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BARGAINING THEORY

Striking For a Bargain Between Two Completely Informed Agents, by Raquel Fernandez (Boston University and NBER) and Jacob Glazer (Boston University)

This paper models the wage-contract negotiation procedure between a union and a firm as a sequential bargaining process in which the union must decide, in each period, whether or not to strike for the duration of that period. We show that there exist subgame-perfect equilibria in which the union engages in several periods of strikes prior to reaching a final agreement, although both parties are completely rational and fully informed. This has implications for other inefficient phenomena, such as tariff wars, debt negotiations, and wars in general. We characterize the set of equilibria, show that strikes can occur in real time, and discuss extensions of the model, such as lockouts and the possibility of multiple recontracting opportunities. *The American Economic Review*, Vol. 81, No. 1 (March 1991), pp. 240-52. (Reprinted with permission of the American Economic Association).

THEORY OF CONTRACTS

Adverse Selection in Dynamic Moral Hazard, by Ching-to Albert Ma (Boston University)

This paper studies a multiperiod moral hazard problem under two assumptions: (i) contracts are subject to renegotiations; (ii) the agent's action has long-term effects. The action is also interpreted as a choice of characteristic or "type." Renegotiation-proof contracts that implement various actions, including random ones, are characterized. Under appropriate conditions, the equilibrium involves the principal implementing a random action. Therefore, the equilibrium has standard properties of "adverse selection" models. *The Quarterly Journal of Economics*, Vol. CVI, Issue 1 (February 1991), pp. 255-75. (Reprinted with permission of *The Quarterly Journal of Economics*).

MORAL HAZARD PROBLEM

Moral Hazard and Nonmarket Institutions: Dysfunctional Crowding Out or Peer Monitoring?, by Richard Arnott (Boston College) and Joseph E. Stiglitz (Stanford University)

We examine a situation in which insurance is characterized by moral hazard. When market insurance is provided, supplementary mutual assistance between family and friends (unobservable to market insurers) will occur. When nonmarket insurers have no better information than market insurers, the mutual assistance not only crowds out market insurance but is also harmful and therefore dysfunctional. Alternatively, when nonmarket insurers can observe each other's effort perfectly, mutual assistance is beneficial. These results point to the potential importance of peer-monitoring mechanisms in mitigating moral hazard. *The American Economic Review*, Vol. 81, No. 1 (March 1991), pp.170-90. (Reprinted with permission of the American Economic Association).

RISK PERCEPTION AND ECONOMIC BEHAVIOR

Information Processing in Dynamic Decision Models, by Werner Jammerneegg (Wirtschaftsuniversität Wien, Vienna) and Peter Kischka (Universität Karlsruhe, W. Germany)

This paper deals with a multiperiod model of insurance demand in which losses are not assumed to be stochastically independent over time. The expected utility of end-of-period wealth is to be maximized; we assume constant relative risk aversion. Additional information during the planning process is part of the optimal decision. Structural properties of optimal insurance strategies (e.g., myopicity) are derived. For the special case of a Bayesian learning process we give sensitivity rules. *Journal of Economic Dynamics and Control*, Vol. 15, No. 2 (April 1991), pp. 409-17. (Reprinted with permission of the North-Holland Publishing Company).

Structured Prescriptive Models of Risk Attitudes, by Charles M. Harvey (University of Houston)

This paper discusses conditions on risk attitudes that imply special types of expected-utility functions. First, conditions are described that correspond to different choices of an arithmetic operation that measures the importance of changes in consequences. Second, conditions are described such that one consequence in a pair of indifferent lotteries depends linearly on a consequence in the other lottery. Procedures are described for using one of the conditions to model the risk attitude of a public or private decision making group without performing the detailed preference assessments that are needed to determine a general utility function. *Management Science*, Vol. 36, No. 12 (December 1990), pp. 1479-1501. (Reprinted with permission of *Management Science*).

Are Risk-Attitudes Related Across Domains and Response Modes?, by Paul J.H. Schoemaker (University of Chicago)

This paper examines experimentally the nature of people's risk-attitudes across different payoff domains and response modes. Only simple gambles are examined, entailing just two monetary outcomes. The main issue of interest is to what extent risk-preferences in one domain or response mode predict anything (beyond chance) about risk-preferences in another domain or mode. Three domains are examined: gain, mixed and loss. The three response modes used are certainty equivalence (CE), probability equivalence (PE) and outcome equivalence (OE) judgments.

In general, weak associations were found among *ordinal* risk-preferences within-subjects across domains, especially with respect to losses. To make the *parametric* responses (i.e., the CE, PE and OE judgments) comparable across domains and subjects, linear as well as utility-based risk-measures were examined. In the gain and loss domains, the linear risk-premia measures exhibited *higher* CE-PE correlations (within domain) than the utility-based measures. Using a multitrait-multimethod comparison, the highest correlations were found within domains across response modes.

The main findings are (1) strong risk-aversion for gain and mixed gambles, (2) risk-seeking for symmetric loss gambles, although less pronounced, (3) low correlation of risk-preferences within subjects across domains, (4) high convergent validity of response methods within domain, and (5) increased risk-aversion for loss (but not gain) gambles when using real payoffs. *Management Science*, Vol. 36, No. 12 (December 1990), pp. 1451-63. (Reprinted with permission of *Management Science*).

Multivariate Risk Aversion and Consumer Choice, by E. E. Schlee

This paper analyzes the effect of increases in risk aversion on a general consumer choice model with multiple sources of risk. Sufficient—and, in the two commodity case, necessary—conditions for a given demand function to increase (or decrease) with increased risk aversion are derived. These general results are illustrated with a two-period, consumption-savings model. *International Economic Review*, Vol. 31, No. 3 (August 1990), pp. 737-45. (Reprinted with permission of the *Journal of Economic Literature*).

HEALTH CARE FINANCIAL

The Competitive Solution and the Health Care Problems of Today, by Judith L. Wagner (Office of Technology Assessment, US Congress)

Mark Pauly claims that a "competitive" health care system will solve the health care cost crisis. This article examines how problems of the health care system: (1) almost universal lack of adequate health insurance for nursing homes and home care; (2) Medicaid's penurious approach to payment for health services for the poor; (3) the emergence of a dual health care system, especially for children; (4) the entrenched waste and inefficiency of the health

care system; and (5) consumers' inability to judge the quality of health care. The competitive solution does not eliminate any of these problems—and may not even improve some of them. *Quarterly Review of Economics and Business*, Vol. 30, No. 4 (Winter 1990), pp. 95–100. (Reprinted with permission of the *Quarterly Review of Economics and Business*).

The Problem of Attaining an Efficient Capital Stock, by Richard J. Arnold (University of Illinois at Urbana-Champaign)

Serious problems exist with the nature of health care financing in the United States. This article summarizes problems caused by the high cost of serving an aging population, the lack of incentives in insurance plans for preventive care, and the growing number of uninsured people in the population. The article then focuses on efforts to bring about greater efficiency by changing the contractual relations between the principal—either the payor or the patient—and the agent—the provider. These new contracts attempt to place a greater share of the financial burden on the provider. Evidence of the success of these new contracts is mixed. The major point of the article is that real efficiencies will not be reached unless these incentive mechanisms together with competitive market forces relieve the excess capacity in the health care industry. *Quarterly Review of Economics and Business*, Vol. 30, No. 4 (Winter 1990), pp. 81–94. (Reprinted with permission of the *Quarterly Review of Economics and Business*).

Financing Health Care, by Mark V. Pauly (University of Pennsylvania)

This article reviews the causes of growth in health care and concludes that only changes in the rate of growth in intensity of care are likely to be effective. It proposes a model of consumer choice (with advice) among health plans, and competition among plans on the basis of the rate at which new technology is introduced, as a solution to the problem of picking the appropriate rate. It argues that the existence of the uninsured is evidence of government failure. *Quarterly Review of Economics and Business*, Vol. 30, No. 4 (Winter 1990), pp. 63–80. (Reprinted with permission of the *Quarterly Review of Economics and Business*).

US Health Care Policy in 1990: Looking Back, Looking Ahead, by Eli Ginzberg (Columbia University)

Health policy in the United States is best understood as a policy of incrementalism with major interventions occurring only in response to crisis, as in the case of the Medicare legislation that profoundly altered our historic financing of health care. The characteristically minor, unplanned, adjustments that are made often have major unanticipated consequences, and these serve to explain the radical transformation of the nation's health system in the half-century since World War II. The main elements in this change—the evolution of employment-tied private insurance for the majority of the population, the predominance of specialism and superspecialism in medical practice, the expansion of the voluntary hospital system with capital liberally

raised through tax-exempt bond issues, advancing technology and medical capability are reviewed. The major persistent policy issues—uncontrolled expenditures and the increasing numbers of uninsured—will ultimately precipitate change, perhaps by the end of the decade, very likely a minimum benefit, universal federal-state insurance system, supplemented by the private market—hardly radical systemic reform. *Quarterly Review of Economics and Business*, Vol. 30, No. 4 (Winter 1990), pp. 15-22. (Reprinted with permission of the *Quarterly Review of Economics and Business*).

HEALTH CARE AND INSURANCE

The Interaction Between Forms of Insurance Contract and Types of Technical Change in Medical Care, by James R. Baumgardner (Duke University)

A simple three-parameter description of medical technology is introduced to investigate the relationships between technical change, welfare, and type of insurance contract. The value of a particular change in technology depends on the existing form of a contract. The marginal equilibrium expected utility to consumers of different types of technical change hinges on the manner in which the insurance arrangement is designed to mitigate moral hazard. These results open the way for a positive model of the effects of insurance arrangements on the types of technology that are adopted and of the effects of technical changes on the prevalent forms of insurance contract. *Rand Journal of Economics*, Vol. 22, No. 1 (Spring 1991), pp. 36-53. (Reprinted with permission of the *Rand Journal of Economics*).

GOVERNMENT INSURANCE PROGRAMS

The Cost of Deposit Insurance: Derivation of a Risk-Adjusted Premium, by Jorge Urrutia (Loyola University, Chicago)

This paper 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 coinsurance and deductible clauses for deposit insurance. The resulting 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 coinsurance 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 bankers and depositors discipline reducing the moral hazard problem existing under the current flat insurance premium. *Insurance: Mathematics and Economics*, Vol. 9, No. 4 (December 1990), pp. 281-90. (Reprinted with permission of the North-Holland Publishing Company).

SOCIAL INSURANCE

Illness-Episode Approach: Costs and Benefits of Medigap Insurance, by Shoshanna Sofaer (University of California, Los Angeles)

Over two-thirds of Medicare beneficiaries have private supplementary coverage, but few know enough about Medicare, their own supplements, or available alternatives to make intelligent comparisons and informed purchasing decisions. The illness-episode approach, a new way to provide insurance information to Medicare beneficiaries, calculates out-of-pocket costs likely to be faced by beneficiaries experiencing 13 illnesses, under Medicare alone and under different medigap policies. Applying the approach to six policies marketed in Los Angeles in 1986 revealed that plans varied widely in their ability to reduce financial vulnerability; may still leave the elderly with substantial out-of-pocket costs. *Health Care Financing Review*, Vol. 11, No. 4 (Summer 1990), pp. 121-131.

HUMAN CAPITAL

A New Approach To Valuing a Life, by Robert J. Brent (Fordham University)

Because the issue of how to put a monetary value on a life will always be controversial, this paper presents an alternative approach that can in certain circumstances avoid the use of monetary values. The alternative approach uses time as the numeraire. This numeraire can handle both the ex ante and ex post approaches to valuing a life. After showing how a simple two-period consumer choice problem can be translated into terms of time, the paper considers an application that involves reformulating the data used to evaluate the 55 mph speed limit decision in the United States. *Journal of Public Economics*, Vol. 44, No. 2 (March 1991), pp. 165-71. (Reprinted with permission of the North-Holland Publishing Company).

PENSIONS AND RETIREMENT

Occupational Differences in the Ability of Men to Delay Retirement, by Thomas N. Chirikos (University of South Florida) and Gilbert Nestel (Ohio State University)

Whether the functional capacity of older men to remain at work differs by occupational assignment is an important consideration in judging policies designed to advance the age of retirement. A competing-risk model of retirement, disability and death is used to test hypotheses about the influence of physically strenuous work on the ability to delay retirement. Time-dependent hazard rate functions are estimated with panel data on a nationally representative sample of older American males. Physical job requirements and health conditions are found to affect the likelihood of retiring in a disabled state. However, projections of the fractions of workers in physically strenuous and sedentary job categories that are likely to encounter difficulty in staying in the labor force do not differ greatly. Special policy consideration of

workers in nonsedentary occupations may therefore be questioned. *The Journal of Human Resources*, Vol. 26, No. 1 (Winter 1991), pp. 1-26. (Reprinted with permission of *The Journal of Human Resources*).

Capital Market Effects of the Aging Population: The Dutch Pension System in the Long Run, by A.P. Huijser

The present article aims at showing the influences of the aging of the population on the capital market supply of the pension funds in the long run. The analysis covers the period 1990-2025, and makes use of an extended version of an economic and demographic computational model published in Huijser and Van Loo (1986). The calculated scenarios show the relation between a number of assumptions about economic variables and the future development of the pension funds' operations. *European Economic Review*, Vol. 34, No. 5 (July 1990), pp. 987-1009. (Reprinted with permission of the *Journal of Economic Literature*).

LIFE INSURANCE

Whole-Life Insurance Lapse Rates and the Emergency Fund Hypothesis, by J. François Outreville (United Nations Conference on Trade and Development)

There has been a long-term interest in the subject of lapse rates and the basic question of what causes lapses has been under study for many decades by the insurance industry. The interest rate hypothesis has received the most attention and empirical support in recent years. An older hypothesis is that cash values are utilized by policyholders as an emergency fund. This hypothesis deserves attention here because it has not been extensively tested. *Insurance: Mathematics and Economics*, Vol. 9, No. 4 (December 1990), pp. 249-55. (Reprinted with permission of North-Holland Publishing Company).

INSURER MANAGEMENT

Asset Pricing Models and Insurance Ratemaking, by J. David Cummins (University of Pennsylvania)

This paper provides an introduction to asset pricing theory and its applications in non-life insurance. The first part of the paper presents a basic review of asset pricing models, including discrete and continuous time capital asset pricing models (the CAPM and ICAPM), arbitrage pricing theory (APT), and option pricing theory (OPT). The second part discusses applications in non-life insurance. Among the insurance models reviewed are the insurance CAPM, discrete time discounted cash flow models, option pricing models, and more general continuous time models. The paper concludes that the integration of actuarial and financial theory can provide major advances in insurance pricing and financial management. *Astin Bulletin*, Vol. 20, No. 2 (1990), pp. 125-66. (Reprinted with permission of the *Astin Bulletin*).

Smoking, Skydiving, and Knitting: The Endogenous Categorization of Risks in Insurance Markets with Asymmetric Information, by Eric W. Bond and Keith J. Crocker (Pennsylvania State University)

We analyze the efficiency and market equilibrium effects of endogenous categorization, where insurance companies classify risks on the basis of insureds' voluntary consumption of products that are correlated with underlying loss propensities, and we show that the use of such categorization may permit the attainment of first-best allocations as competitive Nash equilibria. The optimal insurance premium involves a trade-off between the use of categorization to correct moral hazard externalities generated by the consumption of the product and the use of differential consumption to sort heterogeneous consumers, thereby mitigating the social costs of adverse selection. The efficiency consequences of taxing or subsidizing aggregate, as opposed to individual, consumption is also considered. *Journal of Political Economy*, Vol. 99, No. 1 (February 1991), pp. 177-200. (Reprinted with permission of The University of Chicago Press).

On Changing the Parameter of Exponential Smoothing in Experience Rating, by Heikki Bonsdorff (Pohjola Insurance Company Ltd., Helsinki, Finland)

We consider exponential smoothing $Y_n = \alpha X_n + (1 - \alpha)Y_{n-1}$, $0 < \alpha < 1$, in experience rating. Here the premium Y_n is determined by the policy's own claims history (X_n). In order to uniformize the fluctuation of premiums, it is appropriate to use a bigger α for the big policies than for the small ones. When the size of the policy changes with time, a need arises to change α correspondingly. It has recently been shown that changing based on the size of the premiums Y_n may lead to too low a tariff level. This result is presented here and illustrated by means of simulation. Further, some general results are given how the changing can be made without a decline in the tariff level. The results are applied to a tariff system in which the linking of the smoothing parameter to the size of the policy is particularly motivated. *Astin Bulletin*, Vol. 20, No. 2 (1990), pp. 191-200. (Reprinted with permission of the *Astin Bulletin*).

Underwriting Cycles and Rate Regulation in Automobile Insurance Markets, by J. François Outreville (United Nations Conference on Trade and Development, Geneva)

Cycles in the underwriting profits of the property-liability industry have been attributed to a number of causes. One hypothesis is that the appearance of a cycle is created through accounting procedures and institutional mechanisms which interfere with market equilibrium. Price approval regulation is likely to exacerbate any cyclical behavior in underwriting results. This paper confirms this hypothesis in the case of automobile insurance markets in the United States. *Journal of Insurance Regulation*, Vol. 9, No. 2 (December 1990), pp. 274-86. (Reprinted with permission of the author).

LOSS FORECASTING

Bayes And Empirical Bayes Estimation For The Chain Ladder Model, by R.J. Verrall (City University, London)

The subject of predicting outstanding claims on a portfolio of general insurance policies is approached via the theory of hierarchical Bayesian linear models. This is particularly appropriate since the chain ladder technique can be expressed in the form of a linear model. The statistical methods which are applied allow the practitioner to use different modelling assumptions from those implied by a classical formulation, and to arrive at forecasts which have a greater degree of inherent stability. The results can also be used for other linear models. By using a statistical structure, a sound approach to the chain ladder technique can be derived. The Bayesian results allow the input of collateral information in a formal manner. Empirical Bayes results are derived which can be interpreted as credibility estimates. The statistical assumptions which are made in the modelling procedure are clearly set out and can be tested by the practitioner. The results based on the statistical theory form one part of the reserving procedure, and should be followed by expert interpretation and analysis. An illustration of the use of Bayesian and empirical Bayes estimation methods is given. *Astin Bulletin*, Vol. 20, No. 2 (1990), pp. 217-44. (Reprinted with permission of the *Astin Bulletin*).

Applications of the GB2 Family of Distributions in Modeling Insurance Loss Processes, by J. David Cummins (University of Pennsylvania), Georges Dionne (University of Montreal), James B. McDonald and B. Michael Pritchett (Brigham Young University)

This paper investigates the use of a four parameter family of probability distributions, the generalized beta of the second kind (GB2), for modeling insurance loss processes. The GB2 family includes many commonly used distributions such as the lognormal, gamma and Weibull. The GB2 also includes the Burr and generalized gamma distributions. Members of this family and their inverse distributions have significant potential for improving the distributional fit in many applications involving thin or heavy-tailed distributions. Members of the GB2 family can be generated as mixtures of well-known distributions and provide a model for heterogeneity in claims distributions. Examples are presented which consider models of the distribution of individual and of aggregate losses. The results suggest that seemingly slight differences in modeling the tails can result in large differences in reinsurance premiums and quantiles for the distribution of total insurance losses. *Insurance: Mathematics and Economics*, Vol. 9, No. 4 (December 1990), pp. 257-272. (Reprinted with permission of the North-Holland Publishing Company).

On Life Table Applications of Ordering Among Risks, by Werner Hürlimann (Winterthur-Leben, Switzerland)

Survival models attached to a Life Table are compared in the first degree stochastic dominance and in the second degree stop-loss dominance. The hyperbolic or Balducci approximation of the Life Table for non-integral ages is shown to be the less dangerous of those approximations considered, and is not recommended for practical use in insurance rate making. Furthermore, stop-loss formulas are derived, which should be helpful in the construction of Life Tables based on probabilistic risk comparisons. *Insurance: Mathematics and Economics*, Vol. 9, No. 4 (December 1990), pp. 277-79. (Reprinted with permission of the North-Holland Publishing Company).

RISK MANAGEMENT

Premium Allocation and Risk Avoidance in a Large Firm: A Continuous Model, by Charles S.s Tapiero (Hebrew University of Jerusalem) and Laurent L. Jacque (University of Minnesota)

Corporate wide risk pooling by a multi-divisional firm can reduce insurance costs through (i) economies of scale and (ii) properly motivating subsidiaries in managing their risk avoidance effort. Because of information asymmetry between the parent company and its subsidiaries, the firm faces the problem of devising implementable monitoring and premium (sharing) allocation schemes which provides an incentive for subsidiaries to control risk.

This article develops an intra-corporate conceptual framework to premium allocation when claims and premium collection are defined in terms of continuous stochastic processes. The approach outlined is based on a principal-agent framework when the principal - the parent company, acts as an intermediary, returning to the agents—the subsidiaries, the benefits derived from risk aggregation. The problems arising from partial information regarding claims and loss prevention efforts are dealt with through a premium function which is sensitive to the liability accounts of subsidiaries, i.e., it reflects the residual claims collected net of premium payments made over time. *Insurance: Mathematics and Economics*, Vol. 9, No. 4 (December 1990), pp. 237-47. (Reprinted with permission of the North-Holland Publishing Company).

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