

### 3. Pricing and Valuation of Deposit Insurance

*Entries in this section deal with the methodologies for calculating deposit insurance premiums. In particular, they explore option pricing theory and its application to deposit insurance pricing; the effects of fixed and risk-adjusted pricing regimes; estimation of actuarially fair premiums; and the market value of deposit insurance guarantees over time.*

Acharya, Sankarshan. 1995. Credit Rating Enhancement Norms and Ratings-Based Bank Capital and Deposit Insurance Premium. Finance and Economics Discussion Series 95-28. Board of Governors of the Federal Reserve System.

The standard asset-pricing paradigm is applied to measure a credit rating agency's implied rating standards, such as leverage and asset volatility, from observed bond yield spread data. A methodology is proposed to measure the amount of debt that a firm needs to reduce in order to enhance its credit quality (bond rating) without changing its asset risk and size. This methodology is applied to develop implementable bank capital and deposit insurance premium standards based on ratings of pools of bonds held by banks in equilibrium within a paradigm (an alternative to narrow banking and consistent with universal banking) in which regulators act like private surrogates of bank debtholders, insuring debt for a price but not for profit, and banks choose their asset composition. (©1999 EconLit)

Acharya, Sankarshan. 1996. Charter Value, Minimum Bank Capital Requirement and Deposit Insurance Pricing in Equilibrium. *Journal of Banking and Finance* 20, no. 2:351-75.

This paper shows that leaving insolvent banks with large enough charter values open can be optimal and derives normative bank closure/reorganization policies based on the liquidation value of assets and the charter value. The charter value of a bank is broadly defined as the value that would be foregone due to a closure. Our simulations of risk-taking show that an optimal forbearance for an insolvent bank with a large enough charter value alleviates the moral hazard problem. This is because increasing the risk raises the probability of losing the charter value, although it generates a moral hazard gain. (©1999 EconLit)

Acharya, Sankarshan, and Jean-François Dreyfus. 1989. Optimal Bank Reorganization Policies and the Pricing of Federal Deposit Insurance. *Journal of Finance* 44, no. 5:1313-33.

Optimal dynamic regulatory policies for closing ailing banks and for deposit insurance premiums are derived as functions of the rate of flow of bank deposits and interest paid on deposits, the economy's risk-free interest rate, and the regulators' bank audit/administration costs. Under competitive conditions, the threshold assets-to-deposits ratio below which a bank should be optimally closed is shown to be greater than or equal to one. Optimal deposit insurance premiums and probabilities of bank closure are shown to be nondecreasing in the bank's risk on investment and nonincreasing in the bank's current assets-to-deposits ratio. (©1999 EconLit)

Allen, Linda, and Anthony Saunders. 1993. Forbearance and Valuation of Deposit Insurance as a Callable Put. *Journal of Banking and Finance* 17, no. 4:629–43.

Previous research evaluating deposit insurance as a put option has ignored the ability of the deposit insurer (put writer) to control the timing of the puts exercise via closure decisions. We model deposit insurance as a callable put, i.e., a put option where the FDIC retains a valuable call provision. The value of deposit insurance subsidies can therefore be measured as the net difference between the put and call features of the insurance contract. Forbearance can be viewed as forfeiture by the deposit insurer of the value of its call component of the deposit insurance option. (©1999 EconLit)

American Bankers Association. 1991. *Deposit Insurance Premium Levels and Credit Availability*. American Bankers Association.

This report argues that the direct costs of raising deposit insurance premiums will increase FDIC case resolution costs by increasing the number of bank failures and reducing the present value of failed banks to potential acquirers. Indirect effects—although less obvious—are also important. Raising premiums will reduce credit availability and slow the economic recovery. In turn, the slower recovery will result in additional bank failures and an even greater burden on the BIF.

Anderson, Ronald W., and Nusret Cakici. 1999. The Value of Deposit Insurance in the Presence of Interest Rate and Credit Risk. *New York University Salomon Center Financial Markets, Institutions, and Instruments* 8, no. 5:45–61.

The authors use the theory of the term structure of interest rates and the pricing of interest-contingent contracts to determine the fair value of insurance for depository institutions. The balance sheet of a bank is taken to consist of long and short positions in various fixed-income securities. Deposit insurance for the bank is a put option on the value of the assets. The value of deposits, assets, and implied exercise price of the put and the value of the put are all determined simultaneously as part of the same valuation solution. The approach is initially developed for a single-state term structure and is then extended to incorporate credit risk on bank assets.

Barth, James R., Daniel E. Page, and R. Dan Brumbaugh Jr. 1992. Pitfalls in Using Market Prices to Assess the Financial Condition of Depository Institutions. *Journal of Real Estate Finance and Economics* 5, no. 2:151–66.

In this article the authors examine the information that stock prices provide about the financial condition of federally insured thrift institutions. In order to assess their financial condition from the different perspectives of stockholders and the federal insurer, they calculate the value of the put option of federal deposit insurance available to thrift institutions. Their results demonstrate that the two perspectives often provide, particularly for unhealthy institutions, quite different views of the financial condition of individual institutions. (©1999 EconLit)

Blair, Christine, and Gary S. Fissel. 1991. A Framework for Analyzing Deposit Insurance Pricing. *FDIC Banking Review* 4, no. 2:25–38.

The authors address the question of whether to revise the current system of flat-rate deposit insurance premiums in favor of a risk-based system. Although there is general agreement that relating an insured bank's premium to the risk it poses to the insurance fund would be desirable, the information-intensive nature of the intermediation process in which banks specialize makes risk measurement difficult. The authors present an overview of alternative methods for establishing risk-based premiums and then discuss the arguments for and against risk-based premiums.

Chan, Yuk Shee, Stuart I. Greenbaum, and Anjan V. Thakor. 1992. Is Fairly Priced Deposit Insurance Possible? *Journal of Finance* 47, no. 1:227–45.

The authors analyze risk-sensitive, incentive-compatible deposit insurance in the presence of private information and moral hazard. Without deposit-linked subsidies, it is impossible to implement risk-sensitive, incentive-compatible deposit insurance pricing in a competitive, deregulated environment except when the deposit insurer is the least risk averse agent in the economy. The authors establish this formally in the context of an insurance scheme in which privately informed depository institutions are offered deposit insurance premia contingent on reported capital; the result holds for alternative sorting instruments as well. This suggests a contradiction between deregulation and fairly priced, risk-sensitive deposit insurance. (©1999 EconLit)

Cheng, Anthony Wing-Man. 1996. Estimating the Market Value of Deposit Insurance for Savings and Loans. Ph.D. diss., University of Virginia.

The author estimates the market value of deposit insurance for a sample of savings and loans associations, using various methods that can be applied to S&Ls that do not have publicly traded stocks. For each S&L, deposit insurance is priced as a one-period European put option with a striking price equal to the book value of the S&L's liabilities. Previously this method of pricing deposit insurance has been applied to banks and S&Ls that do have publicly traded stocks. The author shows how the market value of assets and asset volatility can be obtained from the S&Ls' accounting data by several methods. The results of this study suggest that it is feasible to price deposit insurance premiums using accounting data. The results further suggest that under the fixed-rate deposit insurance system, significant cross-subsidization among S&Ls was evident during the 1990s.

Cook, Douglas, and Lewis Spellman. 1994. Repudiation Risk and Restitution Costs: Toward Understanding Premiums on Insured Deposits. *Journal of Money, Credit, and Banking* 26:439–59.

There is a widely held impression that federally insured deposits are the risk equivalent of Treasury securities. Despite this impression, the authors provide evidence of risk pricing of insured deposits. If there is risk pricing of guaranteed

deposits, investors in deposit instruments evidently price the possibility of loss from incomplete or costly deposit insurance coverage. The risk pricing of insured deposits is tantamount to believing the guarantee might be repudiated in whole or in part. This paper examines this issue in the context of premium rates found to exist for the FSLIC-insured deposits during that agency's waning days before its abolition in 1989.

Cornett, Marcia Millon, Hamid Mehran, and Hassan Tehranian. 1998. The Impact of Risk-Based Premiums on FDIC-Insured Institutions. *Journal of Financial Services Research* 13, no. 2:153–69.

The authors examine the effect of a series of announcements leading to the approval of risk-based deposit insurance premiums on returns to stockholders of commercial banks. Utilizing risk-weighted capital ratios and measures of overall risk, we group banks according to one of the nine-tier insurance categories subsequently defined by the FDIC. During the period in which the new insurance system was considered and approved, it was found that stockholders of "well-capitalized," "healthy" banks experienced wealth changes significantly different from those experienced by less than well-capitalized, less than healthy banks. Although many argued the premium range in the initial insurance schedule was insufficient, the results show that this initial risk-basing marked an important change in the relative burdens imposed by FDIC insurance. (©1999 EconLit)

Craine, Roger. 1995. Fairly Priced Deposit Insurance and Bank Charter Policy. *Journal of Finance* 50, no. 5:1735–46.

The thrust of current deposit insurance reform--risk-based insurance premiums and capital requirements--is an effort to price deposit insurance more fairly. Fairly pricing deposit insurance eliminates inequitable wealth transfers but it does not lead to an efficient equilibrium. This paper shows that an alternative charter policy results in an efficient separating equilibrium. (©1999 EconLit)

Dermine, Jean. 1992. Deposit Insurance, Credit Risk and Capital Adequacy: A Note. Working Paper no. 19. INSEAD.

Previous research on deposit insurance and capital adequacy has modeled the bank as a corporate firm with risky assets and insured liabilities. No attempt was made to analyze explicitly the risk characteristics of bank assets. The purpose of this paper is to model bank lending and calculate credit-risk sensitive insurance premia. The lending function of banks creates the need to model equity as a "capped" call option. Previous estimates of insurance premia which are based on a "naked" call assumption could be biased. Moreover, it is shown that the Modigliani-Miller capital structure irrelevance theorem implies the ineffectiveness of bank capital regulations. (©1999 EconLit)

Downie, David Craig. 1995. *Essays in Banking*. Ph.D. diss., University of British Columbia.

This dissertation examines two issues in the theory of banking: the role and efficiency of a monopoly bank in a spatial economy, and the design of a deposit insurance contract. Chapters 2 and 3 of the thesis develop and analyze a simple production economy with two types of agents. Lenders have an endowment of one unit of a good that may be consumed or invested in a firm. Firms have access to a project but lack the capital necessary to operate it and are thus forced to borrow: firms' projects are identically independently distributed cross-sectionally. A simple information asymmetry prevents efficient contracting by lenders and firms and results in the incurring of deadweight default costs.

Duan, Jin-Chuan, and Min Teh Yu. 1994. Forbearance and Pricing Deposit Insurance in a Multiperiod Framework. *Journal of Risk and Insurance* 61, no. 4:575-91.

A multiperiod deposit insurance pricing model is developed in this article, which utilizes an asset value reset rule comparable to the typical practice of insolvency resolution by insuring agencies. The fairly-priced premium rate of our model can substantially differ from Merton's (1977). After incorporating capital forbearance and moral hazard into the model, our results show that the fairly-priced premium rate is not neutral to forbearance policy even in the absence of moral hazard. The model formalizes the process of how excessive risk-taking under capital forbearance could lead to instability in the deposit insurance system. (©1999 EconLit)

Duan, Jin-Chuan, and Min Teh Yu. 1999. Capital Standard, Forbearance and Deposit Insurance Pricing under GARCH. *Journal of Banking and Finance* 23, no. 11:1691-706.

The authors propose a multiperiod deposit insurance pricing model that incorporates simultaneously a capital standard and the possibility of forbearance. The model uses the recently developed GARCH (Generalized Auto Regressive Conditional Heteroscedasticity) option pricing technique in determining the deposit insurance value. The authors contend that their model offers two distinct advantages. First, it explicitly considers the implications of the strict enforcement of capital standards as stipulated in the FDIC Improvement Act of 1991 (FDICIA). Second, use of the GARCH model allows the authors to capture many robust features exhibited by financial asset returns. By the GARCH option pricing theory, the value of a contingent claim is a function of the asset risk premium. This unique feature is found to be prominent in determining the bank's deposit insurance value. The model is also used to study the effects of capital forbearance and moral-hazard behavior in the multiperiod deposit insurance setting.

Duan, Jin-Chuan, Arthur F. Moreau, and C. W. Sealey. 1993. Incentive Compatible Deposit Insurance Pricing and Bank Regulatory Policies. In *Research in Finance*, vol. 11, edited by Andrew Chen, 207–27. JAI Press.

The many publications on various aspects of deposit insurance reform have failed to explain how the features of deposit insurance contracts affect bank decisionmaking; and they lack a clear prescription for formulating such contracts so as to achieve policy goals. This article develops a model of bank behavior under regulatory constraints within a framework of moral hazard. The results show that the policy goals pursued by regulatory authorities can be achieved only if deposit insurance contracts take into account incentive compatibility. One implication of the model is that, under existing (1993) regulatory policies, a ceteris paribus move to risk-adjusted deposit insurance premiums may actually make banks riskier. Some numerical results are presented to show the quantitative importance of the model's implications.

Duan, Jin-Chuan, Arthur F. Moreau, and C. W. Sealey. 1995. Deposit Insurance and Bank Interest Rate Risk: Pricing and Regulatory Implications. *Journal of Banking and Finance* 19, no. 6:1091–108.

The linkage between the interest-rate risk exposure of banks and the liabilities of a deposit insuring agency is not well understood. The authors develop a model to evaluate the interest-rate risk exposure of both deposit-taking institutions and deposit-insuring agents when bank equity has limited liability and interest rates are stochastic. Empirical results based on a sample of U.S. banks are presented for the interest-rate risk exposure of banks and for the effect of this exposure on the liabilities of the FDIC.

Duvic, Robert Conrad. 1990. Deposit Insurance in the American Savings Industry: Analysis and Extension of the Contingent Claims Approach. Ph.D. diss., University of Texas at Austin.

This study examines several empirical issues that must be addressed if the Contingent Claims Approach (CCA) is to be used to price deposit insurance. The author examines the difficulties of dealing with mutual associations, the proper setting of the term of the associations' deposits, and the proper measure of the riskiness of those deposits. He devises procedures and structures them into a model that uses the CCA to price deposit insurance for all associations, not just associations with widely traded equity. This model also facilitates an analysis of the validity of the CCA. The study's major result is that the default risk premiums developed for each association by the CCA were statistically similar to those measured in the market. This finding supports the use of the CCA in the pricing of deposit insurance.

Epps, T. W., Lawrence B. Pulley, and David B. Humphrey. 1996. Assessing the FDIC's Premium and Examination Policies Using "Soviet" Put Options. *Journal of Banking and Finance* 20, no. 4:699-721.

The FDIC's total liability for insuring a bank's deposits during a fixed period diminishes as the frequency of examinations increases, since a marginally solvent bank can be closed while losses are small. This article develops a technique for pricing the insurance liability over a fixed period during which there are multiple examinations. Under 1996 regulatory policy, most banks are examined annually and reviewed every six months, at which time the fees for insurance may be adjusted. Since the existing schedule of fees allows only a narrow range and a few discrete levels, the FDIC typically retains some positive or negative residual liability in each six-month period and for the entire year. The authors show how to estimate this net liability. The calculations of total and net liability are illustrated for a sample of large banks.

Federal Deposit Insurance Corporation (FDIC). 1990. A Study of the Desirability and Feasibility of a Risk-Based Deposit Insurance Premium System. Report. FDIC.

In this FIRREA-mandated report, the FDIC reviews the framework for deposit insurance pricing methods and recommends procedures and an implementation strategy. Chapter 1 reviews the conceptual framework of deposit insurance pricing, examining several pricing issues as well as several alternative methods for establishing risk-based deposit insurance. Chapter 2 develops a proposal for risk-based deposit insurance that uses an adjusted capital approach. Chapter 3 presents the study's conclusions.

Fissel, Gary S. 1994. Risk Measurement, Actuarially-Fair Deposit Insurance Premiums and the FDIC's Risk-Related Premium System. *FDIC Banking Review* 7, no. 3:16-27.

The author compares the FDIC's risk-related premium system with independent risk classifications derived from a proportional hazards model (PHM). The PHM estimates actuarially-fair insurance premiums on the basis of econometric estimates of expected time-to-failure. The author concludes that the FDIC's relative risk rankings are generally consistent with those of the PHM as well as with historical failure rates. The premium rate spread between high- and low-risk institutions, however, is considerably narrower than what is suggested by the PHM.

Flannery, Mark J. 1991. Pricing Deposit Insurance When the Insurer Measures Bank Risk with Error. *Journal of Banking and Finance* 15, no. 4-5:975-98. Also 1989. Pricing Deposit Insurance When the Insurer Measures Bank Risk with Error. In *Banking System Risk: Charting a New Course*, Proceedings of the 25th Annual Conference on Bank Structure and Competition, 70-100. Federal Reserve Bank of Chicago.

If the deposit insurance agency ("FDIC") can observe bank risks without error, it can attain actuarial soundness equally well with either risk-related premium assessments or risk-related capital standards. However, many bank assets are difficult and expensive to evaluate, so their true value and risk cannot be

ascertained without error. These risk measurement errors cause the FDIC to misprice its deposit insurance, which can be analyzed as a put option written on assets with uncertain volatility and current value. This paper evaluates the optimal means of pricing deposit insurance in such an environment. Because FDIC's insurance pricing errors increase with bank leverage, the impact of these errors on private-sector allocations can be minimized with a combination of risk-related capital standards and risk related premia. (©1999 EconLit)

Flood, Mark D. 1990. On the Use of Option Pricing Models to Analyze Deposit Insurance. Federal Reserve Bank of St. Louis *Review* (January): 19–35.

This paper critically examines the use of option pricing models for analyzing deposit insurance premiums. The author outlines the basic theory of option pricing, which was originally developed to assign dollar values to the option contracts traded on financial exchanges. Then, by applying the model to several insurance arrangements, he illustrates how to analyze the claims of bankers, depositors, and insurers on the assets of a bank or thrift. Finally, he considers some of the limitations of this approach.

Freixas, Xavier, and Jean-Charles Rochet. 1998. Fair Pricing of Deposit Insurance. Is It Possible? Yes. Is It Desirable? No. *Research in Economics* 52, no. 3:217–32.

This note elaborates on a recent contribution by Chan, Greenbaum and Thakor (1992) who argue that fairly priced deposit insurance is incompatible with free competition in the banking sector when adverse selection is present. We show that, under more general assumptions on the banks' operating costs, there exist incentive compatible mechanisms that are fairly priced. However, we compute the characteristics of the optimal premium schedule and show that it is not fairly priced: instead it entails subsidization of the less efficient banks by the most efficient ones. We also analyze the trade-off between short-run and long-run efficiency: cross-subsidies help relaxing incentive compatibility constraints but generate unfair competition. (©1998 Academic Press)

Fries, Steven M., and William R. M. Perraudin. 1991. Banking Policy and the Pricing of Deposit Guarantees: A New Approach. Working Paper WP/91/131. International Monetary Fund.

This paper describes a new approach to pricing government deposit guarantees that uses techniques of stochastic process switching employed in the recent literature on exchange rate determination. Our model avoids inconsistent assumptions about the information available to investors and the government common in previous work based on an option pricing approach. We derive actuarially fair deposit insurance premia and optimal financial reorganization rules and examine the role of banking policies such as capital requirements. (©1999 EconLit)



Garrott, Thomas M. 1991. Deposit Insurance: How Much Can We Afford? *Cato Institute Regulation* 14, no. 1:20-22.

The author expresses his concern about the immediate need for deposit insurance reform. He suggests (1) reducing deposit insurance coverage from \$100,000 to \$50,000; (2) abolishing the policy of "too big to fail"; (3) making insurance premiums paid by banks a function of risk; and (4) publishing the FDIC ratings of each bank for consumers to use when choosing a bank with which to do business.

Hein, Eelis. 1996. Deposit Insurance: Pricing and Incentives. *Studies in Economics and Finance* no. E:6. Bank of Finland.

Uses option valuation models to analyze the economics of a deposit insurance system. Provides an introduction to deposit insurance systems and a brief history of the Finnish deposit insurance system, describing how it has functioned and changed in the environment of the recent economic and banking crises. Presents a one-period European-type put option model of deposit insurance. Conducts comparative static analysis to identify the basic determinants in the value of a deposit insurance contract and their interactive effects. Provides an analysis of deposit insurance coverage as far as the various liability holders are concerned. Uses the one-period model for estimating the value of deposit insurance for those Finnish banks whose stock price information is available. Analyzes deposit insurance with a multiperiod American-style put option model, exploring bank risk incentives under various regulatory schemes, and calculating point estimates of the value of deposit insurance premia under various insurance schemes and assumptions of the stock market's expectations concerning the regulator's behavior. Licentiate thesis for the Helsinki School of Economics and Business Administration. (©1999 EconLit)

Hwang, Dar Yeh. 1991. Alternative Pricing: Models for Estimating FDIC Deposit Insurance Premiums: Theory and Empirical Studies. Ph.D. diss., Rutgers University.

This study uses alternative pricing models from both the macro and micro viewpoints to estimate FDIC premiums. Then, using an option as well as a non-option approach, it estimates risk-based insurance premiums for banking firms. The study uses computer-accessed market data and FDIC Call Report data. The empirical results indicate that the FDIC overcharged banks for deposit insurance during the 1980s.

Hwang, Dar Yeh, Cheng F. Lee, and K. Thomas Liaw. 1997. Forecasting Bank Failures and Deposit Insurance Premiums. *International Review of Economics and Finance* 6, no. 3:317-34.

Logistic regressions are performed to estimate the probability of bank failure. The in-sample logistic regression analysis indicates that the higher the equity capital, profitability, or liquidity, the lower the probability of bank failure. On the negative side, the ratio of past due loans to total assets is the most stable factor contributing to bank failures over the sample period. Other failure contributing

factors change over time. In addition, a numerical illustration is provided to calculate the actuarial fair deposit insurance premiums. (©1999 EconLit)

Jaeger, Mireille. 1994. Application des modèles d'option à l'analyse de l'activité et du risque bancaires (The application of option pricing models to the analysis of banking activity and risk). [With English summary.] *Revue-d'Economie Politique* 104, no. 6:826–49.

This paper is a survey of economic literature concerning the applications of the OPM (Option Pricing Model) to the banking firm. Firstly, the model was used for assessment purposes, namely to derive the fair deposit insurance rate and to measure the risk of the bank assets. Secondly, the OPM studied the capital structure problems, and the related banking strategies, especially the tendency of bankers to increase their risk-taking. These findings led to an analysis of banking regulation, concerning the ways of rating deposit insurance and the definition of solvency ratios. Concluding remarks turn on the limits of the OPM, when applied to the banking firm, as it takes into account only the solvency risk, and ignores the liquidity risk. (©1999 EconLit)

Kendall, Sarah B. 1992. A Note on the Existence and Characteristics of Fair Deposit Insurance Premia. *Journal of Banking and Finance* 16, no. 2:289–97.

This paper treats the fair deposit insurance premium as a fixed point of the value of insurance per dollar of deposits. Using the standard model of the value of deposit insurance and treating the premium as an up-front cost to a bank it is shown that the fixed-point premium exists and is unique under fairly general conditions. It is shown that ignoring the premium as an up-front cost may lead to underestimation of the fair premium. In addition, the fixed-point model suggests that premium rates should vary with the ratio of deposits to total liabilities. (©1999 EconLit)

Kendall, Sarah B., and Mark E. Levonian. 1991. A Simple Approach to Better Deposit Insurance Pricing. *Journal of Banking and Finance* 15, no. 4–5:999–1018.

The authors examine the ability of simple insurance pricing schedules to match premiums with the values derived from a contingent-claim model of deposit insurance. They use a quadratic loss function to compare a flat-rate pricing system to alternative pricing schedules incorporating measures of risk. A simple two-bracket schedule that distinguishes between high and low capitalization is a substantial improvement. A pricing schedule under which the rate paid by low-capital banks depends on their degree of undercapitalization is better still. In addition, the gains from using market value measures of capital rather than book value are great. (©1999 EconLit)

Kerfriden, Christian, and Jean-Charles Rochet. 1993. Actuarial Pricing of Deposit Insurance. *Geneva Papers on Risk and Insurance Theory* 18, no. 2:111–30.

Using a pricing formula for options on coupon bonds, Jamshidian (1989), El Karoui and Rochet (1990), the authors compute the actuarial pricing of deposit

insurance for a commercial bank. The formula takes into account the maturity structure of the bank's balance sheet, as well as market parameters such as the term structure of interest rates and the volatility's of zero coupon bonds. The relation with asset liability management methods is explored. (©1999 EconLit)

Kuester, Kathleen A., and James O'Brien. 1991. Market-Based Deposit Insurance Premiums: An Evaluation. Finance and Economics Discussion Series no. 150. Board of Governors of the Federal Reserve System.

Risk adjusted deposit insurance premiums have been among deposit insurance reforms considered by economists and policy-makers. This paper evaluates the use of option pricing methods, used in a number of studies, to set stock market-based, risk adjusted deposit insurance premiums, and more generally, to identify banks by their riskiness. The paper points out potential biases in the approach, and it empirically tests the ability of the option measures to distinguish banks by risk. The results demonstrate that the equity market measures are sensitive to contemporaneous accounting information and have predictive power for future bank performance, but that the market measures do not contain all the information conveyed by accounting data. Thus, the results do not make a convincing case for exclusive use of this methodology to set risk adjusted insurance premiums. They suggest, however, that market and accounting information may be useful jointly in identifying risky banks. (©1999 EconLit)

Lai, Van Son. 1996. The Effects of Variations in Laxity (or Strictness) of Closure Rules on the Valuation of Deposit Insurance. *Financial Review* 31, no. 4:721-46.

The passage of the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA), which removed some of the freedom or latitude the FDIC had in resolving and closing insolvent institutions, makes it clear that regulatory closure rules are not invariant with regard to time and events. Therefore, this paper analyzes the effects of variations in the laxity or strictness of bank closure rules on the valuation of deposit insurance. Hardly predictable state variables, such as political, economic and bureaucratic constraints, represent potential sources of uncertainty that drive changes in the stringency of closure policy. A variation of Ronn and Verma's model is extended to consider situations where the insurance agency's closure rule is uncertain. (©1999 EconLit)

Landskroner, Yoram, and Jacob Paroush. 1994. Deposit Insurance Pricing and Social Welfare. *Journal of Banking and Finance* 18, no. 3:531-52.

Recent literature has established that financial disruption has real costs which justify government intervention in the financial sector. One form of government intervention is deposit insurance. In this paper we determine the optimal pricing and subsidy of deposit insurance in a social welfare context. The main conclusion is that optimal deposit insurance need not be actuarially fair. In an economy with a real and a financial sector we consider the effects of taxation and social (political) weights of the sectors. We analyze two policy tools: government supervision and deposit insurance pricing. (©1999 EconLit)

Laub, Michael. 1993. *Deposit Insurance and the Treasury Manager: The Effects of Increased Deposit Insurance on Business Customers of Banks*. Report. Bethesda, MD: Corporate Council for Government Relations, Treasury Management Association.

This paper reports on the effects of increased deposit insurance premiums on businesses. Among other things, the study finds that (1) 93 percent of deposit insurance premiums for business accounts are passed through to business customers; (2) deposit insurance pricing does not justify switching banks, except in the case of risk-based penalties; (3) the FDIC's allowance for uncollected balances is archaic and is substantially less than the actual amount of uncollected balances in business accounts; (4) the most-favored cash-management techniques are controlled disbursements and sweep accounts.

Lee, Inmoo. 1995. *Two Essays in Finance (Equilibrium, Deposit Insurance)*. Ph.D. diss., University of Illinois at Urbana-Champaign.

The second of two essays—"Deposit Insurance with Changing Volatility: An Application of Exotic Options"—assumes that the volatility of the bank's assets changes or can be changed when the assets first hit a certain level. Accordingly, this essay develops a model to incorporate the bank manager's incentives to change the bank's volatility. The results show that shareholders' equity and the deposit insurance premium can be represented as combinations of generalized versions of particular barrier options known as down-and-out and down-and-in options. Numerical examples illustrate the properties of the model.

Levonian, Mark E. 1991. *Risk-Adjusted Deposit Insurance Premiums*. Federal Reserve Bank of San Francisco *Weekly Letter* no. 91-3.

The annual premium that banks paid for federal deposit insurance before reform was a simple flat percentage of total domestic deposits. This *Letter* argues that certain aspects of banking risk can be measured objectively and that simple modifications to deposit insurance pricing to reflect these aspects of risk will generate substantial benefits compared with a flat-rate system.

Li, Anlong. 1992. *Three Essays on Contingent Claims Pricing*. Ph.D. diss., Case Western Reserve University.

This study consists of three research essays on contemporary financial option pricing theories and their applications. The common theme of the essays involves the pricing of financial claims whose values become path-dependent when the usual lattice-approximating schemes are used. The first essay explores the potential of transformation and other schemes in constructing a sequence of simple binomial processes that weakly converges to the desired diffusion limit. The second essay extends some of the simple lattice-approximation methods for one-dimensional diffusions to higher dimensions and develops special lattices to approximate perfectly correlated diffusions. The last essay analyzes the investment decisions of insured banks under fixed-rate deposit insurance.

Lucey, Brian M. 1993. Fair Deposit Insurance Premia for Two Irish Banks. Research Paper 93-4. Institute of European Finance.

The author evaluates the deposit insurance scheme operated by the Central Bank of Ireland, and conducts a theoretical analysis to determine fair premiums.

Maude, David, and William Perraudin. 1995. Pricing Deposit Insurance in the United Kingdom. Working Paper Series no. 29. Bank of England.

The valuation of bank deposit guarantees depends crucially on the point at which troubled financial institutions are closed. Under different assumptions about regulatory policies, the authors use data on the equity value and deposits of eight large U.K. banks to value deposit insurance. The models implemented include the standard Merton-style audit models of deposit guarantee valuation, an endogenous closure rule model, and a model with endogenous subsidies in which equity holders remain in control of the financially troubled bank.

Moore, Scott Bradley. 1990. A Methodology for Determining Quasi-Market Deposit Insurance Premium Rates for Savings Institutions. Ph.D. diss., University of Kentucky.

Merton (1977) argues that risk-based deposit insurance premium rates can be determined using an extension of the Black and Scholes (1973) option pricing model. A number of authors have extended Merton's model to simulate premium rates or to estimate bank-specific premium rates for a sample of savings institutions. Results obtained here are consistent with the fixed premium rates creating inequalities and moral-hazard incentives. However, the difficulties of measuring two critical model variables—the market value of savings institution assets and the asset return variance—limit inferences that can be drawn from the sample and may cast doubt on the study's findings. To use Merton's methodology to estimate risk-based premium rates, one must collect more accurate data on savings institution assets. A methodology for collecting that information is outlined.

Nagarajan S., and C. W. Sealey. 1995. Forbearance, Deposit Insurance Pricing, and Incentive Compatible Bank Regulation. *Journal of Banking and Finance* 19, no. 6:1109–30.

This paper examines the incentive compatible role of regulatory forbearance policy in the context of optimal bank regulation under moral hazard. Its results show that, when a bank's asset portfolio returns have market risk, the regulator can influence the bank's choice of ex ante risk by delaying the closure of an insolvent bank. The optimal closure policy involves co-ordinating the closure decision with market-wide performance. Such a policy may significantly alleviate the bank's ex ante risk-shifting problem. Furthermore, even fixed-rate deposit insurance can be optimal when combined with a sound forbearance policy and a minimum capital standard. (©1999 EconLit)

Nagarajan, S., and C. W. Sealey. 1998. State Contingent Regulatory Mechanisms and Fairly Priced Deposit Insurance. *Journal of Banking and Finance* 22, no. 9:1139–56.

This paper presents a model of incentive compatible bank regulation under moral hazard and adverse selection. We derive a wide range of simple and conceptually implementable mechanisms that can solve each type of incentive problem separately and also achieve the first-best outcome--but only when regulatory instruments involve ex post pricing that is contingent on the bank's performance relative to the market. An important feature of these mechanisms is that they do not involve a subsidy to the bank. When the regulator faces both moral hazard and adverse selection simultaneously, we identify the conditions under which the same mechanism can achieve the first-best solution. (©1999 EconLit)

Oda, Nobuyuki. 1998. Estimating Fair Premium Rates for Deposit Insurance Using Option Pricing Theory—An Empirical Study on Japanese Banks. Institute for Monetary and Economic Studies Discussion Paper Series, no. 98-E-11. Bank of Japan.

This paper uses option pricing theory to estimate fair, variable deposit insurance premium rates in accordance with individual bank default risk, and conducts empirical analyses using Japanese data. The purpose of the analyses is to discuss the role that deposit insurance plays in monitoring bank management. The U.S. system combines the subjective judgment of a bank supervisor with certain objective criteria. The author analyzes the types of methodologies viewed as policy options in Japan. The results confirm that if one adjusts for the changes in market expectations about the forbearance of the supervisory authorities, one can improve the accuracy of the estimates. Finally, this paper considers the probable effect on bank management if this method were actually adopted.

Oorlog, Dale Robert. 1991. Risk-Adjusted Deposit Insurance Premiums at Optimal Audit Frequencies. Ph.D. diss., University of Nebraska at Lincoln.

Before reform, all federally insured depository institutions paid a flat-rate deposit insurance premium. This created a moral hazard: bank owners had an incentive to increase the riskiness of their institutions; thus, the insurance was underpriced. The author presents a model for determining premiums that are sensitive to the degree of liability to which the institution exposes the deposit insurance agency. The model is based on option pricing methodology. The conclusions demonstrate that risk-sensitive premiums can be reliably estimated, at least for banks whose equity is publicly traded. Additionally, most of the cost of deposit insurance is shown to be due to the FDIC's policy of forbearing to close mildly insolvent banks. This suggests that the cost of deposit insurance can be cut in half if policymakers introduce state-deposit audit frequencies, and the average optimal audit frequency is about half of the current average.

Ritchken, Peter, James B. Thomson, Ramon P. DeGennaro, and Anlong Li. 1995. The Asset Flexibility Option and the Value of Deposit Insurance. In *Research in Finance*, vol. 13, edited by Andrew H. Chen, 219–36. JAI Press.

Models of deposit insurance typically assume that the volatility of a bank's assets is exogenous, or predetermined. Although this static approach is useful for exploring the effect of volatility, closure rules, and subsidies on bank decisions, it ignores the ability of equity holders to respond to market events by adjusting previous investment and leverage decisions. This paper presents a dynamic model of a banking firm that incorporates this flexibility option. The paper explores the effect of the flexibility option on optimal decisions, firm value, and the value of deposit insurance.

Ritchken, Peter, James B. Thomson, and Ivilina Popova. 1995. The Changing Role of Banks and the Changing Value of Deposit Guarantees. Working Paper no. 9502. Federal Reserve Bank of Cleveland.

This article develops a model for pricing deposit guarantees. The model treats the bank's investments as a portfolio of default-free bonds and risky loans. The risk of the loans is determined by individual firms' financing and investment decisions. Pushing back risk to the level of the borrowing firms allows the authors to link deposit guarantees to specific characteristics of these loans and to make correlations between business risk and interest rates. Since the nature of bank loans has been changing over time, the model should predict the accompanying change in the value of the government guarantees.

Saunders, Anthony, and Berry Wilson. 1995. If History Could Be Rerun: The Provision and Pricing of Deposit Insurance in 1933. *Journal of Financial Intermediation* 4, no. 4:396–413.

This paper examines cross-subsidy, moral hazard, and bank liability issues related to the provision of federal deposit insurance by "rerunning" its implementation, i.e., determining fair premium values, over the period 1927–32. The pre-1933 period was characterized by historically high asset-price volatility, a large number of bank failures, and a weak federal safety net. In this economic context, we find a high degree of self-insurance on the part of the banks in our sample, both in terms of higher overall capital levels and a strong correlation between capital levels and asset volatility. Potentially large, regional cross-subsidies among banks were also found. (©1995 Academic Press)

Shaffer, Sherrill. 1997. Deposit Insurance Pricing: The Hidden Burden of Premium Rate Volatility. *Cato Journal* 17, no. 1:81–90.

This article presents evidence that the existing (1997) pattern of deposit insurance pricing may be costing the industry over \$1 billion per year more than an alternative policy of stabilizing the premium rate and allowing the Bank Insurance Fund to serve as a shock absorber for fluctuations in aggregate losses. The additional cost is in the form of risk premiums demanded by investors and uninsured depositors.

Singh, Sandeep. 1992. A Risk-Based Evaluation of Deposit Insurance Premiums for Select Banks in G-5 Countries and Canada. Ph.D. diss., Kent State University.

The government guarantee of bank deposits has been traditionally defended on grounds of promoting financial stability, enhancing competition, and reducing surveillance costs. However, it has come under increasing criticism for acting as an incentive to unjustified risk-taking by banks and for encouraging depositor indifference. Late in 1991, FDICIA based deposit insurance on the degree of capitalization. Using the options pricing methodology, this study calculates risk-based deposit insurance premiums for banks in G-5 countries and Canada.

So, Jacky C., and Jason Z. Wei. 1998. Forbearance, Deposit Insurance, and the Market Value of Savings and Loan Associations. In *Advances in Financial Planning and Forecasting*, vol. 8, edited by Cheng-Few Lee, 177–99. JAI Press.

This study examines the effect of forbearance on the valuation of deposit insurance premiums. Unlike previous studies, this one treats forbearance as an implicit option that allows the FDIC to delay closing insolvent financial institutions. The implicit option approach is able to correct for the downward biases created by the pricing model proposed by Merton (1977).

Urrutia, Jorge. 1990. The Cost of Deposit Insurance: Derivation of a Risk-Adjusted Premium. *Insurance, Mathematics, and Economics* 9, no. 4:281–90.

This article develops a model for determining a risk-adjusted insurance premium to be charged by the FDIC. The proposed model is an alternative to models based on the option pricing formula and introduces co-insurance and deductible clauses for deposit insurance. The resultant risk-sensitive insurance premium is (1) an increasing function of the interest rate paid on a bank's deposits, the bank's loan-loss rate, the bank's deposit-to-capital ratio, and the expenses incurred by the FDIC and the insured bank; and (2) a decreasing function of the interest rate earned on the bank's loans and the rate of return on the FDIC's investments. The models with co-insurance and deductibles reduce the FDIC's liabilities and result in smaller insurance premiums than the full insurance model. A risk-adjusted insurance premium would encourage banker and depositor discipline by reducing the moral-hazard problem existing under the current (1990) insurance premium.

U.S. Securities and Exchange Commission. 1991. Estimating the Value of Federal Deposit Insurance. Report. Office of Economic Analysis, U.S. Securities and Exchange Commission.

This study uses two methods to estimate the value of the federal deposit insurance provided to commercial banks. The first method considers that since deposit insurance effectively converts risky debt into riskless debt, the spread between yields on uninsured bank debt (or bank holding company debt) and yields on comparable riskless Treasury securities can be viewed as a first approximation of the value of deposit insurance. The second method is an option pricing model. In this approach, the value of deposit insurance is viewed as equivalent to the value of a put option issued by the insurer to the bank, allowing the bank to put its asset



to the insurer in return for the insurer's assumption of the bank's deposit liability. Both methods reveal that the value of deposit insurance is three to five times greater than the amount collected under the existing (1991) premium of 19.5 basis points, which indicates that federal deposit insurance represents a large contingent liability of the federal government. Furthermore, the value varies widely across banks, a fact indicating that the present (1991) system of flat-rate premiums results in a large cross-subsidy from safer banks to riskier banks.

Walker, Anna Kuzmik. 1995. Harnessing the Free Market: Reinsurance Models for FDIC Deposit Insurance Pricing. *Harvard Journal of Law and Public Policy* 18, no. 3:736-92.

This article briefly surveys reinsurance and the reinsurance options available to Congress; presents the reinsurance pilot program proposed by the FDIC in response to FDICIA; discusses the FDIC's options for structuring the reinsurance market; reviews possible market participants and special considerations for certain participants; explores the compatibility of private pricing and FDIC pricing of deposit insurance, focusing on the unique aspects of the FDIC; discusses the uses of reinsurance premium information available to the FDIC; and concludes by reviewing the strengths and weaknesses of reinsurance as a model for reform.

Wu, Lifan. 1994. Essays on Regulatory Control of Deposit Insurance and Dual Trading. Ph.D. diss., University of Illinois at Urbana-Champaign.

The first essay in this dissertation extends the existing theoretical framework to incorporate a bank's charter value and analyzes its effect on the pricing of deposit insurance. Using both deterministic and stochastic charter values, the author derives values of deposit insurance. The author shows that at a given level of regulatory control, significant charter value can be a main cost to exploit the FDIC's guarantee. Consequently, studies that fail to allow for charter value tend to understate the costs of a bank's risk shifting and to overstate the FDIC's true obligation for an insolvent bank. In the case of stochastic charter value, the correlation between a bank's tangible assets and its charter value is important for determining its fair insurance premium.