

research review



Issue No. 6, July 2006 – December 2006

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research review

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Public Policy Discussion Papers

p-06-5

Social Dynamics of Obesity

by Mary Burke and Frank Heiland

complete text: <http://www.bos.frb.org/economic/ppdp/2006/ppdp065.pdf>

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Motivation for the Research

A number of recent papers in economics have sought to explain the large increase in the prevalence of obesity among American adults observed over the past 30 years. The explanations have focused on economic factors such as falling food prices, the increased convenience of obtaining ready-to-eat food, and reductions in physically demanding labor at work. Since the explanatory frameworks describe the behavior of representative agents, the predictions speak primarily to secular trends in average weight and body mass index (BMI). Although the evidence looks quite compelling that food price movements (including time costs) have contributed to increases in mean weight (and therefore obesity) in the United States, the existing economic models have had a harder time explaining the disproportionate weight gains in the upper tail of the distribution. The authors show that a model that incorporates biological heterogeneity and social interactions, in addition to falling food prices, captures the persistent features of the body weight distribution and specifically predicts larger increases in 95th- and 99th-percentile weights than in mean weight as food prices fall.

Research Approach

The authors develop an analytical choice model in which utility depends on food and nonfood consumption and on how individual weight compares with a social weight norm or aspiration. In the model, individuals differ in their respective genetic endowments of resting metabolic capacity but are otherwise identical. The social weight norm is endogenous and depends on the aggregate behavior of the population.

Through analytical results and simulations calibrated to American women in the 30-to-60-year age bracket during the period from 1976 through 2000, based on data from NHANES surveys, the authors illustrate how food price declines affect the entire weight distribution and describe explicit adjustment dynamics across long-run equilibria.

The authors also examine the potential contribution of alternative types of heterogeneity, such as the degree of self-control over food intake, to explaining changes in the weight distribution over time. They do this by describing the heterogeneity explicitly and simulating the implied weight distributions at the same price levels used in the initial simulations.

Key Findings

- Consistent with the data, the authors predict large increases in mean adult weight, and even larger gains in upper-quantile weights, as food prices fall. For simulated price declines pinned to independently estimated trends in the full price per calorie of food—including both time costs and the money price—the predictions match the quantitative changes in average weight and the obesity rate for this group quite closely.
- Larger weight gains in the upper tail of the distribution are shown to result from a combination of the concavity of metabolism with respect to body weight, and social multiplier effects. Although a model involving variation in self-control can also predict larger increases in upper-quantile

weights than in mean weight in response to price declines, the authors argue that it is hard to judge the contribution of variation in self-control because the exact dimensions of such variation are unknown, whereas variation in metabolic capacity has been measured and can be modeled with greater confidence.

- If shifts in the body weight norm occur with a lag, the adjustment to a new long-run equilibrium, following a decline in the price of food, may take years. The authors find support for this lagged effect in the recent evidence that among American adults, average weight and obesity rates are continuing to increase despite the leveling off of food prices since the mid-1990s.
- While previous economic models of obesity described metabolism as a linear function of body weight, the authors find—consistent with the most recent research on metabolism—that models in which the basal metabolism rate is a strictly concave function of weight fit the data better.
- The marginal effect of calorie consumption on body weight increases, on average, as average weight grows, even with no change in genetic endowments. This result, which does not arise when metabolism is assumed to be a linear function of weight, contributes significantly to growth in upper-tail weights relative to the mean. Thus, the specifics of the metabolism model matter considerably for prediction and policy analysis.
- The model assumes that individuals aspire to weigh less (by some fraction) than the average weight in the population at a given time. This weight norm is predicted to increase as food prices fall because price declines cause average weight to rise, setting off a social multiplier effect. This prediction agrees with the observation that the average self-reported “desired weight” of Americans increased significantly between 1994 and 2002—by about half as much as the actual increase in average weight.

Implications

Although explaining cross-sectional variation in weight levels was not one of the authors’ primary goals, their findings suggest that metabolic variation alone induces substantial weight variation across individuals and that the weight distributions derived from an empirically grounded metabolism model strongly mirror the persistent qualitative features of the observed weight distribution.

Given the concave relationship between body weight and metabolism, the rightward shift of the weight distribution means that the realized marginal effects of calorie consumption on weight are now greater on average than in the past, even with no genetic change. The concave metabolism model has further implications. An individual who predicts her basal metabolic rate at a higher weight, based on the curve’s slope at her current weight, will systematically overestimate her metabolic rate, and therefore will underestimate the weight gain associated with a permanent (non-marginal) increase in calorie consumption. This finding suggests a need for better public education as well as better medical counseling about the relationship between body weight, body composition, and calorie-burning.

The authors’ model of endogenous norms predicts that population weights and the prevalence of obesity should continue to rise if food prices continue to fall, but that marginal price effects on calorie consumption should be smaller, the lower the initial price level. In this framework, the limits of weight and obesity growth depend on the slope of the weight-metabolism curve at high weight levels. If the curve continues to follow the authors’ fitted model, and provided that calories are not addictive, the increases in average weight and the obesity rate should eventually level off, even if norms are flexible and prices continue to fall. Further research on metabolism among obese subjects to determine the shape of the curve is clearly warranted.

There appears to have been technological adaptation, in the form of advances in the treatment of obesity-related disease, as well as social adaptation, in the form of increasing “desired weights,” to the shift in the weight distribution. The authors expect such technological adaptation to continue, effecting an eventual shift upward in the range of medically recommended “normal” BMI values and a further decline in the incentives to engage in behavior modification to control weight.

p-06-6

Do Households Benefit from Financial Deregulation and Innovation? The Case of the Mortgage Market

by Kristopher Gerardi, Harvey S. Rosen, and Paul Willen

complete text: <http://www.bos.frb.org/economic/ppdp/2006/ppdp066.pdf>
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Motivation for the Research

The mortgage market in the United States has experienced phenomenal change over the last 35 years. Today’s consumers can choose from an extensive menu of mortgage offerings instead of being limited to the traditional 30-year, fixed-rate, level-payment mortgage. Most observers believe that the deregulation of the banking industry and financial markets generally has played an important role in this transformation. This paper develops and implements a technique for assessing the impact on households of changes in the mortgage market.

Research Approach

The authors develop and test an econometric model, based on an implication of the permanent income hypothesis: the higher a household’s future income, the more it desires to spend and consume, other things being equal. The logic underlying the model runs as follows: if credit markets were perfect, then desired consumption would match actual consumption, and current spending on housing would forecast future income. Since in the real world credit market imperfections mute this effect, one can view the strength of the relationship between current spending on housing and future income as a measure of the degree of imperfection of mortgage markets. Thus, a natural way to determine whether mortgage market developments have actually helped households by decreasing market imperfections is to examine whether this link between current housing consumption and future income has strengthened over time. The primary data source is the Panel Study on Income Dynamics for the years 1968 to 2001.

After exploring the overall relationship between current housing spending and future income, and testing for breakpoints indicating discontinuous changes in this relationship over time, the authors examine subsectors of the housing market. They look for variations based on poverty, race, and gender; on whether a purchaser is a first-time or a repeat home buyer; and on whether the house purchase represents a high or a low share of the buyer’s current income. The authors also employ the model to explore one controversial issue: the role of the government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, in the development of a secondary market in mortgages.

Key Findings

- Over the past several decades, housing markets have become less imperfect in the sense that households are now more able to buy homes whose values are consistent with the purchasers’ long-term income prospects.
- For the population of the United States as a whole, there appears to have been a discrete improvement in the housing finance markets in the early to mid-1980s.

- No evidence was discovered to support the idea that the GSEs' activities have contributed to the decrease in the degree of imperfection of the housing market—either for U.S. homebuyers in the aggregate or for subsamples of the American population one might expect to benefit particularly from GSE activity, such as low-income households and first-time buyers.

Implications

Although the findings suggest that the housing finance market in the United States has become substantially less imperfect over time, based on these findings one cannot reject the hypothesis that the GSEs and their activities in the secondary market have failed to improve the housing finance environment confronting low-income and first-time homebuyers.

The authors surmise that the discrete improvement in housing markets in the early to mid-1980s was due to a combination of innovative mortgage products, financial market deregulation, and the development of a secondary market in mortgages.

More broadly, this paper demonstrates that taking a life-cycle approach to thinking about questions regarding housing finance is both theoretically attractive and empirically tractable, suggesting that such an approach might be applied fruitfully in other contexts. Issues that might lend themselves to an approach of this type include, among others, measuring the “affordability” of housing and assessing the extent of mortgage market discrimination.

p-06-7

Managing the Risk in Pension Plans and Recent Pension Reforms

by Richard W. Kopcke

complete text: <http://www.bos.frb.org/economic/ppdp/2006/ppdp067.pdf>
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Motivation for the Research

The status of companies' defined benefit pension plans shifted dramatically from surpluses in the 1990s to deficits in the early years of this century. In the wake of this experience, the federal government included provisions in the Pension Protection Act of 2006 to promote the full funding of defined benefit pension plans in the future, and accounting authorities have been considering reforms to improve the financial reporting of these plans.

This paper examines the characteristics of three funding strategies for pension plans and analyzes the investment strategies that complement these strategies. Although the primary focus is on defined benefit plans, which include Social Security, the analysis also applies to employees' defined contribution plans, which, when their beneficiaries set specific goals for their future retirement benefits, function essentially as defined benefit plans.

Research Approach

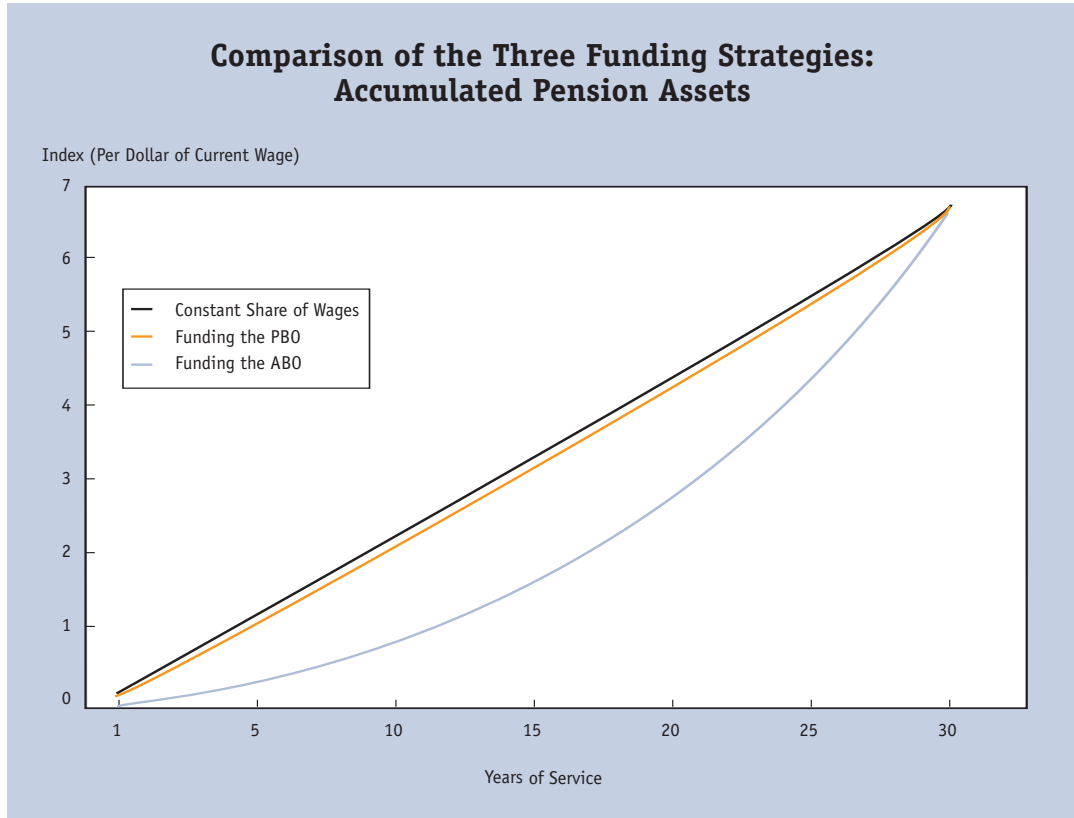
The author introduces three funding targets: 1) the projected benefit obligation (PBO), the standard according to generally accepted accounting principles; 2) the accumulated benefit obligation (ABO), the standard required by federal law; and 3) the constant contribution rate (CCR). Noting that each of these strategies represents a different path to the common goal of fully funded pensions, for each strategy he describes the investment requirements and opportunity costs for sponsors, the risks involved, and the extent to which traditional immunization can control the risks. After stressing the importance of calculating the present value of pension plans' obligations using interest rates on Treasury securities and of holding surplus assets sufficient to cover any risks

assumed in funding the obligations, the paper extends the discussion of techniques for controlling risk. It presents a two-factor immunization strategy—a means of combining conventional bonds and inflation-adjusted bonds to protect a plan from the risks of unexpected changes in the inflation rate and real rates of return—and illustrates the value of combining these investments with stocks and other assets to hedge other risks, albeit less than completely.

Key Findings

- Defined benefit plans, including Social Security, could stabilize the balance between the value of their assets and their obligations if they funded the obligation entailed by employees' current income (the ABO) and financed this obligation by investing in Treasury securities. With this strategy the required contribution per dollar of wages changes significantly with the rate of growth of employment. Funding the ABO achieves the lowest contribution relative to wages when the labor force is growing rapidly, because rapid growth reduces the average years of service of the workforce.
- The balance between the value of assets and obligations is less stable and contributions relative to wages are higher for plans that fund the PBO rather than the ABO. But with this strategy contributions relative to wages change less significantly with the rate of growth of the workforce. This funding strategy encourages plans to hold surplus assets and to invest in a broader range of assets—including Treasury inflation-protected securities, stocks, and real assets—to minimize the risk of becoming underfunded.
- The assets necessary to fund a plan's PBO exceed those needed to fund its ABO for active employees, and the difference between these obligations increases with the rate of growth of the employer's work force. A rapidly growing company that feels pressure from financial analysts to fund its PBO may consider offering a defined contribution plan rather than a defined benefit plan.
- The risks in all funding strategies can be managed to varying degrees through the plans' choice of assets. Given that the ABO is exposed mostly to inflation and real rate of return risks, a defined benefit plan that funds its ABO can immunize its funded status against unexpected changes in these variables with a two-factor strategy that uses conventional Treasury bonds and Treasury inflation-protected securities.
- From the employees' point of view, employers that fund their PBO offer more protection, provided the plans do not adopt investment strategies that entail excessive risk. But funding the PBO imposes more risk on employers. Although a plan funding the PBO is exposed to inflation and real rate risks against which it can immunize its funded status with a two-factor strategy, it is also exposed to other risks, like real wage risk, for which there are no close hedges. Plans can offset these risks to a degree by holding stocks and real assets, whose values are correlated with real wages.
- Although a defined contribution plan that adopts a CCR is exposed to the same range of risks as a plan that funds its PBO, a CCR strategy is less sensitive to risks other than inflation and real rate risk. Consequently, to immunize itself it would invest more heavily in Treasury securities than would a plan that funds its PBO.
- The foregoing conclusions apply in efficient financial markets. The record for the last decade shows that immunized portfolios have accounted for a comparatively small share of defined benefit plan assets. First stocks and real estate and now other investment strategies, including hedge funds and commodities, are attracting funds as employers seek better performance from their retirement plans.

- These findings also apply to Social Security. To minimize the variability of the payroll tax rate, especially when the rate of growth of the work force is falling, the program could fund its PBO, rather than its ABO. Then, to minimize the volatility in its funded status for obligations to active workers due to changes in economic projections, the program could reduce its risks by holding a broader range of assets, including stocks and real assets. Social Security's funded status for obligations to retirees could be immunized by funding these benefits with Treasury inflation-protected securities.



Implications

If public policy is not to discourage employers from adopting or maintaining defined benefit pension plans, the analysis in this paper suggests that the financial community might move toward practices mandated by pension law and define the funded status of a plan as its assets less its ABO. Financial reporting should then provide analysts with the information they need to assess a company's ability to continue to fund its ABO, much as they currently assess its ability to continue to pay its interest expenses, earn an adequate profit margin, and sustain its dividend or franchise value. For this purpose, financial reporting would need to distance itself from current law by using the Treasury yield curve to discount future pension benefits.

Pension law also must continue to evolve if it is to foster an adequate funding of defined benefit pension obligations. By using corporate bond yields in place of Treasury yields to calculate the present value of obligations, the new pension act may understate the ABO by 10 percent or more for many companies, thereby overstating their funded status commensurately. Also, by making no provision for the risk that plans assume in their choice of assets for funding their ABO—no insistence on a surplus in their funded status to cover risk—the law allows plans additional latitude for effectively underfunding their obligations.

In any case, the importance of defined contribution plans will continue to grow, perhaps in conjunction with defined benefit plans. For many employees, the portability of defined contribution plans and the ability to customize their coverage or features, within limits, is appealing. Accordingly, the financial community will continue to develop new products to serve these plans. Some could be investment funds that allow employees to achieve a specified retirement income that maintains its purchasing power for the life of the beneficiary. Financial innovations could also offer hybrid designs for pension plans, blending the advantages of defined contribution plans and defined benefit plans: customization, professional management, and diversification of risks.

Working Papers

w-06-12

Minimally Acceptable Altruism and the Ultimatum Game

by *Julio J. Rotemberg*

complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0612.pdf>
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Motivation for the Research

This paper presents a model designed to explain the outcomes of two experimental games of social preferences, the ultimatum game and an important variant, the dictator game. The main advantage of the model proposed in this paper is that, unlike other models with similar aims, it does not predict unrealistic actions on the part of individuals in scenarios outside of these experimental settings.

Because the experimental outcomes of ultimatum and dictator games are in sharp conflict with the predictions of standard economic models, many experimental variations have been considered, and the literature on this subject is vast. However, the essentials of the setup are consistent. Both games involve two players. The first player, called the proposer, offers to split a reward with the second, called the responder. In the ultimatum game, the responder can either accept or reject the proposer's offer. If the responder rejects the offer, neither player gets anything. Otherwise the reward is split as suggested by the proposer. In the dictator game, the responder must passively accept the proposer's offer.

The modal offer in the ultimatum game is to split the reward 50-50. The actual share of even splits varies somewhat from experiment to experiment, and sometimes across rounds of play within a given experiment. Splits that are less favorable to responders often get rejected. In several experiments, such rejections are so common that the average earnings of proposers actually decline, as they make offers that are less favorable to responders. Witnessing this behavior of responders, proposers should offer even splits if they wish to maximize their own expected payoffs. However, even in experiments in which proposers earn less by making less generous offers and even after subjects have learned the game by playing it several times, some proposers make less generous offers. In the dictator game, expected monetary payoffs obviously rise when less generous offers are made. Not surprisingly, therefore, offers of even splits are made less frequently than in the ultimatum game. Still, the literature reports that in some experiments about 20 percent of proposers in the dictator game offer even splits.

Research Approach

The author develops, and tests against experimental evidence presented in the literature, a theoretical model of individual preferences in which individuals are mildly altruistic towards others, while

also expecting others to be mildly altruistic. In the model, if an individual encounters evidence that another person is less altruistic than he finds acceptable, he becomes angry and derives pleasure from harming the excessively selfish individual. In order to explain the making and recurrent rejection of low offers that are likely to be rejected, the model incorporates the idea that some experimental subjects behave as if they were risk-loving.

Key Findings

- Demonstrated behavior of extreme selfishness on the part of another person triggers a reaction whereby people actually enjoy hurting those whom they regard as excessively selfish. This explains why preferences that differ so little from the selfish ones that form the baseline of economic analysis can fit the experimental results of ultimatum games and dictator games.
- A moderate taste for small gambles can explain why proposers whose propensity for altruism is low offer less than even splits despite the fact that the probability that such offers will be accepted is low and so making such offers is likely to reduce the proposer's earnings.

Implications

The ultimatum game provides evidence that people react negatively to actions that they regard as unfair. This matters for anyone who makes decisions, because it suggests that decision-makers will be treated badly when others feel that their decisions are unfair. Because typical decisions are not identical to those in the ultimatum game, however, the experimental evidence does not provide direct guidance about what will be seen as unfair in real life. The theory developed here fits a variety of both experimental and field evidence and thus has a simple implication for all decision-makers. This is that those who are affected by decisions will react quite negatively if, in their minds, the decision in question demonstrates an insufficient level of altruism towards them. Decision-makers should thus worry in advance whether their decisions will be interpreted in this way.

w-06-13

A Tale of Tails: An Empirical Analysis of Loss Distribution Models for Estimating Operational Risk Capital

by Kabir Dutta and Jason Perry

complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0613.pdf>
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Motivation for the Research

Financial institutions play an important economic role by mediating between borrowers and depositors. The solvency of a financial institution, and a country's financial structure as a whole, is an outcome of an institution's internal management procedures and effective regulatory supervision. The Bank of International Settlements, which fosters cooperation among central banks to improve the stability of the global financial system, is in the midst of developing and implementing the Basel II Capital Accord. Its enhanced guidelines aim to improve the international consistency of capital regulations, make regulatory capital requirements more sensitive to risk exposure, and promote stronger risk-management practices among large financial institutions that operate internationally. The procedures in the new Capital Accord are expected to set benchmark standards for all financial institutions.

Illiquidity and financial crises can be triggered by "operational risk," defined as the potential loss a financial institution might suffer from external events or because of inadequate or failed internal

processes, people, or systems. As financial institutions hedge their market and credit risk through asset securitization and other means, their exposure to operational risk has become a larger share of their total risk profile. Yet only very recently have financial institutions begun to estimate their operational risk exposure with greater quantitative precision, so these newer techniques are still in their infancy. There are many models available to financial institutions to gauge their operational risk, and an important choice is which modeling technique to use for estimating the severity (dollar value) of operational losses. An important policy question is whether institutions using different loss severity models arrive at different and inconsistent estimates of their risk exposure, which could then result in their holding inadequate capital reserves. This paper seeks to better inform operational risk procedures by performing a rigorous analysis of internal loss data, and then experimenting with various modeling techniques used to measure operational risk in order to ascertain which models perform best under the widest range of criteria.

Research Approach

Following the methods of Exploratory Data Analysis suggested by Tukey (1977), the authors start by analyzing the structure and characteristics of loss data from a sample of seven financial institutions that participated in the 2004 Loss Data Collection Exercise, an effort by bank regulatory agencies in the United States to collect operational risk data. Taken together, these seven institutions are broadly representative of the banking industry in size and business type. Besides analyzing the loss data at the enterprise level to better gauge risk estimates, the authors also analyze losses at the business-line and event-type levels called for in the Basel II Accord. The loss severity data exhibit a high degree of unsystemic skewness, but no definite pattern emerged for kurtosis (elongation). This preliminary analysis revealed that a distribution model would need to have a flexible tail structure that could vary significantly across different percentiles in order to provide an accurate model of operational risk exposure.

The loss severity data were subjected to four major techniques to model its distribution: 1) a method of extreme value theory (EVT), around which many of the different current techniques for modeling operational risk center; 2) capital estimation based on non-parametric empirical sampling; 3) parametric distribution fitting techniques with one and two general class distributions; and 4) general class distributions using four parameters. Many financial institutions reported using one- and two-parameter distributions to model loss severity in Quantitative Impact Study 4, a survey conducted by American banking regulators to better understand how the Basel II capital standards might impact the minimum regulatory capital requirements for large financial institutions based in the United States. The authors compare these different loss severity measurement techniques according to five different performance criteria, listed in descending order of importance: 1) goodness-of-fit, meaning how well the method statistically fits the data; 2) realism, meaning that if the data fit well statistically, does the method generate a loss distribution with a realistic capital estimate; 3) specification, meaning that the characteristics of the fitted data are similar to the loss data and are logically consistent; 4) flexibility, meaning that the method reasonably accommodates a wide variety of empirical loss data; and 5) simplicity, which asks whether the method is easy to apply in practice, and whether it easily generates numbers for the purposes of simulating losses. In this study, operational risk capital is measured at the 99.9-percentile level of the simulated capital estimates for aggregate loss distributions, because this is the level currently proposed under the Basel II Accord. Any model rejected as having a poor statistical fit for most institutions was regarded as an inferior technique for modeling operational risk.

Key Findings

- Applying different loss severity models to the same financial institution yielded vastly different estimates of capital risk exposure. This finding is important because it implies that when a financial institution constrains its choice of a technique to one with a good statistical fit, the capital

estimates across these techniques can vary greatly. In several cases, when the same model was applied to different institutions—even when the model satisfied the statistical criterion of goodness-of-fit it yielded very inconsistent and unreasonable estimates across institutions. However, it is important that when the condition of realism is added to goodness-of-fit, different statistical techniques yielded very similar capital estimates. This result is significant, because when goodness-of-fit and realism are imposed together, we do not see the variability in the capital estimates seen when using goodness-of-fit alone.

- Of the many techniques tested by the authors, the EVT method yielded some of the worst-specified loss severities. When the EVT approach did give somewhat reasonable capital estimates, these estimates varied significantly with the choice of the tail threshold. For over half the institutions measured at the enterprise level, EVT implies infinite expected loss severity. This result leads to implausibly large capital estimates. This finding is surprising, as EVT is a well-researched method designed to handle high-severity data resulting from catastrophic losses, such as extreme weather events. Moreover, many of the different techniques currently used for modeling operational risk exposure are centered on EVT methods.
- For capital estimates at the enterprise level, only the capital estimation technique based on non-parametric empirical sampling and the g-and-h four-parameter distribution yielded realistic and consistent capital estimates across all seven institutions. The range and standard deviation in these estimates across institutions are higher for the empirical sampling method, relative to the g-and-h distribution, and this empirical sampling method is prone to underestimating capital requirements if the actual data do not contain enough extreme events.
- In this study, the g-and-h distribution is the only method that results in a meaningful operational risk measure that fits the data, and in consistently reasonable capital estimates at the enterprise, business-line, and event-type levels. The standard errors for g-and-h distributions are very low. The g-and-h distribution best satisfies the five performance criteria, but it can be a challenging method to implement.
- The most important key finding is that operational losses can be modeled well in the loss distribution framework without trimming or truncating the data in an arbitrary or subjective manner. Using the g-and-h distribution, operational risk can be measured at a 99.9 percent confidence level at every unit level, and no severity or loss distributions resulted in an infinite mean.

Implications

The paper challenges some common practices by showing that many extensively used methods may not be suitable for measuring operational risk. The findings raise very important issues: are the various models financial institutions currently use to assess operational risk measuring it properly, even in the few situations in which they seem to yield reasonable exposure estimates, or do models generate some reasonable results simply by chance? If a financial institution uses one of these uneven methods to measure its current risk exposure, how reasonable might this result be over time? A distribution or method that is unable to model a variety of tail shapes is not expected to perform well in modeling operational loss data. Based on the results, the authors firmly believe that the problem of accurately measuring operational risk centers on measuring and modeling the distributional tail structure. In this study, the g-and-h distribution was the only one that worked, but the authors believe that other distributions may be found that accurately measure operational loss exposure. Exploratory data analysis and measurement using the g-and-h distribution can aid in this direction. It is a matter of finding new models that describe the characteristics of the data rather than limiting the data so that they match the characteristics of the model.

This study of performance measures does not gauge out-of-sample performance, as this goal was not part of the immediate purpose to find methods that work for the sample. Moreover, given the paucity of good historical loss data, ascertaining the out-of-sample performance will require several years of data that many financial institutions currently do not have. However, in pursuing this issue further, the authors' preliminary results indicate that the g-and-h distribution seems to work well.

The results showing that operational risk can be modeled accurately should encourage the development of new financial products that better mitigate and hedge against operational risk and hence foster the better management of national and international financial institutions.

w-06-14

In Noise We Trust? Optimal Monetary Policy with Random Targets

by Ethan Cohen-Cole and Bogdan Cosmaciuc

complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0614.pdf>
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Motivation for the Research

This paper addresses the intersection of two debates in monetary policy. The first is the degree to which central banks have the ability to influence the real economy in the short run. For illustrative purposes and acknowledging recent advances, the authors use an extreme assumption, complete rational expectations. Under such conditions, Taylor's well-known conclusion is that the monetary authority can impact the real economy only during a period when expectations are being formed at the outset of a new policy regime. At all other times, monetary policy has well-understood limited effects on the real economy.

The second line of debate concerns the appropriate monetary policy framework or mechanism to use in transition environments. Such transitions are important in both persistently high- and persistently low-inflation environments, for example, in Latin America in the 1980s, Japan in the late 1990s, and Zimbabwe today. Current conclusions are that an inflation-targeting regime can contribute to a relatively rapid decline in inflation under conditions of hyperinflation. The practice involves ever bolder declarations of inflation targets, and more-highly skilled central bankers to implement the plans.

In each of these cases, credibility plays a crucial role in determining the efficacy of the monetary policy regime—and arguably the appropriate method of monetary policy action. In high-inflation environments, the population will be unlikely to believe announcements of low-inflation policy. Even under the assumption of fully rational expectations, if the central bank's promise is not credible, it will take time until the population's expectations converge to the actual central bank target. Similarly, given the Japanese populace's expectations of the central bank's low-inflation prejudice, they are unlikely to believe the bank's commitment to raise inflation. In practice, this “transitional expectations” period is a common occurrence in countries undergoing regime changes and/or in countries with “sticky” expectations.

Research Approach

The authors discuss two approaches to managing inflation: a “classic” one, in which the government commits to a particular inflation target, and the authors' proposed approach in which the government pre-commits to a particular randomization of its inflation target. In each case, the target inflation rate is unknown to the public. The authors then develop and run a simulation model, comparing the simulated path of expected inflation over time in the scenario with randomization versus its path in a classic Taylor scenario.

Key Findings

- Randomization of monetary policy in transition cases provides a better response mechanism to the population's behavior than the classic approach, because it eliminates a portion of the information asymmetry problem. Through such a policy the monetary authority can “encourage” rapid convergence without requiring an increase in credibility or reputation.
- In transition situations in which the central bank and/or the government lack credibility with respect to a stated static inflation target, a government can achieve faster convergence of inflation expectations to an economy's optimal inflation rate through randomized inflation targeting than by pursuing a fixed inflation target.

Implications

Under rational expectations theory, central banks automatically achieve rapid convergence of public inflation beliefs to the actual rate of inflation. In many cases, this is not plausible monetary policy, given credibility constraints. If the public is ignorant of the parameters of the government's optimization problem, then the announcement of a new target will not automatically be credible. This may be particularly true in developing countries where, because of political instability, the central banks and/or the government may minimize a private loss function that does not reflect the societal optimization. In such cases, using a randomized inflation target may be a more effective way for the central bank to achieve its desired results.

w-06-15

Decomposing Consumer Wealth Effects: Evidence on the Role of Real Estate Assets Following the Wealth Cycle of 1990–2002

by Michael R. Donihue and Andriy Avramenko

complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0615.pdf>
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Motivation for the Research

What the authors term the 1990–2002 boom-bust wealth cycle represents the greatest accumulation and subsequent collapse of household net worth in the United States since the Great Depression. Yet unlike the case in the earlier episode, aggregate consumer spending was relatively unaffected by the decline in household wealth following the stock market's peak at the end of 2000:1, when real per capita household net worth was 58.5 percent higher than in 1990:3. Real per capita household wealth peaked in 2001:1, declined 18 percent in real terms by 2002:3, and yet by the end of 2005 had surpassed its 2001:1 peak, despite the fact that assets invested in the stock market regained only 68 percent of their 2000:1 value. During the 1990–2005 period household saving rates declined steadily and fell below zero in 2005:2.

While traditional life-cycle theory regarding consumption and savings behavior holds that wealth effects should be symmetric, this approach is not useful for explaining the asymmetries observed in the aftermath of the 1990–2002 wealth cycle. The economics literature has tended to concentrate on how wealth derived from equities—what has been termed the “stock market wealth effect”—influences consumer spending, but this approach does not explain the post-stock market bubble period during which savings declined and household consumption remained steady. Though the American stock market peaked in 2000:1 before posting a dramatic decline, inflation-adjusted per capita real estate wealth grew by 55 percent from 2000:1 through 2005:4, which led some economists to suggest that rising real estate prices sustained consumer spending during this period. Yet there has been

little published work on the asymmetries in consumer wealth effects following the stock market decline that began in 2000. This paper addresses the need for a better econometric understanding of this period and helps to refine our understanding of the life-cycle model of consumption.

Research Approach

The authors use a standard life-cycle model, which assumes that in the aggregate and in the long run households target spending behavior over their entire lifetimes. The model incorporates an error-correction framework, which recognizes that in the short run there will be periods during which households will deviate from their planned consumption levels in response to unanticipated changes in income and wealth. To measure wealth effects for the period between 1990:3 and 2005:4, the authors employ four definitions of wealth, using total real per capita household net worth and computing three decompositions of total real per capita household net wealth according to asset liquidity. The first decomposition separates assets held as stocks from other forms of wealth. The second decomposition divides liquid assets, a category that includes currency, mutual funds, and direct equity holdings, from illiquid assets, a category that includes consumer durables, real estate, and pension and trust funds. The third decomposition separates out real estate assets and divides stock market wealth into liquid components, a category that measures direct equity holdings, and illiquid components, a category that includes stocks held in pension funds and other illiquid categories. Using quarterly data from 1953:2 to 2005:2, the authors subject these four definitions of wealth to a dynamic estimation of the life-cycle model of consumption and, to estimate wealth effects, compute the marginal propensity to consume based on changes in each of these different asset categories.

Key Findings

- A co-integrating relationship among per capita consumption, labor income, and wealth does not appear to exist when total household net worth is used to measure wealth. But when decompositions of total household net worth are employed, one to four co-integrating relationships emerge, depending on the lag length and the chosen level of statistical significance. Accounting for the liquid and illiquid components of wealth establishes a more meaningful basis for understanding the short-term and long-run wealth effects on consumption.
- Over the entire period from 1953:2 to 2005:2, the authors find that both stock market assets and non-stock market wealth have a statistically significant effect on per capita consumption. For the first decomposition, a larger effect comes from changes in non-stock market wealth than from wealth derived from equities: the marginal propensity to consume is 7 cents per dollar for non-stock market wealth versus 5 cents per dollar for stock market assets.
- The result for the second decomposition is surprising: when wealth is divided between liquid and illiquid assets, the estimated marginal propensity to consume is 4 cents per dollar for liquid assets, and 5 cents per dollar for illiquid assets.
- Negative shocks to liquid stock market assets lead to short-run decreases in consumption growth, but positive changes to liquid stock market wealth have no statistically significant effect on consumption in the short run. Negative shocks to liquid stock market assets matter more than positive changes to all other components of per capita net worth.
- Real estate wealth is shown to have a positive effect on long-run consumption; at 6 cents per dollar, the marginal propensity to consume associated with real estate wealth is larger than the 4 cents per dollar associated with liquid stock market assets. Changes in liquid non-stock market assets such as currency and deposits are associated with a marginal propensity to consume of 14 cents per dollar. Illiquid non-stock market wealth (including consumer durables and other non-financial assets) is

estimated to have a 5-cents-per-dollar effect on the marginal propensity to consume. The category of illiquid stock market assets (such as corporate equities held in pension, retirement, and trust funds) is the only wealth component that does not have a statistically significant effect on consumption in the long run. The results from this third decomposition help to explain why per capita consumption continued to grow despite the dramatic drop in stock market wealth between 2000 and 2002. The rapid appreciation in real estate values appears to have fueled the continued increases in consumer spending that occurred after the stock market declined in value.

- The results show that short-run asymmetries in the error-correction behavior of households do exist, but that in the long run, wealth effects are symmetric, as predicted in traditional life-cycle theory. For each of the four life-cycle models in the short run, households adjust their consumption more quickly when actual spending exceeds the lifetime target, and are more cautious in adjusting their spending behavior when actual spending falls below the planned levels.

Implications

This paper furthers our understanding of which household wealth components drive consumer spending in the short run and in the long run; taken together, the results help to provide a more meaningful foundation for refining an understanding of the life-cycle consumption model and its use in macroeconomic forecasting. The value of non-stock market wealth increased throughout the 1990–2005 period, lending credence to the claim that the 1990–2002 wealth cycle was a stock market-induced phenomenon. The analysis offers specific econometric support for the short-run asymmetric effects that asset values have on consumer spending, particularly for the United States' economy after 2002. The results in this paper offer further support for the liquidity effects of declining stock market values on consumer spending, but also indicate that positive changes to liquid and illiquid stock market wealth do not have a statistically significant effect on consumption.

The rapid 55 percent increase in real per capita real estate wealth between 2000:1 and 2005:4 was largely due to lower mortgage interest rates. These historically low rates, coupled with innovative mortgage financing and extractions of real estate equity, may help to explain why consumer spending continued to increase during the post-bubble period. It is possible that just as the 1990–2002 wealth cycle was an equity-driven phenomenon, the 2000–2005 increase in real estate values that bolstered consumer spending in the short run will ultimately prove to be a unique episode that stands apart from the long-run historical trends in the real estate market.

w-06-16

How Small is Zero Price? The True Value of Free Products *by Kristina Shampan'er and Dan Ariely*

complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0616.pdf>
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Motivation for the Research

Since the late 1950s, psychologists have shown that people treat zero in qualitatively different ways from other numbers, and that a transition from small positive numbers to zero is often discontinuous. These differences have been documented in research on motivation, where it has been shown that in some contexts, getting no (zero) reward for an action, as opposed to receiving some small compensation, may actually increase the desirability of performing the task. In short, zero is often perceived differently in terms of the value it connotes and confers.

This paper uses insights from psychology to better explain the differences between how people react to positive prices and to zero prices (free products). By extending the psychological implications of zero to the realm of pricing, this paper explores how consumers perceive and respond to a “free” good, meaning one that has a “zero” price, and how their perceptions of a good that has an assigned value changes as its price is manipulated.

Research Approach

The authors propose the “zero-price model,” which holds that in the domain of prices, as in other areas, zero is regarded as qualitatively different from other amounts of value. In a standard model of consumer behavior, a choice between two goods involves a cost-benefit analysis that takes price into consideration when mentally calculating what might be considered the “net benefit” or “utility” each product would convey to the consumer. According to the standard cost-benefit model, reducing both prices by the same amount would not change the relative benefits each good confers; in other words, consumers will not change their preferences based on this change because the price difference between the two products remains the same and because the intrinsic valuation of the two goods does not change. Yet the authors hypothesize that if the price of one good is reduced to zero, effectively rendering it “free,” consumers will react to the free product beyond what the standard cost-benefit model predicts. In other words, zero will not be regarded as “just another price,” as consumers will assign an intrinsic element of value to the free product when its price is removed.

The “zero-price model” and the psychology behind it were tested by a variety of different experiments, one using gift certificates worth \$10 or \$20 and all the others using relatively low-cost chocolate candy. Three initial experiments were conducted to test demand conditions when the relative prices of two products change, and the cheaper good goes from a low-price cost condition to the free condition of zero price. Showing that reducing the cheaper good’s price to zero increases its demand and lowers demand for the more expensive good, the authors dub this special effect on consumers’ cost-benefit analysis the “zero-price effect.” To better explain the psychological underpinnings of this effect, the authors focus on two possible mechanisms, mapping difficulty and affect. “Mapping difficulty” describes the internal mental difficulty people have translating the expected hedonic benefit of consumption into monetary values, and posits that relying on external cues helps to resolve this confusion, as choosing a free good is certain to confer some net benefit. “Affect” is the idea that choices involving no cost evoke a more positive affective response than choices that entail both benefits and costs. Three additional experiments were conducted to see whether mapping difficulty or affect was more likely to drive the zero-price effect.

Key Findings

- The effect of a price reduction to zero is more powerful than a price reduction that still results in a positive monetary price. A 1-cent difference in prices has an enormous influence on demand if this change results in one good’s being priced at zero (a free good) than if the 1-cent reduction still results in positive prices for both goods. There is a significant difference between a low-cost versus a no-cost pricing condition, as consumers’ valuations of free goods go beyond their monetarily priced benefit-cost differences.
- The results show that the zero-price effect is not limited to exchanges involving monetary transactions. Options that do not require forgoing something else of value still increase the incentives to choose the product that is free.
- When subjects are asked to compare “apples to apples” (meaning that the cost and benefits are in the same form), the zero price effect persists. This suggests that the difficulty of mapping expected hedonic utility—translating monetary prices into non-monetary measures of utility—is not likely to provide a complete explanation of the psychology behind the zero-price effect.

- In the experiments, a free good evoked more positive affect than predicted by standard cost-benefit analysis, indicating that the affective mechanism is the main reason a zero price has a special psychological effect. The zero-price effect works by evoking a higher positive response to receiving something for free, and this positive affect is an input in the consumer's decision-making process.

Implications

This paper demonstrates that when treated as a price, zero is accorded a qualitative difference compared with other prices or values. This study suggests that the zero-price effect is best explained by the psychological affect a free good evokes, but more work needs to be done in a greater variety of contexts in order to explore this rich and complex issue. The experiments in this study were conducted with relatively low-cost products and predicated on largely unimportant decisions, such as choosing between two types of chocolate candy or between a \$10 or \$20 certificate for free books. It remains to be seen whether the zero-price effect might become a “small-price effect” when the stakes involve greater sums of money and more important choices. Conceivably, products such as cars could be assigned prices such that a sufficiently low price—such as a \$28,000 luxury car reduced to an \$8,000 price—would operate as effectively as the zero price did in these experiments. The magnitude of the original prices and the circumstances of the decision will likely play a role in determining how prices work as a signaling device across a variety of goods with varying costs.

w-06-17

International Risk-Taking, Volatility, and Consumption Growth

by *Maria Giduskova and Borja Larrain*

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Motivation for the Research

A nation's ability to consume, and to increase its consumption over time, is a widespread measure of its welfare and long-run economic performance. In an integrated world economy, consumption growth in a particular country is dependent upon its exposure to international risk. International risk-taking is defined as the covariance of national consumption growth with world consumption growth scaled by the variance of world consumption growth (a measure called *beta* in financial economics). While there is widespread empirical evidence that perfect international risk-sharing does not exist, there is a distinct lack of empirical work exploring the explicit risk-growth tradeoff. This paper develops a specific analytical framework to test directly how international risk-taking influences a country's present and future consumption growth. Because of the current limited coverage of existing risks, factors that cannot be insured in financial markets also influence a country's consumption growth. “Idiosyncratic consumption volatility” provides information about the sensitivity of national consumption to these additional factors, and is also considered in the analysis.

Research Approach

The authors set up a theoretical model that correlates a country's future consumption growth with a measure of international risk-taking. This framework assumes that taking on a higher degree of risk, such as investing in emerging technologies, will stimulate consumption growth. The theoretical model is inconclusive about the direction of the relationship between consumption growth and idiosyncratic volatility, so to answer this question the model is tested empirically. Using purchasing power parity-adjusted data from the Penn World Table 6.1, a sample of consumption growth rates between 1960 and 2000 is constructed for 74 countries. International risk-taking is estimated as the *beta* coefficient in the 10-year backward-looking regression of a country's consumption growth on world consumption growth. Idiosyncratic consumption volatility is measured by the residual in

that regression. The relationship between 1-, 3-, 5-, and 10-year forward-looking consumption growth rates, *beta*, and idiosyncratic consumption volatility is tested in a panel regression. For illustration purposes, the authors also implement the portfolio analysis used in financial economics. Specifically, countries are first sorted into groups based on their *beta* and idiosyncratic volatility ranking, and then average forward-looking consumption growth rates are compared across the groups.

Key Findings

- Countries that take on more international risk experience higher expected consumption growth. A one-standard-deviation increase in international risk increases average consumption growth by 40 basis points over the following 5 years.
- Countries with a higher exposure to international risk are rewarded with higher consumption growth even after controlling for income.
- Idiosyncratic consumption volatility is detrimental to future consumption growth. A one-standard-deviation increase in volatility decreases average consumption growth by 40–50 basis points over a 5-year horizon.
- International risk-taking and idiosyncratic consumption volatility are not highly correlated.
- International risk-taking is not a privilege confined to rich countries, but most rich countries have low idiosyncratic consumption volatility and most poor countries have high idiosyncratic consumption volatility.
- Countries with high *betas* (international risk exposure) tend to hold larger stocks of foreign assets, while countries with high idiosyncratic consumption volatility tend to hold smaller stocks of foreign assets. A one-standard-deviation increase in *beta* is associated with a 3.3-percentage-point increase in the ratio of foreign stocks to GDP. A one-standard-deviation increase in idiosyncratic consumption volatility is associated with an 8.7-percentage-point decrease in the ratio of foreign stocks to GDP.
- International risk taking (*beta*) and idiosyncratic volatility are powerful predictors of per capita consumption growth in the sample of 74 countries spanning 50 years, particularly at medium-run horizons between 3 and 10 years. These risk measures have forecasting power above and beyond traditional growth determinants such as the ratio of investment to GDP or measures of human capital. *Beta* has the advantage of not being highly correlated with income, but volatility clearly decreases with higher income.

Implications

By establishing empirical evidence that a country's ability to bear international risk has implications for its near-term and long-term consumption growth, this paper's findings highlight the potential welfare gains that would come from better global financial integration and financial innovation. There is a clear need for a world market for bearing international risk, as first recommended by Athanasoulis and Shiller (2000). The results show that idiosyncratic volatility has persistent negative consequences for consumption growth. Highly volatile countries often are highly indebted, and they may encounter solvency constraints that limit their ability to invest in foreign assets, which in turn limits their future consumption growth. For these reasons, establishing an insurance market to alleviate the shocks that contribute to idiosyncratic volatility would have positive long-lasting effects.

Do Subsidies Increase Charitable Giving in the Long Run? Matching Donations in a Field Experiment

by *Stephan Meier*

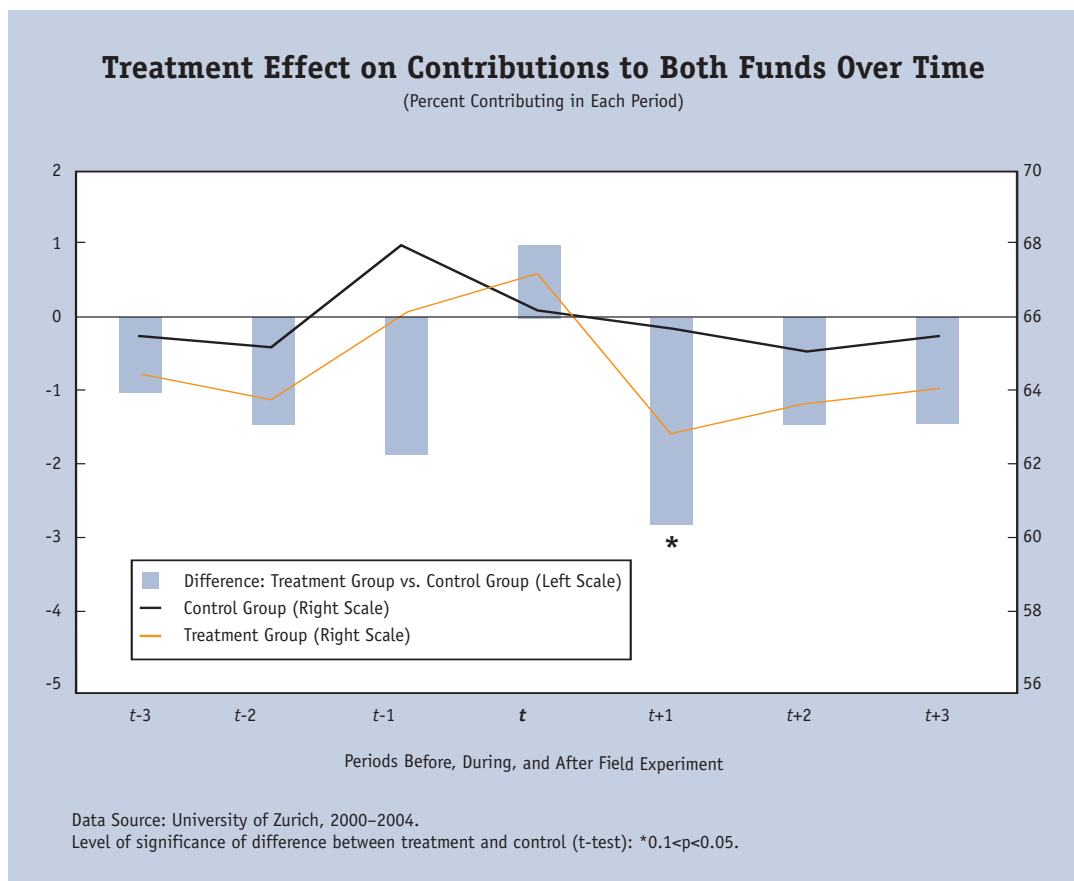
complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0618.pdf>
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Motivation for the Research

Using a matching incentive to promote charitable donations is very popular among private and public organizations. Many firms in the United States and Europe offer some type of match to subsidize their employees' charitable contributions. Governments sometimes offer incentives to encourage donations for a specific cause, such as aiding victims of large natural disasters like Hurricane Katrina. The common idea behind these incentive plans is to reduce the price of giving and thereby encourage more donations that serve the public good. But often the match is only temporary, and it is unclear what the short-term and long-term consequences are when the match subsidy is removed. Does subsidizing charitable giving ultimately increase, decrease, or have no lasting effect on pro-social behavior? There has been little formal research on matched charitable giving, and most of what has been done has been conducted within a laboratory setting. This paper offers some of the first evidence drawn from a real-world situation of how a matching mechanism actually affects short-run and long-run donation decisions.

Research Approach

To isolate the single effect a matching mechanism has in the short run and in the long run, this field



experiment took advantage of a recurring decision-making situation at the University of Zurich. Each semester when returning students pay their tuition fees, they are asked whether they want to voluntarily contribute a specific monetary sum to two social funds. One fund offers low-interest loans to students having financial difficulties and asks for a donation that is equivalent to US\$4.20 (CHF 5.0). The other fund supports foreign students studying at the university, and asks for US\$3.00 (CHF 5.0). Students must make an explicit choice by marking a form that indicates their consent. They have the option of making no donation, donating to one fund, or contributing to both funds. The donations of 532 randomly selected students comprising two treatment groups were matched if they contributed to both funds—at a rate of either 25 percent or 50 percent. The resulting behavior was compared with a control group of 10,847 students whose donations were not matched.

In laboratory-based experiments it is very difficult to measure the long-term effects a matching mechanism has on subsequent decision-making, which is the reason why previous research has neglected this important consideration. The field experiment overcomes this impediment by assembling a panel data set recording all the students' contribution decisions for seven semesters, between summer 2001 and summer 2004. These panel data permit an analysis of students' established behavior before the match was offered, the immediate effect the match had in the semester it was offered, and the long-run effect three decision periods after the match was no longer available and the relative price of donating had returned to its original level.

Key Findings

- Offering a matching incentive immediately increases the contributions to a charity serving the public good. The matching mechanism increased contributions to both funds during the period it was offered to the treatment groups.
- In the field experiment, people's willingness to contribute to the two funds was reduced in the first period when the matching incentive was removed. Moreover, the overall effect on the contribution rate was negative in this immediate time period. This finding is significant because people in the treatment groups averaged 10.8 prior donation decisions before the period when the match was offered, and had a high average contribution rate. After the experimental match was removed, the proportion of people in the treatment groups who elected to make no donations increased. The disincentive caused by removing the match proved to have a very strong influence on behavior 6 and 12 months afterwards.
- The strong behavioral reaction, positive and negative, towards the matching donation mechanism suggests that there is more than just an ordinary price effect at work. The pro-social behavior that the match hoped to foster was reversed after the incentive was removed, and this reversal affected behavior in subsequent periods.
- In the very long run, three decision periods following the match, contribution patterns returned to the levels observed before the experiment. However, decision periods were spaced about six months apart, meaning that the negative effect of removing the subsidy had immediate and lasting consequences.

Implications

This paper shows that a matching incentive designed to increase charitable giving can actually backfire. The results of this study add to the growing literature on the potentially negative effects of incentives.

Further research is needed to determine what ultimately motivates people to behave pro-socially and how incentives might be better designed to avoid negative long-run effects that have unintended consequences.

Measuring Disparities in Non-School Costs and Revenue Capacity among Massachusetts Cities and Towns

by Katharine Bradbury and Bo Zhao

complete text: <http://www.bos.frb.org/economic/wp/wp2006/wp0619.pdf>

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Motivation for the Research

This paper develops new measures of locally uncontrollable costs (that is, the costs of providing local services that are outside the control of municipal governments) and local revenue capacity (that is, the ability of local governments to raise revenue) that are intended to form the basis of a new general-purpose (non-school) aid formula for Massachusetts cities and towns.

Massachusetts cities and towns vary widely in the degree of mismatch between their locally uncontrollable costs and revenue capacity. To reduce inter-local fiscal disparities that are mostly beyond the control of municipal governments, Massachusetts state government has a history of providing cities and towns with general-purpose aid, in addition to earmarked school aid.

Massachusetts cities and towns are now seeking additional non-school aid from the state government. Partly because increases in state aid were concentrated on public schools during the 1990s, and partly because state budget cuts during recent economic downturns have reduced non-school aid and generally made it unpredictable, cities and towns are under considerable fiscal strain.

Because existing formulas do not respond appropriately to communities' current needs, a new aid formula is needed to distribute any potential increase in non-school aid.

Research Approach

On the cost side, unlike previous studies, the authors' research focuses on local non-school spending, quantifying the effects of uncontrollable cost-related characteristics while controlling for the impacts of school responsibilities, available resources, and preferences. On the revenue capacity side, the authors' research focuses on accounting for the constraints of a tax limitation, for the first time in the literature. The authors use data on recent taxing patterns to develop an exogenous measure of the effective constraints of Proposition 2 1/2 (the local property tax limitation in Massachusetts), which they model as a function of residents' incomes, and they use that measure to adjust the size of the local property tax base in measuring revenue capacity. In addition, the authors' measure of revenue capacity takes account of the ability to raise revenue from other (non-property-tax) local sources and subtracts the revenue capacity not available for general municipal (non-school) purposes. They calculate the "gap" for each community by subtracting its local revenue capacity from its locally uncontrollable costs.

Key Findings

- Communities with greater population density, commuters, population size, unemployment, and poverty have to spend more per capita to provide municipal services; that is, they have higher uncontrollable costs.
- Local governments in higher-income communities have greater ability to tap into their residential property tax base and thus are less constrained by the local property tax limitation.
- Based on the new measures of costs and revenue capacity, it appears that substantial inter-local fiscal disparities exist among Massachusetts cities and towns. The per capita gap for a

Massachusetts city or town with average characteristics was \$192 in 2000. The gap distribution ranges from large negative gaps in many resort towns with very large property tax bases to substantial positive gaps in larger cities with high costs and low capacity for raising local revenue.

Implications

The authors suggest that a new municipal aid formula that distributes per capita aid in proportion to measured gaps across communities would help to alleviate inter-local fiscal disparities in Massachusetts. Such a gap-based approach would provide more aid to cities and towns with higher uncontrollable costs and lower ability to raise revenue locally, other things being equal.

The measurement approach developed in this paper is designed for Massachusetts, but it is potentially applicable to other states facing similar challenges. If one were cognizant of institutional idiosyncrasies, it would be fairly easy to replicate the method using other states' data. The authors' approach may be particularly useful for the 42 other states with local tax limitations, none of which have incorporated the constraints of these tax limitations in their general-purpose aid formulas.

Public Policy Briefs

b-06-1

Using State and Metropolitan Area House Price Cycles to Interpret the U.S. Housing Market

by Yolanda K. Kodrzycki and Nelson Gerew

complete text: <http://www.bos.frb.org/economic/ppb/2006/ppb061.pdf>
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Motivation for the Research

Residential housing markets have sustained the American economy since the mid-1990s, even during the 2001 recession. Over the last decade, rising real estate prices have contributed to increasing household wealth, providing a positive impetus to consumer spending. The increase in prices was particularly pronounced between 2002:2 and 2005:4. During this period, existing home prices in the United States rose 37 percent in nominal terms, which represents an annual rate of increase that is 1.9 times the long-term historical average. In real (inflation-adjusted) terms, this episode just achieves the FDIC's technical definition of a boom: real house price appreciation of 30 percent or more over a three-year period. In 2006, the slowing housing market prompted debate over what seems to be an impending price correction, its potential magnitude, and how this correction might affect the larger economy. Yet because the United States has not experienced a true national housing market bust for many years, we lack relevant historical precedents for predicting future price movements stemming from the current, and unusual, housing cycle.

This brief, based on material presented to the President and Board of Directors of the Federal Reserve Bank of Boston between January and May 2006, was updated selectively to reflect new data available as of October 2006. The newer data did not substantially alter the study's results and conclusions, which are based on decompositions of the United States aggregate residential housing market over a 30-year period.

Research Approach

This brief uses the widely cited house price indexes published by the Office of Federal Housing Enterprise Oversight (OFHEO), which tracks mortgage data for single-unit properties supplied by the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage

Corporation (Freddie Mac). Starting in 1975, the OFHEO data track all 50 states, the District of Columbia, and 379 metropolitan areas. As the OFHEO indexes measure the average price changes, based on sales or refinancing transactions, of the same properties at different points in time, the OFHEO gauge of price changes is less sensitive to the unique mix of properties sold at any given date than are alternative measures issued by realtor associations. The nationwide OFHEO index records only three episodes of declining real house values—1975, 1979–1982, and 1989–1994—and no instances of decreasing nominal prices. By concentrating on the greater variability at the state and metropolitan level, this study seeks to elicit a better understanding of the timing and causes of house price swings not evident in the smooth national data. The premise behind this approach is that state and local house price patterns can be aggregated as indicators (albeit imperfect ones) of national price movements. In this study, a house price decline is defined as a situation in which nominal housing prices decrease by more than 5 percent from their peak over multiple quarters. The study also references the concept of a housing bust, which the FDIC defines as a five-year period in which nominal housing prices fall at least 15 percent below their peak level.

The first part of the brief analyzes the timing and apparent causes of state-wide house price declines. Then, using insights gained from their analysis of state-wide house price movements, the authors estimate an empirical model of house price declines by metropolitan area. Recently, two very different methods with conflicting results have been used to gauge the degree to which metropolitan-area OFHEO house price indexes deviate from justifiable values, and both are used in the regression analysis employed by the authors. One, by National City/Global Insight, tracks the historical relationship between house-price-to-income ratios and mortgage interest rates; it finds that housing was overvalued by at least 13 percent in 135 out of 299 metropolitan areas in 2005:4. The other method, by Himmelberg-Mayer-Sinai, calculates the annual cost of homeownership and gauges the extent to which housing prices are higher or lower than their equilibrium values, given market interest rates and other economic fundamentals. Their study of 47 large metropolitan areas employing this approach found that in late 2005, housing prices in most of these urban areas were not out of line with equilibrium values.

Key Findings

- Between 1979 and 1995, there were 41 state-level house price booms, when gauged as nominal price increases over a three-year period equal to at least twice the series average. In these episodes, the median rise in nominal prices was 29 percent over a three-year period and 62 percent over a five-year period. About half these run-ups ended in flattening house prices. The other half of the price run-ups ended in substantial price reductions, with a median decrease of almost 14 percent. Per the FDIC's definition of a boom, there were only eight state-wide house price booms between 1979 and 1995, all taking place during a concentrated period from the late 1980s through 1990.
- Since 1979, there have been 21 state-wide house price declines. In most cases when prices fell noticeably, the decrease was 10 percent or more. Eight episodes achieve the FDIC's definition of a bust. Most of the state-wide declines took place over two periods and were related to factors that caused the economies of particular states to weaken. The first sharp price decreases took place in or near the oil-producing states and were linked to the almost 50 percent drop in oil prices between 1980 and 1986. The second wave of state-level declines took place in California and the northeastern states during the late 1980s and the early 1990s. These downturns were associated with downsizing in the defense sector and collapsing commercial real estate markets, plus the impact of the 1990–1991 recession.
- The data show that existing home sales almost always begin to fall while housing prices are still rising. In all eight FDIC-defined housing booms, bar California in 1990, sales volumes turned down six to 13 quarters before house prices started to fall. Looking at all house price booms under

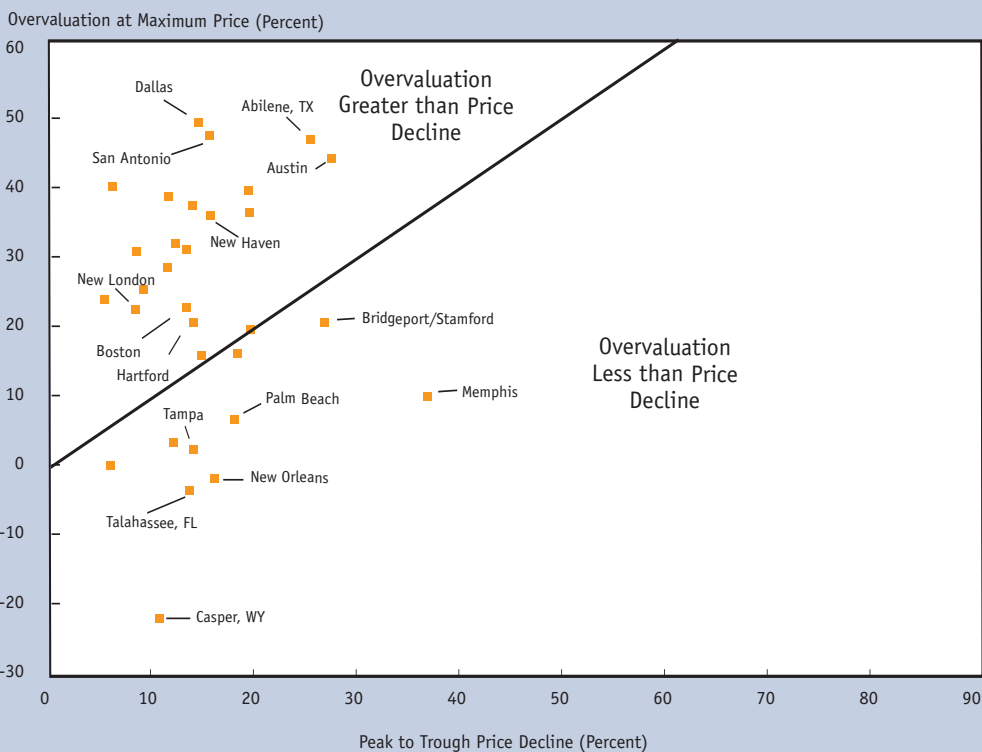
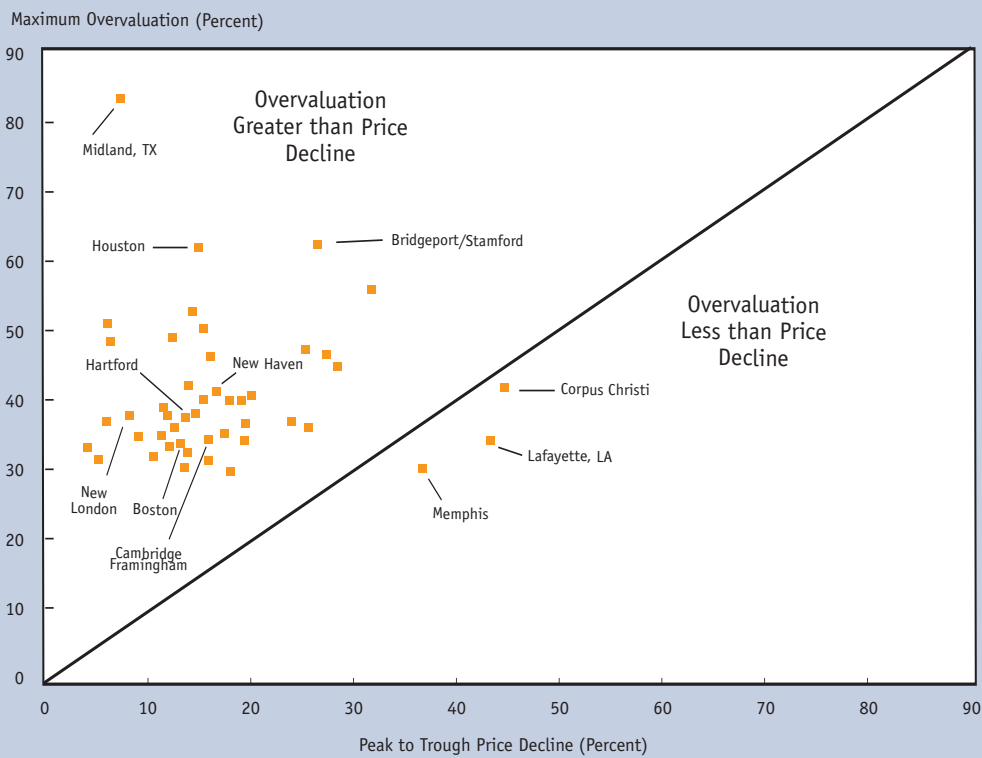
the nominal-increase definition, the median lag between the sales volume peak and the peak in housing prices was 12 quarters.

- For state housing cycles, the historical data show that construction volumes and mortgage delinquencies also provide advance signals that a house price boom is approaching its end. In the median case, housing starts have peaked eight quarters, and 90-day mortgage delinquencies have peaked nine quarters, prior to the house price peak.
- This evidence on the relationship between home prices and other housing market indicators suggests that, on a nationwide basis, the OFHEO measures of home prices may continue rising through the end of 2006, and even through the first half of 2007.
- The history of state-wide housing cycles indicates that the magnitude of a house price boom is not a very reliable indicator of whether prices will fall when the boom is over. In the absence of a state-wide economic downturn, house prices are more likely to flatten than to fall after a boom ends. When states experience a recession, it is usually triggered by factors other than falling home prices and it is likely that the state's economy has turned down before housing prices have peaked. In sum, a sharp appreciation in state-wide home prices may sometimes be followed by a large price decrease, and these substantial price drops are more likely to occur when additional economic factors depress the demand for housing.
- In examining metropolitan area prices, the authors show that price declines following periods of severe overvaluation of house prices tend to be smaller than the initial overvaluation.
- The regressions for the metropolitan-level data on house prices show that improving market fundamentals lower the probability of a decline in housing prices, while greater overvaluation relative to equilibrium or expected values leads to a higher probability that housing prices will decline within 2–3 years.
- However, given the erratic behavior of house prices at the metropolitan level, neither the model specification using inputs from National City/Global Insight nor the one that using inputs from Himmelberg–Mayer–Sinai provides a powerful degree of explanatory precision for specific metropolitan area housing markets and specific historical periods.
- The regression model has only mixed success in explaining how many metropolitan markets experienced house price declines in any given year. With the National City/Global Insight data, the model provides reasonably accurate estimates for 1990–93, 1995, 1997–98, and 2000–04. With the Himmelberg–Mayer–Sinai data, the model was too pessimistic in 1983 and 1987, but very accurate in recent years.
- Plotting the historical data for the United States as a whole against metropolitan area housing prices shows that the rate of house price appreciation in the United States tends to be lower in years when many urban areas experience price decreases.
- Assuming continuing increases in personal income, no more than a 50-basis point increase in 2007 mortgage rates, and flat apartment rents, an extrapolation of the model suggests that national housing price increases are likely to range from 1 to 3 percent between 2005:4 and 2006:4, and from 2 to 5 percent between 2006:4 and 2007:4.

Implications

On the whole, the results add support for the view that average U.S. home prices are likely to be fairly flat in 2006 and 2007, and that any national peak in housing prices is unlikely to occur until well into

Housing Overvaluation versus House Price Correction



2007. Because house prices are subject to inexplicable movements, this conclusion should be viewed as a plausible extrapolation using historical evidence rather than as a forecast. An additional caveat is that mortgage markets and other institutional factors may have changed sufficiently so as to alter the relationship between house prices and the economy compared with what existed in past cycles.

b-06-2

Measurement of Unemployment

Katharine Bradbury

complete text: <http://www.bos.frb.org/economic/ppb/2006/ppb062.pdf>

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Motivation for the Research

Measures of unemployment attempt to count individuals who do not have a job but are looking for one. For measurement purposes, the critical question is what constitutes “looking.” This article explores the issue and its implications for policymakers.

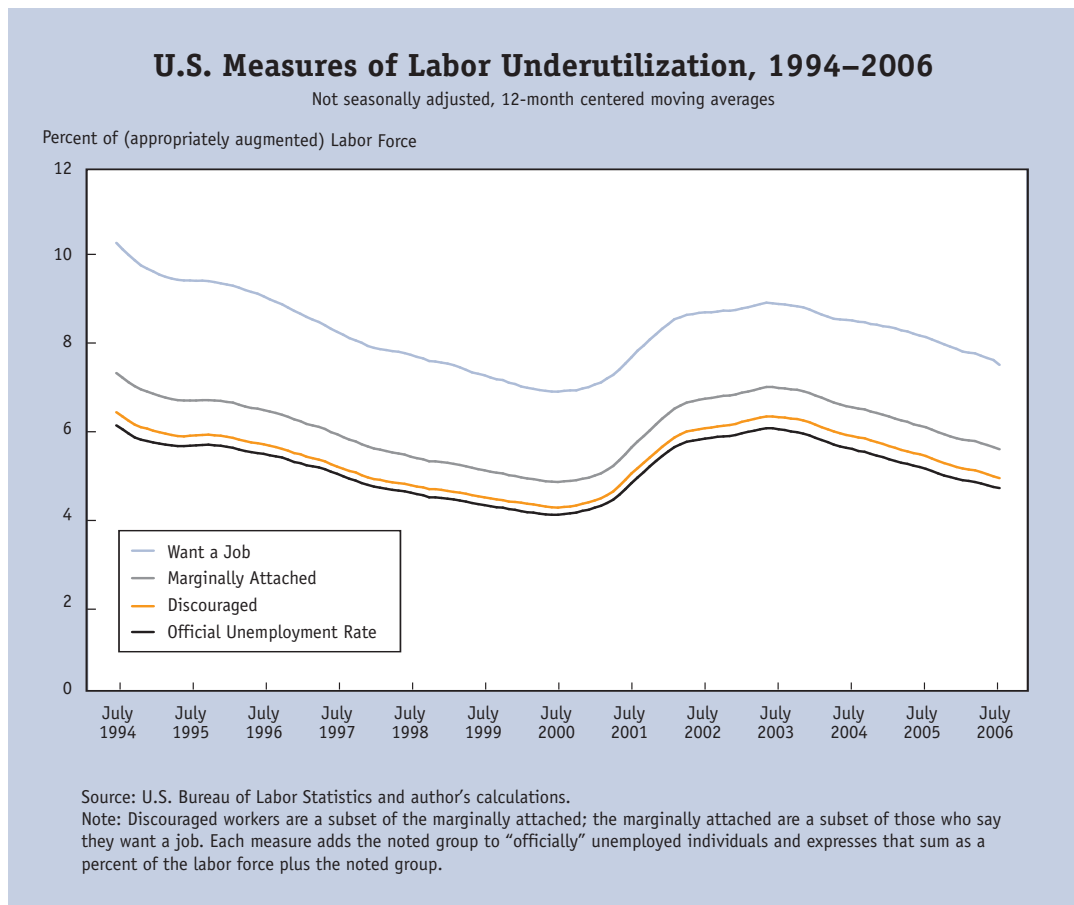
Research Approach

The article summarizes how unemployment is measured by official entities in the United States and Europe, and describes recent research investigating the permeability of the dividing line between the unemployed and “marginally attached” subgroups of those out of the labor market.

Key Points

- While the concept of unemployment is reasonably straightforward, various measurement approaches are used to distinguish those without jobs who are seeking work from those who are not, generally based on the specific methods used for search, the intensity of search, and how long it has been since they actively sought employment.
- By asking individuals who are not employed, and not considered to be unemployed, about their interest in and availability for work, the U.S. Bureau of Labor Statistics (BLS) seeks to determine the degree to which these individuals may be marginally attached to the labor force. Based on the responses, the BLS defines a set of alternative measures of labor underutilization that either subtract from or add to the official unemployment rate.
- Categories that add to the official unemployment rate in the United States include discouraged workers (those who give a job-market-related reason for not currently seeking employment), an additional group of marginally attached individuals who have sought a job sometime in the preceding 12 months and indicate that they want and are available to work, and another set of individuals who have not sought work in the preceding 12 months but who also answer “yes” when asked, “Do you currently want a job?”
- Adding those individuals who are in the discouraged worker category to the ranks of the officially unemployed increases the official U.S. unemployment rate over the period from 1994 to 2006 by a few tenths of a percentage point. Adding the marginally attached adds a percentage point, and adding those who “want a job” adds several percentage points.
- In most of the industrialized world, the concept of unemployment is the same as in the United States, and the definition for measurement purposes is quite similar. One difference between definitions of unemployment in the United States and the European Union is that the EU includes as unemployed those who only study job advertisements, while the United States does not consider reading ads to be active job search.

- Researchers examining European data have found that the rates of transition into employment of most of the marginally attached categories lie between those of the unemployed and those of people who are not in the labor force and not marginally attached.
- To address the challenge of measuring the degree of tightness in the labor market as accurately as possible, researchers have developed and investigated a variety of alternative indicators of labor market slack. One set of alternative measures concentrates on the distinction between employment and nonemployment, thereby avoiding the difficulty of drawing a line between the unemployed and the inactive working-age population. Other researchers consider the labor force participation rate as an indicator of interest, along with the unemployment rate. Complementary approaches consider a variety of direct measures of labor market tightness, either individually or in combination.



Implications

The arbitrariness of where the dividing line is drawn between unemployment and the state of being out of the labor force, together with the heterogeneity of subgroups within the “inactive” working-age population, implies that the relationship between the measured unemployment rate and “true” economic slack, and hence inflation, may vary, depending on the specific definitions used in measuring unemployment, potential labor market entrants, the age and gender composition of the population, and labor market institutions. This suggests that policymakers might gain useful information by looking at a range of measures—along with the official unemployment rate—in judging the state of the labor market.

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