit real (inflation-adjusted) growth rate. Per capita gross domestic product (GDP) for 1994 was only $431, but actual purchasing power was much higher because of low price levels (The State Administration of Statistics of the People's Republic of China [SAS] 1995b). Foreign direct investments increased at an average annual rate of 40.7 percent between 1983 and 1993 (Knight-Ridder 1994); at the end of 1994, 206,000 joint ventures and foreign subsidiaries had investments of $291.43 billion (SAS 1995b). Total exports had reached $120 billion by the end of 1994, total imports were $115 billion, and the foreign currency reserve reached $51.6 billion (SAS 1995b), which was ranked one of the largest in the world. In December 1990, Shanghai Securities Exchange (SHSE) was established, and in April 1991, Shenzhen Stock Exchange (SZSE) followed suit, both growing rapidly in the last couple of years.

Given the Chinese economy's rapid growth and its enormous potential, the emergence and development of its mergers and acquisitions market are likely to be significant in the international economic community. As will be discussed, one difference the market will make is in opening up an additional channel for foreign investors to participate in the Chinese economy.

Table 1
Industrial Output by Enterprise Type
(Percent)

Type of Enterprise	1978	1994
State-owned	77.6	34.1
Collective	22.4	40.9
Private and foreign	0.0	25.0

Source: SAS (1995a).

A Taxonomy of Enterprise Ownership. As the essence of mergers and acquisitions is restructuring the ownership of enterprises, a taxonomy of the current ownership of industrial enterprises in China might be informative as background for the discussion. It is important to remember, of course, that the ownership structure of these enterprises has been changing constantly and any simple classification such as the one presented here can serve only as a reference point for further understanding.

Ownership of enterprises in China may be sorted into three categories: state ownership, collective ownership, and a combination of private and foreign ownership. The state-owned enterprises vary in size, and their production scope covers heavy industry, light industry, and the service sector. They contributed 34.1 percent of China's total industrial output in 1994, a much lower share than that of sixteen years earlier (SAS 1995a; see Table 1). The collective enterprises are usually small and are concentrated in light industry, agriculture-support industry, and the service sector. Their total capacity, however, has expanded rapidly since 1978, and these enterprises contributed 40.9 percent of the total industrial output in 1994. The private enterprises are mostly in the service sector, and foreign enterprises cover a broad spectrum of manufacturing. They together contributed 25 percent of the total industrial output in 1994; most of these enterprises did not exist in 1978. A subcategory of the private industrial enterprises is 8 million so-called sole proprietors (see Table 2), which are not merger or acquisition targets given that their average number of employees is small.

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State-owned Enterprises. A state-owned enterprise is one established by the government, owned nominally by "all the people of China," and managed by government-appointed bureaucrats. Before 1980, no state-owned enterprise pursued profits but instead served as a government agency carrying out directives from its superiors. These directives specified the goods to be produced or distributed and the compensation to be received by workers. The raw materials and bank credits needed for the operation were allocated to the enterprise directly or indirectly by the State Planning Commission and the Ministry of Finance. The administrative superior of a state-owned enterprise was one or a few of the following bodies: the ministry in charge of the industry in which the enterprise was categorized, the provincial government, or the city government. The managers' goal was solely to fulfill the government plan, without having to consider business decisions, such as input and output prices, which were fixed by the government.

Table 2
Number of Industrial Enterprises by Ownership
(Thousands)

Ownership	1978	1994
State-owned	n.a.	102.2
Collective	n.a.	1,863.0
Township/village	15,240.0	24,945.0
Private and mixed-ownership (excluding sole proprietors)	0	44.5
Sole proprietors (rural and urban)	150.0	8,007.4

Source: SAS (1995a).

Entering the 1980s, the government began experimenting with reform measures aimed at enhancing the efficiency of state-owned enterprises (Jinlian Wu 1987). The reform advanced along two lines, one being to devolve decision rights to the enterprise managers and the other, to reform the price system, the tax system, and the financing system so that the economic environment would be more like a market and state-owned enterprises would respond to market signals. The results have been mixed, and many problems remain unsolved: unsuccessful alignment of incentives for labor, management, and the government; lack of management experience and skills needed in a new environment undergoing market-oriented transitions; aggressive competition from collective enterprises and foreign enterprises; and high operation costs owing to material wastes, shirking, redundant workers, and backbreaking welfare burdens.[2]

Collective Enterprises. A collective enterprise is nominally owned by its "guardian" or "sponsor," usually another company, a social organization, or a government agency, but it is usually quite independently operated by its management team. More often than not, the initial capital of a collective enterprise is contributed by the guardian or borrowed from the state banks or other institutions using the guardian's influence and connections. In the first case, the guardian may be entitled to a portion of the enterprise's profits; and in the latter, the guardian is usually entitled to an annual fee from the enterprise. The management team, which acts like a de facto owner, cannot claim the residual profits but has discretion about how to reinvest the profits and whether to disburse them as bonuses within the explicit or implicit limits set by the company charter and government regulations. Production by a collective enterprise is not planned by the government. Its managers decide what goods to produce or what services to provide, but they do so, of course, within the parameters of having to obtain raw materials and credits in the marketplace. Prior to 1978, a collective enterprise often found itself ignored by the economic planning system. During the 1980s, they benefited from economic reforms and, with their competitive advantage of management flexibility, low labor costs, and autonomy regarding the retained after-tax profits, they began to thrive in the more marketlike environment. Their success may partly explain why more and more collective enterprises have been set up under the encouragement of rural townships and urban municipalities since economic reform started. (See Table 2, which lists township enterprises, a subcategory of collective enterprises, separately.)

Private and Foreign-owned Enterprises. For ideological reasons, private enterprises were all but nonexistent before 1978. They were allowed to come into existence then under the explosive pressure of mass unemployment manifested in the homecoming flood of city youths, who had been coaxed and coerced to the countryside during the cultural revolution (1966-76). The first such enterprises were usually small businesses in the service sector, most of them operated by an individual or a family. While a small portion of them have subsequently grown into bigger opera-

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tions and forayed into manufacturing, most have remained small in both scale and scope. The number of firms that are wholly or partly owned by foreigners, in the form of joint ventures or independent companies, has mushroomed throughout the nation since 1978, thanks to the open-door policy to attract foreign capital. The role of both private and foreign-owned enterprises is expected to grow quickly.

Joint-Stock Companies. In the late 1980s, the Chinese government began implementing ownership reform for state-owned and collective enterprises. The ultimate goal is to limit the government's role in a state-owned enterprise to that of a shareholder with limited liabilities. For collective enterprises, reform involves redefining or clarifying the ownership shares of the involved parties, after which the enterprise is called a joint-stock company. A joint-stock company may have several classes of shares: those held by individual investors, those held by institutions, and those held by the government. The individual shares, which are listed on the stock exchanges, include A-shares, which are traded among domestic investors, and B-shares, which are traded among foreign investors; the institutional shares, called C-shares, are traded on the Stock Trading and Quotation System (STAQ) or the National Electronic Trading System (NETS). The state shares may be purchased only through negotiation with the government. In 1994, the number of state-owned enterprises converted into joint-stock companies increased to 25,800 from 13,000 in 1993 and 9,440 in 1992 (Jinshen Zhang 1995). Over the same period, about 3 million collective enterprises converted to joint-stock companies (Zhang 1995). Current policy makes it likely that most state-owned enterprises and collective enterprises will follow suit.

The conversion of enterprises into joint-stock companies is significant in the development of the mergers and acquisitions market in a couple of important ways. One is that it lays a rudimentary foundation for ownership transfer through public offerings and merger and acquisition activities because after the conversion it is easier to transfer ownership from one party to another. Well before the stock market came into existence in China, some joint-stock companies began to exploit the operational advantage of restructuring their ownership by selling stocks to their own employees as well as other institutions. Another significance is more profound: without unlimited financial backing from the government, a joint-stock company converted from a state-owned enterprise is expected to compete in the market like a collective or private enterprise. A natural consequence is that some state-owned enterprises may come out alive and well while others will end up facing bankruptcy, a result that expedites the development of the mergers and acquisitions market because the last hope for some of these enterprises may lie in being acquired or merged.

*D*riving Forces behind Mergers and Acquisitions

Mergers and acquisitions are an integral part of any market economy, enhancing an economy's efficiency by reallocating and recombining production resources for better use. As China pushes its market-oriented economic reform into the 1990s, there seem to be three reasons behind the emergence of its mergers and acquisitions market, reasons that are likely to continue driving the market's development.

The government is essentially being forced to restructure and revitalize the state-owned enterprises, especially the unprofitable ones (for example, see Anding Li 1995). The plan involves three steps: severing the government from these enterprises by redefining the government's role as a shareholder with limited liabilities; revitalizing large and some medium-sized state-owned enterprises by further devolving decision rights to management and continuing economic reform toward a fair and competitive market; and selling and renting the small and some medium-sized state-owned enterprises to competent public or private entities. This policy has basically opened the door for mergers and acquisitions of small and medium-sized state-owned enterprises. For large state-owned enterprises, the possibility of letting some be partially or wholly privatized remains a sensitive issue but is being considered by the government.

A second force behind the growth of the mergers and acquisitions market is that it is called for by the growing needs of the enterprises themselves as they seek to implement their development strategies (Jixiang Ni and Zhigang Zhu 1994). Profitable enterprises, either collective or state-owned, may need to expand their capacities, upgrade their technologies, diversify or streamline their products, invest in a new industry or divest from an existing business, enter into a new geographic area, and the like; the mergers and acquisitions market provides them an efficient channel for achieving these goals. The many unprofitable enterprises also stand to benefit, potentially breathing in

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new life through being acquired by or merged with other enterprises. In other words, industrial growth in the last fifteen years has brought the Chinese economy to a point of readiness for an active mergers and acquisitions market that will facilitate its internal structural adjustments.

The third dynamic encouraging development of China's mergers and acquisitions market is that it helps enterprises attract more international capital (Ni and Zhu 1994). Foreign investments in China usually take one of three forms—establishing and operating a joint venture with a local partner, investing in listed stocks, or acquiring or merging with an existing enterprise. Joint ventures are the most common form of foreign investment since 1978; because they involve the detailed operation of a project, the foreign investor usually needs to possess expertise in the particular business. Investing in the stocks of Chinese firms is a purely financial market activity, and the opportunities are available to the general public; the investment targets are limited, however, to the companies listed in the domestic and foreign stock exchanges.

In comparison with these means of investment, investing in a Chinese firm through merger or acquisition offers several advantages: (1) The investor may choose to attend to the acquired firm's daily business, but he or she may not necessarily have to do so. Such a form of investment may, therefore, be suitable for industrial companies as well as general investors through holding companies. (2) Potential investment targets are much more numerous than those listed on the stock exchanges. (3) Cash flow may be generated in a shorter time than in the case of a joint venture since a plant does not have to be built from scratch. (4) The investor may have full control of the acquired company, which is not attainable in a joint venture because the law stipulates that the management of a joint venture must be equally shared by local and foreign investors irrespective of their capital shares. (5) Most importantly, a merger or acquisition deal may be attractive to an investor because it offers land use at little or no cost, ready-made distribution channels, skilled labor, technical and commercial information, and so forth—even when a target has been a money-losing enterprise.

Driven by these forces, many voluntary merger and acquisition activities sprouted in China in the late 1980s and early 1990s, with the active support of local governments. The long-anticipated official sanction of the central government was issued on November 14, 1993, when it passed the landmark document *A Resolution on Several Issues in Establishing a Socialist Market Economic System*, which formally acknowledged the value and legitimacy of private enterprises and endorsed more liberal reform measures for state and collective enterprises.

An Overview of China's Mergers and Acquisitions Market

Historical Developments. Of the factors contributing to the economic motivation for opening up the mergers and acquisitions market, the severe problems of the state-owned enterprises have done the most to tilt the political balance toward government acceptance of mergers and acquisitions. The inefficiency of the state-owned enterprises is a long-standing problem, and in the context of the market-oriented reform the survival of many of these has become an imminent issue as they hinder further economic development and reform. Nearly half of them are incurring losses, and many if left to their own resources would have already gone bankrupt. In recent years, the government has allocated 60 percent to 70 percent of annual fixed-assets investments from banks—all are state banks—to state-owned enterprises, largely to bail out those suffering losses (see Mark Spiegel 1994, for example). Such nonproductive fiscal expenditures account for the major portion of the fiscal deficit and contribute to the country's recurrent high inflation, which in 1994 was 24.1 percent for the nation and much higher for some major cities (SAS 1995b).

Early government attempts in the mid-1980s to reform the state-owned enterprises included measures to arrange mergers and acquisitions. The result, however, was less than satisfactory if not in fact a failure (Deqiao Hu 1994). Among the arranged mergers only a few generated some synergy, which usually dissipated very quickly, and many turned out to be disastrous because of conflicts of interests that materialized. Little efficiency enhancement should have been expected, though, given that the mergers and acquisitions essentially involved management adjustments and production replanning without consideration of ownership issues, capital injection, or technology upgrading and given that, being arranged by the government, the activities lacked the motivation for success of profit-seeking enterprises.

Since the late 1980s, the government has been experimenting with other reforms for state-owned enterprises—for example, letting incurable firms go

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bankrupt and transferring the ownership of some other firms to the public through free-market-style mergers and acquisitions. The bankruptcy experiment has progressed slowly because there is no social safety net for absorbing released workers, and private job growth is not fast enough to absorb the workers either. The mergers and acquisitions market has gained vitality, though, in the 1990s. State-owned enterprises may merge among themselves, and enterprises and private enterprises are also allowed to join the game on equal footing. In contrast to the mergers and acquisitions of the mid-1980s, the activities in this round are voluntary, and they may cross kinds of ownership, industries, and regions. In 1993 alone, more than 2,900 enterprises, most of them small and medium-sized, were merged or sold in the sixteen major cities of China, including Tianjin, Shanghai, Guangzhou, Wuhan, and Shenzhen; 6 billion yuan ($1 = 8.3 yuan) of assets changed hands, and 400,000 employees were reassigned (Xinhua News Agency 1994). In addition, the role of the securities market in mergers and acquisitions has been exploited. In October 1992, the first acquisition of a public company through the secondary securities market was accomplished, and several other companies have followed the example.[3]

Foreign investors are participating in the current mergers and acquisitions market and are at least half-heartedly welcomed. Their participation injects more capital into China, which is good news, especially to the local governments. On the other hand, the central government is concerned about the loss, or the possible loss, of control over certain industries to foreign investors. The official policy has swung back and forth, reflecting the government's ambivalence. Foreign investors in this arena must maneuver without a complete set of guiding laws, and the lack of such a framework may work for or against their activities. For example, because the policy area is gray, some mergers and acquisitions transactions by foreign companies are structured as joint ventures while others are plain vanilla mergers and acquisitions.

The Chinese government finds the results of merger and acquisition activities largely encouraging (Hu 1994). As expected, these activities have revitalized some state-owned enterprises and relieved some of the government's financial burden. One result has been more efficient allocation of production resources as assets have been enlivened by transfer from the low efficiency state-owned enterprises to the new owners. International investors are also reacting positively, clearly attracted by the additional investment channel China offers (see Hu 1994, for example).

Privatization. Privatization of many state-owned enterprises is likely to be the most long-lasting type of merger and acquisition activity. For example, Vantone Company, one of the largest private enterprises that has prospered from the booming real estate business in Hainan Island, has made inroads into retail and pharmaceutical businesses by acquiring state-owned enterprises. The company started with initial capital of 60,000 yuan in 1990 and by 1993 had become a profitable conglomerate with assets of 3.5 billion yuan (Vantone Company 1993). Another well-publicized example is the Wuhan Dadi Science and Technology Company, a private enterprise that acquired the medium-sized state-owned Wuhan Matches Plant at the end of 1993 at a price of about 70 million yuan (Liang Chang 1994).

Along with privatization has come significant growth in the number of entrepreneurs as the mergers and acquisitions market has provided opportunities for people to start and expand their own businesses. In recent years, many small firms have been bought out by independent entrepreneurs or the firms' employees (Hu 1994).

Merger and Acquisition Targets. The Chinese government has several criteria for deciding which enterprises can be allowed to enter the mergers and acquisitions market: First, the merger or acquisition should be carried out gradually so that the economy will not be subject to a shock. Second, control of the crucial outputs important to national security and economic health should be maintained. Third, the mergers and acquisitions market should move forward on an experimental basis (preferably embracing first those enterprises facing the most difficulties) as the government keeps some flexibility in adjusting its policy. In this spirit, the government has stipulated that (1) the mergers and acquisitions of state-owned enterprises should be compatible with the government's industrial strategy; (2) state-owned enterprises related to national security, military defense, advanced proprietary technologies, scarce mineral mining, and other specified areas cannot be sold to private or foreign investors; (3) a state-owned enterprise in a pillar industry such as energy, transportation, or communications may be partially sold, but a majority share must be retained by the government; and (4) any merger or acquisition deal of a large state-owned enterprise that is the backbone of an industry must be reviewed individually (Bureau of State Assets Management 1995).

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Most state-owned enterprises that are put on the market for sale or merger by the government are small or medium-sized, have a long history of operating losses or a lack of promising products, and are subject to a high level of debts. Selecting enterprises with these characteristics is consistent with the central government's motivation to revitalize the money-losing state-owned enterprises and to test and start the mergers and acquisitions market with small and medium-sized enterprises.

When a large or profitable state-owned enterprise needs outside capital, the central government seems to prefer to let it go public rather than to sell it. The securities market, however, is still in its developmental stage and each year stingy quotas, explicit or implicit, are issued to the local governments for initial public offerings. To list in the securities markets in foreign countries (such as on the New York Stock Exchange or the Hong Kong Stock Exchange), a Chinese company has to get approval directly from the central government, and getting such approval is next to impossible for most state-owned enterprises. This situation has forced some large or profitable state companies, which need capital injections and technology upgrading, to venture into the mergers and acquisitions market and sell themselves. They are able to do so because of the consent or support of the local governments, which are eager to attract capital to the local economy. Some cities have thus stepped ahead of the rubric policies of the central government and become pioneers in the so-called ownership revolution.

China seeks to combine economic growth with the transformation of state-owned enterprises and has adopted a policy of reforming them gradually, one by one.

As mentioned above, the government also puts many collective enterprises, profitable or unprofitable, on the market for sale. They are usually small or medium-sized, and the government has fewer restrictions on their merger and acquisition deals. Private enterprises have had such a brief development history that they do not figure as merger and acquisition targets; their ownership transfer, if any, usually occurs within a circle of friends and relatives. Private-to-private merger and acquisition deals are uncommon not because of government discouragement but because these enterprises are not developed fully enough to be attractive merger or acquisition targets.

As discussed above, many merger and acquisition deals for state-owned and collective enterprises are executed after they have been converted into joint-stock companies. A mergers and acquisitions transaction for a joint-stock company target is technically easier because of the company's clearer ownership definition.

The Institutional Environment. Committed to making its transitions gradually, the government has been conservative in institutionalizing procedures for addressing issues in the mergers and acquisitions market. Because existing economic institutions are not designed for a free market operation, rules must be drafted as the game is being played, with the frequent result that they may be both vague and redundant. Existing institutions are intended to address the specific issues of the legality of deals, valuation of assets, and facilitation of transaction. The complicated and often confusing nature of government control over merger and acquisition activity has evolved somewhat out of rational consideration of the issues but also simply out of the bureaucratic machine.

Which regulatory agencies are involved in a merger and acquisition case depends on the ownership of the target and the type of acquirer, among other things. When the target is a state-owned enterprise, at least five government branches will be consulted: the Economic Planning Commission, the Administration for State Assets, the Administration for Industry and Commerce, the department in charge of the industry of which the target company is part, and the Commission for Restructuring Economic Systems. If the acquirer is a foreign investor, the Ministry for Foreign Trade and Economic Cooperation will also be included. For a publicly traded company, the Securities Regulatory Commission of China has a role.

The size and importance of the target company usually determines which level of the government is involved. A deal involving a small state-owned enterprise probably controlled by the local government can usually be approved locally. A medium-sized state-owned enterprise is likely to be jointly supervised by both the local and the central government, and the negotiations have to be carried out on both fronts. Most large state-owned enterprises are under

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the direct control of the central government, and any merger or acquisition deal involving these companies would be carefully reviewed by the central government.

The question of who represents a state-owned enterprise being targeted for merger or acquisition is often a point of contention between local governments and the central government as well as between the government and the company's management. The central government recently tried to reassert its control in the matter by stipulating that (1) the management of a state-owned enterprise has no right to sell the company without authorization; (2) only the designated agent, in most cases the Administration for State Assets, can represent a state-owned enterprise in a merger and acquisition deal if the enterprise has not already been converted into a joint-stock company; (3) a joint-stock company is the property of its shareholders, who have decision weights according to their shares, and the rights of the state shares are to be exercised by the Administration for State Assets; and (4) the acquirer of a state-owned enterprise may be an individual or an institution (Ni and Zhu 1994).

When the merger and acquisition target is a collective enterprise, the matter is simpler. As discussed earlier, a collective company, whose ownership is often vague, is usually controlled by the company's management while another company, a government agency, or a social institution acts as its guardian. Because collective enterprises tend to have a looser relationship with the government and their production focus is mostly on consumer products, the government has less interest in their merger and acquisition deals. In most cases, a deal is negotiated exclusively between the acquirer and the management of the target company, with final approval obtained from the guardian and a formal application filed with the government.

To acquire a joint-stock company, all an investor needs to do is to amass a controlling stake through stock purchase in the secondary market or negotiation with the shareholders, a practice similar to that in most western countries. Acquiring a public company through the secondary market requires careful observation of securities laws and regulations: Foreign investors are not allowed to buy A-shares or take more than 5 percent of the ownership by holding B-shares. They may, in principle, purchase C-shares and state shares by dealing directly with the holders.

There are 174 property exchanges, established by the local governments and major financial institutions in recent years, that serve to facilitate merger and acquisition transactions and enforce government regulations. Specifically, the exchanges collect and disclose information about merger and acquisition prospects, assist both sides in procedures, and provide other consulting services. They also furnish information and experience to the government in formulating merger and acquisition policies on issues such as asset evaluation, debt settlement, and employee placement. Fourteen of the exchanges operate at the provincial level, 104 at the city level, and 56 at the lower municipal levels (Ni and Zhu 1994).[4] While a few exchanges are active and developing quickly, the rest are not ready to function properly. In all likelihood, many of the city and lower municipal exchanges will be consolidated to the provincial level and networked nationwide.

Because the mergers and acquisitions market is in an experimental stage, most related regulations are in the form of provisional rules, which will be revised into permanent laws over time. Continual changes in the regulations should therefore be expected, and they will be open for interpretation as they are evolving. Such a legal environment offers investors both opportunities and risks: while investors may find more freedom in structuring and negotiating deals, they may also lack solid legal protection. China is speeding up the process of establishing a legal system in line with international standards. Each year sees progress in the passing of laws and in the clarifying of legal issues. However, full establishment of properly functioning legal institutions is a long-term goal.

Foreign Investors

For the Chinese government foreign capital and management skills are vitally important in the mergers and acquisitions market if the country is to achieve its presumed economic goals. For international investors the mergers and acquisitions market in China offers another channel for participating in this growing economy and reaping financial rewards.

Investment Channels. Foreign investors have three channels for carrying out equity investments in China: one is to buy listed stocks of Chinese companies, another is to set up a joint venture with a local company,[5] and the third is to acquire part or all of a Chinese company. The three channels span a spectrum of investment characteristics, with stock markets and joint ventures at either end and acquisitions in between.

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Stock Markets. Two stock exchanges have been established in China since late 1990, one in Shanghai and the other in Shenzhen. By the end of 1994, 289 stocks were listed, some of which were accessible to foreign investors (Shanghai Securities Exchange 1995 and Shenzhen Stock Exchange 1995). Besides that, approximately twenty Chinese stocks are listed on the Hong Kong Stock Exchange, New York Stock Exchange, and other markets. Even though the domestic exchanges are experiencing rapid growth and a few more stock exchanges are likely to be established, it seems certain that the listed companies will remain a small fraction of the 100,000 state companies and millions of collective enterprises. Such an investment channel therefore will remain of narrow scope even if the access barrier for foreigners is completely dismantled. Some investors may also hesitate to choose this channel because of the excess price volatility and the irregularities typical of infant stock markets (Economist Intelligence Unit 1995a) as well as the fact that the stock markets are subject to the government's intervention. Investing in stocks does offer the advantage of liquidity, though, which streamlines an investment process down to portfolio management (buying and selling) and thereby relieves the investors of involvement in the operational details of the underlying companies. Because it does not require fine-tuning the management of a company, such an investment channel is accessible to a wide variety of investors who may not possess technical expertise in the underlying business.

Joint Ventures. On the other end of the spectrum as investment opportunities for foreigners are joint ventures, which have been the most common form of direct investments in China since economic reform began in 1978. A new joint venture enjoys preferential tax treatment: no tax for the first two years and half tax for the next three. There are drawbacks, though, because capital invested in a joint venture may have a low level of liquidity and cash flow may not be realized for a long time because of plant construction. A joint venture involves detailed management, and investors using this approach are usually companies already in the same business.

Acquisition. Acquisition of part or all of an existing company is an investment approach that in some respects falls between the above two. Compared with setting up a joint venture, acquisition takes a shorter time to start production and see cash flow. It is also easier for the investors to sell the acquired firm after repackaging it. To protect against this risk, many joint ventures are restricted from ownership transfer by contract. Investors may choose to get involved in the technical and managerial details of an acquired company, as they would do in investing in a joint venture. Or they may choose not to get involved, as in stocks. Either way, an investor's degree of control of management is predicated by the share of ownership. Since the daily operation may not be necessarily attended to if so chosen, such an investment opportunity may be accessible to a bigger pool of investors, who are not necessarily experts in that particular trade, through holding companies.

Investing through acquisition also offers the advantage of less government intervention than forming a joint venture or purchasing listed stocks. Acquisition is a means around several restrictions. In some industries, for example, there is a cap on ownership share of foreign investors in a joint venture. Furthermore, management in any joint venture has to be equally shared between the foreign and local shareholders, irrespective of their ownership shares. In the stock markets, a foreign investor cannot own more than 5 percent of a company's stock. In comparison, a foreign investor may acquire either part or all of a target company, and his control of the management is always weighted fairly by his share.

Special Concerns. Foreign investors may have concerns about whether the contract in a merger and acquisition deal (or any other commercial deal) will ultimately be honored and whether business disputes will be fairly arbitrated. For protection, many insert a clause in the contract that allows them to bypass the Chinese courts. Such a clause specifies that disputes would be taken to the China International Economic and Trade Arbitration Commission (CIETAC) for judgments. CIETAC was created in the late 1980s when the Chinese government joined the international agreement 1958 New York Convention on the Enforcement of Foreign Arbitration Awards. By doing so, the government promised to honor any arbitration involving Chinese institutions or companies, made either in China or abroad.

CIETAC has earned a reasonably good reputation, according to a report by Business China (Economist Intelligence Unit 1995b). The commission consists of professional arbitrators, including ninety from other countries, and awards are rendered within forty-five days of the close of arbitration proceedings. According to the same report, about 80 percent of recent cases ended up in a judgment rather than a conciliation, compared with 50 percent some years ago. A CIETAC award is final and binding according to Chinese law and is not subject to revision of any courts. CIETAC

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has become popular among foreign investors and is the busiest arbitration center in the world, handling more cases than the well-known, much-used Stockholm Chamber of Commerce. One uncertainty has been whether the local courts would, in the environment of regional protectionism common in China, effectively enforce the commission's arbitration award if problems resulted. So far most judgments and conciliation have been honored without the need for enforcement; when enforcement has been needed, problems have been minimal.

The Future of China's Mergers and Acquisitions Market

As outlined earlier, China's strategy in developing its mergers and acquisitions market is driven by the government's desire to reform low-efficiency state-owned enterprises, adjust the industrial structure, and attract foreign investments. Those goals are likely to remain strong ones, guiding the country's economic development, and the mergers and acquisitions market is likely to move forward, albeit along a bumpy path. Several issues will be relevant to its development.

Economic Issues. Currently, the mergers and acquisitions market is a buyers' market and subject to imbalance. For example, in the Enterprise Ownership Exchange Fair sponsored by Hunan province in 1993, only 4 out of 161 enterprises were sold on the spot (Ni and Zhu 1994). One factor contributing to this situation may be that it will take some time for the idea of mergers and acquisitions to become fully appreciated and exploited by the industrial circle in China, as was true for the stock markets. It is important to remember that China was a central planning economy only sixteen years ago. A second important factor is that the mergers and acquisitions market is still in the experimental stage according to the government's strategic plan, as discussed earlier, and a lot of policy uncertainties will not be fully resolved until the government has gained more confidence from the experiments. It also makes a difference that the business norm, including intermediation agencies and operational protocol, has not been established yet. As a result, deals often fall through because of miscommunication or unreasonable expectations. A fourth factor shaping the current imbalance in the market is that information is not properly dispersed, and neither domestic nor international investors are fully aware and confident of the opportunities. As these problems are resolved over time, the demand-supply imbalance may change.

China has applied to reenter the World Trade Organization, and if the application is accepted development of the mergers and acquisitions market is likely to accelerate. China will have less domestic market protection, and its businesses will face more international competition. One consequence is likely to be an increase in bankruptcy for money-losing enterprises, some of which may become acquisition targets. Even currently profitable enterprises may benefit from being merged to reposition themselves for the more intense competition.

For the Chinese government foreign capital and management skills are vitally important in the mergers and acquisitions market if the country is to achieve its economic goal.

The potential benefits to China from foreign investments are enormous, and it would be a rational choice for the government to maintain a policy of welcome for international investors. Given the country's population of 1.2 billion, the consumer market along with the investment market is practically impossible to saturate if the economy stays on a reasonably healthy and stable path. The government has planned that in the next ten years China will invest $500 billion in its infrastructure alone, and a sizable portion of that amount needs to come from international capital markets. The energy industry, for example, will need to raise $20 billion in foreign capital before 2000 (Knight-Ridder 1995). The mergers and acquisitions market provides a valuable channel for attracting foreign capital, and against this general backdrop it is likely to become more open to international investors, with adjustments in policy details occurring from time to time.

Institutional Issues. For a healthy mergers and acquisitions market to develop, the institutional environment needs to resolve policy uncertainties, provide information services, and establish a compatible

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financing system. The first of these areas concerns, in particular, China's policy toward ownership reform—specifically, how fast state and collective enterprises are allowed to be converted to joint-stock companies. As discussed, a joint-stock company may be easier to deal with in a transaction than a state or collective enterprise. At another level, the policy to encourage or discourage such conversions is closely related to the government's attitude toward privatization, which significantly dictates the depth of the mergers and acquisitions market. Privatization is still a politically sensitive word at this point, but the government is liberal enough to list ownership reform as a priority in its economic agenda, and the "Corporate Law" passed in 1994 has provided a legal ground for such reforms.[6] While more state and collective enterprises are expected to be converted and some to be privatized, privatization does not seem to be keeping pace with ownership reform.

Asset-Evaluation Agencies. The asset-evaluation agencies are set up by the government to address potential underpricing of state assets in mergers and acquisitions transactions. Given that the spirit of free markets is to let buyer and seller determine a fair price through free negotiations, one may question the necessity of such evaluation agencies. A partial reply is that in China a state-owned enterprise often suffers severe "agency problems," which is to say that the interest of the state may not be always properly represented by the designated managers or the local government officials. In fact, it is not uncommon for either managers or local governments to underprice state assets in order to advance personal or local gains. On the other hand, as part of the government the asset-evaluation agencies may have the problem of conflict of interest when a state-owned enterprise is involved in a merger and acquisition deal. It has been suggested that the evaluation agencies should be severed from the government to enhance their independence.

Securities Market. The development of China's securities market may have a positive impact on mergers and acquisitions activities in that it provides a better investment atmosphere. In particular, it may provide information and liquidity for acquiring a listed company, and it is also a possible exit for cashing out of an acquisition. In the last three or four years, the institutional framework has been established for the primary and secondary stock markets, which are expanding with amazing speed. But it is not known if or when foreign investors will be allowed to acquire more than 5 percent of a company through the stock market.

Financial System. China's banking system, under tight control of the government, still operates on the Soviet model, which provides little service and support to the mergers and acquisitions transactions unless so directed by the government as in some rare cases in the past. In recent years, gradual reform has begun to separate the functions of the central bank, the policy banks (banks that carry out the government's industrial policy instead of pursuing profits), and the commercial banks. Banks have a long way to go, however, before they become competitive and efficient and able to provide financing for mergers and acquisitions activities.

Related to financing of mergers and acquisitions activities is the issue of credit rating, which is an unfamiliar concept to most Chinese people. Without a system to evaluate the creditworthiness of business entities as well as individuals, a crucial link in the chain of finance is missing. Bad debts among state-owned enterprises have caused periodic systemic crises in recent years. A few cases of credit disputes involving Chinese companies in international activities have also been reported. Such an environment is not only hazardous to the development of the mergers and acquisitions market but also inhibits foreign investment and stunts the growth of the domestic financial markets in general. Establishing independent credit rating agencies will be only the first step in solving the problem. More importantly, cultivating a civilization pillared by the idea of individual responsibilities will be a long-term project—and no easy job in a country where people were deprived of individual decisions for thirty years before they were unfettered but also lost in the collapse of communist ideology.

Political and Social Issues. Several political and social issues will influence the development of the mergers and acquisitions market. The first is unemployment. Some background will shed light on the seriousness of this problem. According to government statistics, the total population in China is 1.2 billion, with 14 million babies born each year (see Ding Li 1995 and SAS 1995a). There are 768 million people currently aged between 15 and 59. The labor force is about 600 million (see Table 3), and more than 10 million people enter the job market each year. Among the 168 million in the urban work force, 2.7 percent are unemployed and 10 percent are on welfare while nominally employed by a state-owned enterprise. Among the 446 million in the rural labor force, 13 to 25 percent are estimated to be oversupplied and 50 million-100 million of them are migrating among the cities looking for a job. By 2000, there will be 500 million

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in the rural labor force while only 200 million will be needed in agriculture and 100 million in the township enterprises. The remaining 200 million will look for jobs to the cities, which at the current pace of development will be able to absorb only 20 million of them by then (Ding Li 1995). With such dire long-term prospects for the labor market, the immediate unemployment pressure is no comfort at all. Half the state-owned enterprises, even though (under the direction of the government) they are eating away 60 to 70 percent of the fixed-assets investments from banks, are still losing money. This unsustainable fiscal policy not only fuels the rising inflation but also strands the government in a difficult dilemma: if it keeps subsidizing the low-efficiency state-owned enterprises, desperately needed fast economic growth and job creation will remain seriously hindered; if it lets the state-owned enterprises go on their own, many of them will face bankruptcy and the result will be immediate massive unemployment.

The mergers and acquisitions activities are a double-edged sword to cut through the unemployment problem. On one side, an acquisition may save many jobs by revitalizing a potentially bankrupt enterprise and may help the economy create more jobs and lessen inflation pressures by relieving the government of a financial burden. On the other hand, an acquisition often results in immediate downsizing of the bloated work force, which transforms a latent economic inefficiency into a conspicuous social problem. The government is therefore likely to maintain a cautious policy toward any work-force cuts following an acquisition or a merger at the same time that it is encouraging the development of the mergers and acquisitions market. In other words, the government may prefer to have big/strong fish eat small/weak fish without spitting out the bad parts; and contracts in a mergers and acquisitions deal may often preclude shutting down factories and laying off workers (Joyce Barnathan 1995). Some other measures promulgated by the government, such as the establishment of a social safety network, may also help. According to the Labor Ministry, about 95 million, or two-thirds, of urban workers now have unemployment insurance, up 20 percent from 1993. Under the plan, a worker who loses a job receives 70 to 80 percent of his or her salary for two years as unemployment compensation, then 20 to 50 percent thereafter as welfare, or the worker can choose a lump sum compensation with which to start a small business (Knight-Ridder 1995).

A second issue is the political resistance by several groups against mergers and acquisitions (Jia Lu 1995). One such group consists of the old guard, who believe that the privatization of state-owned enterprises and the development of private enterprises are ideologically unacceptable. Without convincing alternative proposals, however, they are losing their audience. Another group is made up of economists and sociologists disturbed by the fact that some mergers and acquisitions deals have generated egregiously unequal wealth distribution. Their argument is best appreciated in those cases in which people have exploited legal loopholes to get rich quick. Workers who have lost their jobs and others whose interest has been hurt may very well join forces with this opposition group, and the matter could be further complicated by concerns about strategic national interests in some cases involving foreign investors. Given these realities, people who support the idea of mergers and acquisitions have cautioned against possible slips if the market develops too fast without an adequate legal environment in place. However, they believe that as long as tactical prudence is exercised in the process, the opposition will not be strong enough to stunt the market's development.

Table 3
Employment of Civil Work Force, 1994
(Thousands)

Rural	446,541
Township/village enterprises	120,182
Urban	168,160
State-owned enterprises*	112,140
Collective enterprises*	32,850
Private and mixed-ownership enterprises (excluding sole proprietors)	10,920
Sole proprietors	12,250

* Includes employment in nonprofit organizations such as government agencies, hospitals, and schools.

Source: SAS (1995a).

The third issue is the possible loss of state assets (Ni and Zhu 1994). In mergers and acquisitions activities, many state assets are transferred, at a price, to private ownership. Given the market's immaturity and the deficiency of the regulatory and legal systems, the government has a concern that some transactions

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may be or may appear to be carried out to the state's disadvantage and result in a loss of its assets. One complaint is that intangible assets, such as business and technology know-how, trade secrets, and brand name recognition, tend to be undervalued the most. Although the potential problem of state asset losses may not be enough to justify wiping out the mergers and acquisitions market, it is important that the transfer of state assets to private owners be accomplished in an orderly manner and at a fair price. Establishment of business protocol and the maturing of the market may help to eliminate the loss or the appearance of loss of state assets.

It has been observed that local governments tend to weigh the potential problem of state asset losses less than the added value brought by mergers and acquisitions activities (Qing Xiao 1994), a position that adds to the contention between the central and local governments. The 1994 tax law stipulating that state-owned enterprises belong to and must submit their profits to the central government has prompted local governments to sell state-owned enterprises whose current control is in the gray area. The bank law passed in 1994 has rightly reduced local-government say on the control of bank credit allocation, and the problems of many local state-owned enterprises are likely to be aggravated. The local governments may in turn have an incentive to adopt more lenient policies toward mergers and acquisitions.

Whether China's general economic development, which is the backdrop for the mergers and acquisitions market, can follow a steady path is also an important question. One major risk lies in the lack of an efficient system of social institutions—the lack of an effective judicial system to enforce contracts, a tax collection system fully compatible with the market economy, a sustainable social welfare system, an independent central bank and a market-oriented banking system, a credit-rating system, and the like. Progress in these areas has been made but not as quickly as one might have hoped. Among other reasons, rampant corruption throughout the society, resulting from the lack of efficient checks and balances of power as the country is undergoing dramatic social change, may serve as an indicator for how quickly the system can be in place.

Conclusion

This article has provided an introduction to the mergers and acquisitions market in China, placing the emergence of that market in the context of China's market-oriented economic reform. It attempts to analyze the direct and indirect driving forces behind mergers and acquisitions activities and reviews relevant historical developments and current challenges to development of a strong mergers and acquisitions market.

The development of mergers and acquisitions activity in China has played a positive role in revitalizing its inefficient state enterprises, attracting foreign investment, and rationalizing the industrial structure. The merger and acquisition activity has inevitably led to the privatization of some state and collective enterprises, which is still a sensitive ideological issue. While further development of the mergers and acquisitions market is important in restructuring and modernizing the industry of China, careful handling of many institutional deficiencies and social problems as well as political obstacles will be required to avoid major setbacks in the future. It is hoped that this article's broad overview of the development of China's mergers and acquisitions market will invite further study of this important dynamic in China's economic system.

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Notes

1. The "big bang" of Poland refers to the period of rapid economic structural changes implemented by the government around 1992, including the privatization of state enterprises en masse (through voucher distributions).
2. Workers in a state enterprise are entitled to permanent employment, free housing, free medical care, and other fringe benefits. Running a state enterprise could be like running a small welfare state.
3. Baoan Group, a public company listed on the Shenzhen Stock Exchange, acquired Yanzhong Company, listed on the Shanghai Securities Exchange, in October 1992. The acquisition stirred a great deal of attention and debate at the time.
4. China is administratively divided into about thirty provinces, each covering two types of municipalities—cities and counties. Unlike in the United States, in China a county is a small city.
5. A less common form of this approach is for a foreign company to set up a subsidiary in the country that is 100 percent owned by itself.
6. The Corporate Law is legislation regarding registration, governance, and other matters related to business entities.

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FYI

Monetary Aggregates, Payments Technology, and Institutional Factors

David J. Petersen

Approximately every six weeks, Federal Reserve officials meet in Washington to decide the near-term course of monetary policy. The Federal Open Market Committee can, for example, decide to change its federal funds rate target (alternatively, the stock of bank reserves) or maintain policy as it currently stands. What is the basis for this decision? Ideally, policy decisions are based on current and forecast economic conditions vis-à-vis some ultimate goals for the economy, such as price stability or some target for real (inflation-adjusted) economic growth. The economy's position relative to the Federal Reserve's goals would then largely determine both the direction and magnitude of changes in monetary policy at any given time.

Consequently, in settling on a policy choice the Federal Reserve spends considerable resources monitoring economic performance, often by analyzing data on the real economy and inflation. It is commonly believed, however, that there are potentially long lags between monetary policy actions and economic responses. If monetary policy is to be a prescriptive tool, variables that forecast the near-term paths of growth and inflation can be valuable in attempting to prevent undesirable macroeconomic outcomes. In formulating policy actions, policymakers must also determine how large a change in policy is necessary to correct foreseen deviations from their goals. Implicitly or explicitly, they must thus estimate the relationship between the federal funds rate and gross domestic product (GDP) or inflation, and such an estimation must arise from knowledge of the linkage between the Federal Reserve's policy instruments and its goals, that is, the channels through which monetary policy operates.

Basic economic theory suggests that an economy's stock of money can serve as both a forecast variable and an intermediate link between the Fed-

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eral Reserve's policy instruments and its goals. More precisely, the quantity of money in the economy is linked to national income and ultimately the price level. Thus, money should be useful in formulating monetary policy. The Federal Reserve defines monetary aggregates, composed of financial assets like cash and demand deposits, expressly for this purpose. Over time, some instability in the macroeconomic relationships between these monetary aggregates and national income has been observed, believed to be a response to changes in other economic variables. Since about 1990, for example, growth in the Federal Reserve's M2 monetary aggregate (see Table 1) has been much slower than expected. Given interest rates and growth in nominal output (described in current prices), the Board of Governors' model for M2 demand overpredicted growth in the aggregate by an average 2.5 percentage points each quarter from the beginning of 1990 through the end of 1993 (Sean Collins and Cheryl L. Edwards 1994). Some evidence suggests that this unexpected shortfall arose from the proliferation of alternative financial assets that resemble many components of the M2 money measure. Several studies (for example, John V. Duca 1993 and Collins and Edwards 1994) have examined the potential of some mutual funds as substitutes for M2 savings-type assets like certificates of deposit. In general, these studies argue that the increased liquidity of mutual fund shares and a steep yield curve (with long-term interest rates much higher than short-term interest rates) made stock and bond funds attractive alternatives to M2 savings instruments. In addition, many mutual fund companies and brokerages permit the electronic transfer of balances between banks and mutual funds as well as limited check writing, making these mutual fund balances look a lot more like money.

Because of these innovations, the current composition of M2 probably no longer completely reflects the choice of financial assets available to the public as means of payment and close payments substitutes. Thus, the aggregate's relationship with expenditure on goods and services may no longer be reliable or predictable. The implication is that M2 in turn may not now serve as a reliable link between policy instruments and policy goals, raising broader questions about the role of monetary aggregates in policy making. This article seeks to provide a rudimentary explanation for how the composition and character of payments assets can change endogenously in a dynamic financial system (that is, because of other factors inside the system), ultimately influencing the macroeconomic relationships between monetary aggregates and economic activity.

Why Is Money Important?

Since the passage of Humphrey-Hawkins legislation in the late 1970s, the Federal Reserve has been given explicit responsibility for maintaining an environment of low inflation and high employment. The central bank cannot, however, control these quantities directly. Instead, the tool at its disposal is the ability to control reserve-market interest rates (federal funds

Table 1
Current Measures of Money and Liquid Assets

M1 = Currency (of the nonbank public)
- \+ Demand deposits
- \+ Other checkable deposits, including NOW, Super NOW, and ATS accounts, credit union share drafts
- \+ Travelers' checks of nonbank issuers

M2 = M1
- \+ Savings and small-denomination time deposits at all depository institutions (including retail repurchase agreements)
- \+ Money market deposit accounts
- \+ General-purpose and broker/dealer money market mutual fund shares (including tax-exempt)

M3 = M2
- \+ Large-denomination time deposits at all depository institutions
- \+ Term repurchase agreements at commercial banks and thrifts
- \+ Institution-only money market mutual fund shares (including tax-exempt)
- \+ Term Eurodollar balances at depository institutions and MMMFs
- \+ Overnight repurchase agreements at commercial banks[1]
- \+ Overnight Eurodollar balances[1]

[1]As of February 1996

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and discount rates) or the quantity of bank reserves that must be held by banks against many of their outstanding deposits, like checking accounts. The Federal Reserve is the monopoly provider of base money, defined as currency and bank reserves, enabling it to limit the quantity of cash and transactions deposits in circulation.

As indicated above, money is also directly related to the Federal Reserve's ultimate goals. In a developed economy, little national output is consumed by precisely the same individuals who produce it, requiring that individuals trade the goods they produce to satisfy their wants. Simple barter between two parties is always a possibility, but it requires that each party have exactly the item the other desires. In a large and specialized economy in which each individual conducts many transactions daily, this condition rarely holds and is certainly inefficient. Money is the mechanism that enables the complex purchase of all goods and services to take place most efficiently. To simplify, assume that only new goods and services are purchased each year. Then, in the most basic money model, if each dollar were used in only one transaction, the quantity of money would roughly equal the nominal output of goods and services. Moreover, if each dollar were used in any fixed number of transactions per unit of time, the quantity of money would be directly proportional to nominal output.

This relationship can be represented mathematically by the equation of exchange, $M \cdot V = P \cdot Y$, where M denotes the stock of money, V is the velocity of money (the number of transactions conducted using each dollar per unit of time), P represents the price level, and Y denotes real expenditures so that PY represents total nominal expenditures. If each dollar were used in only one transaction, velocity would equal one. And if each dollar were used in any fixed number of transactions per unit of time, velocity would be equal to some constant. If so, then changes in the quantity of money should be associated with proportional changes in nominal spending given payment habits that are fixed (that is, each dollar is spent a constant number of times per year). Furthermore, if the price level does not instantaneously adjust to changes in money (because of, for example, long-term wage contracts), changes in money could result in higher real economic growth. Since real growth in output is constrained ultimately by the supply of real resources, the change in the quantity of money will be equal in the long run to the approximate difference between nominal and real growth, which is measured as a change in the price level.

The direct relation between the quantity of money in circulation and both Federal Reserve instruments and objectives suggests that money would prove useful as an intermediate gauge for the central bank. Even if an aggregate is not targeted in a formal sense by adjusting monetary policy in response to the aggregate's divergence from its target path, the aggregate may be used as an information variable, providing signals on the effects of monetary policy or the paths of inflation and real growth. To be a useful intermediate target or information variable, however, whatever quantity is designated as money must be somehow related to the central bank's tools, and the velocity of this money must be at least predictable.

*M*oney versus Monetary Aggregates

The case for the quantity of money as an intermediate target or information variable for monetary policy has a solid theoretical foundation. The next step is to build a taxonomy for deciding precisely which assets constitute money. One hint for helping choose the appropriate composition of a monetary aggregate can be derived from theoretical relationships. Both the links between Federal Reserve instruments and money and between money and spending rely on the fact that money can be characterized as a financial asset that allows transactions to take place. Coins and currency pass this test. Balances held in checking accounts are also accepted in exchange for goods and services and are considered money using this criterion. These assets, however, possess another common characteristic: they serve as stores of value. As such, they allow wealth to be held in cash or as demand deposits without the immediate intention to spend it on goods and services. In this respect, though, currency and checking account balances resemble many other financial assets. Many of them, like most other bank deposits, can be transferred to demand deposits or currency quite easily and are frequently used as short-term alternatives because currency and checking accounts bear little or no interest. If these other assets are likely to be converted to payments media in the near term, should they not also be included in monetary aggregates?

As an added complication, some assets possess a mixture of both this savings characteristic and the transactions property. Savings deposits (a significant portion of which were formerly known as money market deposit accounts) can be used as a temporary

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store of purchasing power. They can also be used to pay certain bills. Money market mutual funds frequently offer a yield at least as high as that on a savings deposit account, implying that they might be superior saving instruments. Yet, many of these funds also authorize assetholders to write a limited number of checks drawn on them, albeit with the requirement that the checks are for high minimum amounts, often more than $500. In sum, while some assets that serve as money can be clearly identified, others that possess some moneylike characteristics ("near-monies") defy precise classification.

Where Do Near-Monies Come From?

The relationships among these different types of assets are easier to understand when examined in the context of financial intermediation, where spending units (people, businesses, and the government) are separated into two groups: those who save part of their income and those who borrow. For the purposes of this discussion, also assume that these spending units are not permitted to trade with foreigners. If each spending unit chooses to spend exactly as much as it earns, there will be no savings and consequently nothing available for others to borrow. If, however, individual spending differs from individual income for any of the units, some will have a surplus of income over consumption that they will save. Other spending units desire a level of consumption that exceeds their income and will wish to borrow. The issuance of primary securities (financial claims held by a lender against the ultimate borrower) allows surplus units to transfer unspent income to deficit units in return for future principal and interest or dividends. Examples of primary securities would include equities, mortgages, loans, and bonds. This transfer of income allows some spending units to accumulate wealth over time in the form of financial assets while their counterparts amass debt. The outstanding stock of these primary securities then serves as a measure of both aggregate financial wealth and debt.

So far, spending units have been grouped only by their preference for consumption. Closer examination reveals that some spending units are risk-averse while others are risk-neutral or desire to take risks. Those who take more risks will, of course, demand additional compensation for doing so. Also, most spending units will ultimately want to exchange their accumulated wealth for consumption. Some will want to make this substitution in the short term while others may want to hold savings instruments for many years. Among borrowers, many will place the proceeds from security issuance into investment projects, but these projects will have different probabilities of payoff, different time horizons, and different income streams. Moreover, some spending units will want to borrow to finance current consumption, making their unsecured debt (for example, credit card debt) more risky. These differences among savers and borrowers result in the proliferation of financial contracts differentiated in terms of risk, maturity, liquidity, and yield.

Improvements in payments technology and similar institutional changes also result in less stable relationships between existing monetary aggregates and the nominal expenditure on goods and services.

The financial system described above provides a reasonably good picture of the flow of funds in any developed country. It is still, however, incomplete. In an economy with many different spending units, the cost of acquiring information about the best partner for exchanging income (current purchasing power) for primary securities (representing future purchasing power) would be quite high. In addition, the type and quality of debt instruments would be limited by individual savers' tolerance of risk, maturity, and liquidity as well as their ability to absorb the high minimum denominations of primary securities (for example, $10,000 worth of Treasury bills) most efficient for borrowers to issue.

These inefficiencies provide for the existence of financial intermediaries, market-making organizations that purchase primary securities from ultimate borrowers and issue their own indirect debt to ultimate lenders. These intermediaries can exploit economies of scale (lower average costs associated with higher production) in both lending and borrowing: by serving as a clearinghouse for savers and borrowers and employing accumulated expertise in evaluating borrowers, they are able to lend current purchasing

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power at a lower per-unit cost than the individual saver. By aggregating the funds they borrow, intermediaries can easily invest in primary securities with high minimum denominations. They can also channel borrowings into a wide variety of primary securities, providing diversification of risk. Since the probability of all savers showing up at once to demand repayment is relatively low, intermediaries also can hold a more illiquid portfolio than the individual investor. Financial intermediaries supply surplus-income spending units with variegated financial assets closely reflecting the degree of liquidity and risk they desire while making it less essential for the ultimate borrowers to issue them.

Examples of financial intermediaries include banks and other depository institutions (savings and loans, mutual savings banks, and credit unions), life insurance companies, pension funds, retirement funds, finance companies, money market funds, other mutual funds, and, broadly speaking, even the central bank. Some of the indirect debt issued by financial intermediaries takes the form of demand deposits, savings deposits, time deposits, mutual fund balances, and currency. In the last case, the Federal Reserve can buy Treasury debt (primary securities) in return for bank reserves (a central bank liability), which must be held by banks against many deposits. The public can swap these deposits for Federal Reserve notes (also a central bank liability), making currency an indirect security that is issued by the Federal Reserve and held by the public. Like the direct securities that back them, the various kinds of indirect securities enumerated above also differ somewhat in liquidity and risk but are similar in several respects. For example, they have a near-certain redemption value, meaning that spending units can be reasonably certain how much the financial claim will be worth when they choose to redeem it for current purchasing power. In addition, the cost of investing in these indirect securities is relatively low, and contracts can be purchased in denominations from very small to very large (see John Gurley and Edward S. Shaw 1960, 194). Thus, most spending units should be able to acquire them easily.

The Role of Technology and Institutional Factors

The evolution of a nation's financial system results in the creation of a variety of financial assets that spending units can hold in lieu of consumption or investment in real assets like land or machinery. These include primary securities and also indirect securities created by financial intermediaries. Together these claims form a multidimensional spectrum of financial assets, distributed according to liquidity, risk, and maturity. One corner of this distribution will be occupied by the most liquid, least risky financial assets, which have a low cost of investment and near-constant value and are easily redeemable, enabling them to serve as ideal temporary stores of purchasing power. In an economy with a developed financial system, these are likely to be indirect securities. Moving away from this corner in any direction may uncover a slightly higher-yielding financial asset but most likely a marginally inferior store of value in its liquidity, risk, or maturity.

Sifting through a group of these financial assets that serve as good temporary stores of value, several of them (like cash and demand deposits) serve as payments media, meaning they are generally accepted in exchange for goods and services. Some may be accepted as payment in a limited capacity (checks drawn on mutual funds, savings deposits) while others (certificates of deposit) are ready substitutes for payments media, perhaps bearing more interest. Still more financial assets (shares of stock, shares of many mutual funds) may be used as savings vehicles but are too risky, long-term, or illiquid to act as convenient substitutes for payments media.

What enables certain assets to serve as media of exchange and makes other assets easily substitutable for these payments assets? Technology and institutional factors in the form of laws and customs determine how we can pay for goods and services at any time. They also serve to limit the range of acceptable substitutes for payments media as temporary stores of value. For example, the combination of widespread belief in the value of Federal Reserve notes and legal tender laws makes currency usually acceptable as a means of payment in the United States. Similarly, legal restrictions prohibited the payment of interest on demand deposits and forbade thrifts' offering demand deposit accounts until the late 1970s (for a discussion of the theory underlying legal restrictions, see Neil Wallace 1983). Many passbook savings accounts at thrift institutions consequently were separated physically from customers' demand deposit accounts at commercial banks. These constraints made passbook savings deposits relatively poor substitutes for payments media when the use of money market deposit accounts was not extensive. And

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without recent computer and telecommunications technology, the low speed and high cost of transferring savings deposits to a transactions account limited their use as media of exchange.

Just as technology and institutional considerations erect barriers among payments assets, temporary stores of value, and pure savings vehicles, changes in these factors can weaken these barriers or move them. Advances in payments technology or changes in regulation can enhance the ability of different financial instruments to serve as media of exchange. Other transactions media, such as credit cards or so-called stored-value cards, may also be introduced. In addition, changes in these factors can allow asetholders to more easily substitute erstwhile savings instruments for transactions media, weakening the distinction between them. In the 1970s, for example, high inflation provided a powerful incentive to minimize holdings of currency and demand deposits (which did not bear interest) resulting in innovative cash management techniques, like the use of overnight repurchase agreements. New technology made speedy, low-cost transfer of savings balances to transactions accounts and the transactions use of savings deposits possible. Changes in regulation followed in recognition of these developments, making their impact more widespread. In the early 1990s, the steep yield curve also encouraged the minimization of currency and demand deposits, interest-checking accounts, and other assets that bear a short-term rate of interest in favor of higher-yielding savings assets. With the steep yield curve, the ability to transfer balances via the telephone, and the capacity for limited check writing, many stock and bond mutual fund balances are now much better substitutes for traditional media of exchange.

*M*acroeconomic Consequences

Improving technology and shifting institutional factors result in new payment methods or close money substitutes over time. They have also created hybrid assets with savings and transactions properties of varying degrees, like savings deposits or mutual fund balances. Consequently, sharp distinctions between monetary and nonmonetary financial assets are no longer as readily observable as they once were. Like plate tectonics, these forces can be expected to continue reshaping the financial landscape, but in ways that are difficult to predict. Thus we cannot say exhaustively what money will look like at any point in the future, but history suggests that the set of assets qualifying as money will likely increase.

These developments present a problem for rule-based definitions used to construct monetary aggregates. Economic theory dictates that money comprises those assets that serve as media of exchange. Strictly adhering to this rule means that money includes stores of value that are generally only marginally useful as methods of payment. The above analysis also suggests that more types of financial assets will be included as time passes. Relaxing this restriction to include close money substitutes will make the definition of money grow inexorably wider. Since the Federal Reserve can limit only the supply of currency and some bank deposits, in either case the monetary aggregate becomes much more difficult to control and perhaps only as predictable as nominal expenditure itself.

Improvements in payments technology and similar institutional changes also result in less stable relationships between existing monetary aggregates and the nominal expenditure on goods and services. The equation of exchange allows us to equate a monetary aggregate to nominal expenditure, provided that this expenditure is made exclusively with financial assets inside that aggregate. With changing technology and shifting regulation, goods and services can be purchased with new kinds of payments assets, or even near-monies. Expenditures can increase at the same time the monetary aggregate remains unchanged, failing to capture these transactions. Reexamining the equation of exchange, PY can increase while M remains constant. To maintain the equality, velocity must increase sufficiently to offset gains in nominal expenditure. These observed changes in velocity will occur whenever the set of monetary or near-monetary assets shifts, a process that is likely to continue but difficult to predict.

While we cannot say precisely how velocity will change in the future, history suggests that it is likely to drift upward. As mentioned earlier, the M2 monetary aggregate substantially underpredicted growth in nominal national expenditure during the early 1990s. Measured ex post, velocity (mechanically defined as the ratio of nominal expenditure to M2) rose in an unpredicted manner. Relationships between money targets and economic activity have broken down before. In many respects, M2's problems parallel the breakdown in the relationship between the M1 aggregate and national income in the late 1970s. As indicated above, this breakdown occurred in the face of

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Table 2
Monetary Aggregates Prior to 1980

M1 = Currency
+ Demand deposits at commercial banks

M2 = M1
+ Savings balances at commercial banks
+ Time deposits at commercial banks
– Negotiable CDs at large banks

M3 = M2
+ Savings balances at thrift institutions
+ Time deposits at thrift institutions

M4 = M2
+ Negotiable CDs at large banks

M5 = M3
+ Negotiable CDs at large banks

Source: Thomas D. Simpson (1980).

technological and regulatory changes that encouraged the substitution of interest-bearing assets for traditional transactions balances like demand deposits. In particular, thrifts and credit unions gained the ability to offer negotiable orders of withdrawal (NOW) accounts and share drafts, providing payments services similar to those previously available only through demand deposits at commercial banks. Advances in technology enabled automatic transfers from savings accounts to demand deposit accounts, preauthorized bill payments, and telephone transfers, permitting what are now called savings deposits to function more like money. As a response to these developments, the Federal Reserve redefined the monetary aggregates in 1980 (see Table 2).

Conclusion

Economic theory suggests that the money stock is a useful link between Federal Reserve instruments and objectives in monetary policy. The quantity of money must be controllable, however, and the velocity of money be fixed or move in a predictable manner. Policy making requires a decision on which financial assets correspond to money in theory. Thirty years ago, it was relatively easy to sort financial assets into monetary and nonmonetary categories based on a strict medium-of-exchange basis or payments media plus close substitutes. Not coincidentally, growth in the old M1 monetary aggregate (consisting solely of currency plus demand deposits at commercial banks) was better correlated with growth in expenditure than it is today.

An examination of the financial system reveals that there is fundamentally little that distinguishes monies, near-monies, and nonmonetary financial assets among good stores of value. Preferences, technology, and institutional arrangements determine the boundaries among these assets, and changes in these factors have moved them. The proliferation of new payments assets, close substitutes, and mixed savings-transactions assets makes it difficult, if not impossible, to draw a line between what is money and what is not for monetary policy purposes. For the same reason, existing monetary aggregates can lose their ability to predict changes in national expenditure, and redefinition necessitates confronting the same issue. The addition of more financial assets to the monetary aggregates is unlikely to be a durable solution and will result in the decline in the share of the aggregate's assets that are directly linked to Federal Reserve policy instruments.

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