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# Frontiers in Monetary Theory and Policy:
## Summary of the 2008 International Conference Organized by the Institute for Monetary and Economic Studies of the Bank of Japan

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# Frontiers in Monetary Theory and Policy: Summary of the 2008 International Conference Organized by the Institute for Monetary and Economic Studies of the Bank of Japan

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As the organizers of the conference, we would like to express our sincere appreciation to our honorary advisers, Bennet T. McCallum and Maurice Obstfeld, and all other participants at the conference for their fruitful presentations and discussions. Our special thanks go to Junko Miyoshi and other staff members of the Institute for Monetary and Economic Studies, who devotedly helped to organize the conference. The views expressed in this paper do not necessarily reflect the views of the Bank of Japan.

The Institute for Monetary and Economic Studies (IMES) of the Bank of Japan (BOJ) held the 2008 International Conference entitled "Frontiers in Monetary Theory and Policy" on May 28 and 29, 2008, at the Bank of Japan Head Office in Tokyo.[1] The conference was aimed at understanding the frontiers in monetary theory and policy. About 100 distinguished guests from academia, international organizations, and central banks participated in the conference.[2]

The conference began with opening remarks by the Governor of the BOJ, **Masaaki Shirakawa**, followed by introductory remarks by the honorary adviser of IMES, **Bennett T. McCallum** (Carnegie Mellon University). Six sessions and the Mayekawa Lecture followed. **John B. Taylor** (Stanford University) gave the first Mayekawa Lecture. Papers were presented by **Michael Woodford** (Columbia University), **Keisuke Otsu** (Sophia University, formerly BOJ-IMES), **Mark Gertler** (New York University), **George Evans** (University of Oregon), **Lawrence Christiano** (Northwestern University), and **Christopher Sims** (Princeton University). The discussants were **Miles Kimball** (University of Michigan), **Selahattin Imrohoroglu** (University of Southern California), **Michael Krause** (Deutsche Bundesbank), **James Bullard** (Federal Reserve Bank of St. Louis), **Andrew Levin** (Board of Governors of the Federal Reserve System), and **Frank Smets** (European Central Bank). The conference ended with the concluding remarks by the honorary adviser of IMES, **Maurice Obstfeld** (University of California, Berkeley) after the panel discussion on "Frontiers in Monetary Theory and Policy" chaired by the Deputy Governor of the BOJ, **Kiyohiko Nishumura**, with short presentations on the research frontiers by **Woodford**, **Taylor**, **Gertler**, **G. Evans**, **Christiano**, **Sims**, **Obstfeld**, and **McCallum**.

In the opening remarks,[3] **Shirakawa** first stressed that monetary policy and financial system policy were related in a complex and delicate manner and the distinction between these two policies was often not very clear. Then he raised three challenges for monetary policy: (1) how to define and understand price stability; (2) how to design financial system policy; and (3) how to maintain the stable financial system and well-functioning financial markets for effective monetary policy, namely, how to conduct the banking policy of central banks. Finally, he emphasized the importance of the learning nexus between central banks and academia, such that central banks conveyed to academia whatever puzzles were found in practice and the theories developed in academic circles were fed back to central bank circles as valuable input for

[1] See Appendix 1 for the program.
[2] See Appendix 2 for a list of the participants. Their affiliation is as of the time the conference was held.
[3] For details, see Shirakawa (2008).

the proper conduct of monetary policy.

In the introductory remarks,[4] **McCallum** first summarized the achievements in monetary economics such as developments in structural models that are respectful of both theory and evidence with a policy instrument that agreed with practice, namely successful inflation targeting in practice. Then he pointed out subjects of ongoing disputes such as the empirical performance of key relationships in models; communication and commitment mechanisms; and the relationship of monetary policy to credit, fiscal, and foreign exchange policies, among others. He concluded his remarks by introducing the presenters and their achievements with a brief summary of the presented papers.

In the concluding remarks,[5] **Obstfeld** first summarized the presentations and discussions at the conference. Then he discussed global imbalances as a theme related to the conference presentations. He related global imbalances to Sims' presentation on the fiscal theory of the price level and to Taylor's presentation on global inflation under a pegged exchange rate scheme. He showed that the large current-account deficit of the United States predicted depreciation since its reduction to a more sustainable level will require a reduction in United States demand and an increase in foreign demand.[6] Finally, he concluded that there was clearly a monetary cooperation payoff to eliminating these global imbalances.

The following sections summarize the Mayekawa Lecture, the six presentations and subsequent discussions, and the panel discussions on "Frontiers in Monetary Theory and Policy."

## The Mayekawa Lecture: The Way Back to Stability and Growth in the Global Economy[7]

**Taylor** presented the inaugural Mayekawa Lecture, entitled "The Way Back to Stability and Growth in the Global Economy." The lecture was named after Haruo Mayekawa, who served as the 24th Governor of the BOJ from 1979 to 1984. Taylor reviewed Mayekawa's achievements during the difficult environment in the late 1970s and early 1980s. While noting the very important difference in economic vantage points between the late 1970s/early 1980s and 2008, he stressed the importance of a comprehensive "Mayekawan" approach to research and policy when considering the numerous economic difficulties of today. The difficulties were (1) high and rising global inflation;

[4] For details, see McCallum (2008).
[5] For details, see Obstfeld (2008).
[6] For details, see Obstfeld and Rogoff (2007).
[7] For a brief summary of the career of Haruo Mayekawa, see Appendix 3. For details on the Mayekawa Lecture, see Taylor (2008).

(2) financial instability and risks; (3) high and rising prices of energy, food, and many other commodities; (4) continuing high current account imbalances; (5) globally inconsistent exchange rate policies; and (6) rising protectionism and isolationist sentiment. He pointed out that as Mayekawa stressed many years ago, it was a challenge for policymakers to adopt a more comprehensive international policy focus that recognized the important interaction of these economic problems simultaneously, instead of approaching them separately. He concluded with the remark that policymakers might begin with discussions about some kind of "global inflation target," and expected that if we extrapolated from the recommendations of Mayekawa in the 1980s, we could hope for a way back to stability and growth in the global economy.

## Credit Frictions and Optimal Monetary Policy[8]

**Woodford** presented his work with Vasco Cúrdia extending the basic (representative-household) New Keynesian model to allow for a spread between the interest rates available to savers and borrowers, which was allowed to vary for either exogenous or endogenous reasons. They found that the mere existence of a positive average spread made little quantitative difference for the predicted effects of particular policies. They then reported that variation in spreads over time had more important consequences both for the equilibrium relation between the policy rate and aggregate expenditure, and for the relation between real activity and inflation. Nevertheless, they found that the target criterion which characterized optimal policy in the basic New Keynesian model continued to provide a good approximation to optimal policy, even in the presence of variations in credit spreads. They also considered a "spread-adjusted Taylor rule," in which the intercept of the Taylor rule was adjusted in proportion to changes in credit spreads. They showed that while such an adjustment could improve upon an unadjusted Taylor rule, the optimal degree of adjustment was less than 100 percent; and even with the correct size of adjustment, such a rule of thumb remained inferior to the targeting rule.

In his comments on the paper, **Kimball** recommended that the study provide more intuition at a deep level on the financial shocks. He then raised some broader issues concerning the New Keynesian framework, focusing especially on the importance of investment and other durables in business cycles. He conjectured that if the investment and durables were introduced, the elasticity of intertemporal substitution for borrowers would be much higher than for savers, and in that case, adjusting the policy rate one for one with the credit spread would be more desirable. He claimed that

[8] For details, see Cúrdia and Woodford (2008).

a workhorse model should include investment and durables by incorporating a reasonable size of the investment adjustment cost. He also questioned the parameterization of high price elasticity of demand for each variety of good, which yielded a very strong weight on inflation in quadratic objective functions.

From the floor, some participants asked whether there was any micro evidence of the particular types of credit frictions and whether such frictions were relevant in the recent environment in the financial markets. **Woodford** responded that the paper took the evolution of financial frictions as given, and that the analysis in the paper was not attempting to address the question of what the Federal Reserve Board should have done with regard to liquidity-provision facilities, as distinguished from its interest-rate policy decisions. **Woodford** admitted the simplification of the study and stated that if the evolution of financial frictions depended on monetary policy, monetary policy and banking policy could not be separated. There was another question as to how the inclusion of bankruptcy would change the implications of the study. **Woodford** conjectured that the results would not change much, because the study had already introduced bank capital as a factor of production in an implicit manner. One participant asked how the inclusion of the credit spread mattered for monetary policy in the presence of the zero interest rate lower bound. **Woodford** responded that the zero lower bound would be an even more relevant problem in the presence of credit frictions, because these frictions required the policy rate to be lower than the natural level for the average interest rate.

## The Global Impact of Chinese Growth[9]

**Ippei Fujiwara** (BOJ-IMES), **Otsu**, and **Masashi Saito** (BOJ) discussed the effects of the opening up of China and its rapid growth on the welfare of both China and the rest of the world. They first pointed out three characteristics of Chinese growth: (1) Chinese openness (trade volume/GDP) increased suddenly from 10 percent to 40 percent soon after the policy of reform and opening was introduced in 1978; (2) the Chinese per capita GDP growth rate jumped from 2.5 percent to 8 percent in 1978; and (3) trade was roughly balanced, especially prior to 1978. They then asked how these affected the G-7 countries. For this purpose, a standard two-country model following Backus, Kehoe, and Kydland (1994) was calibrated for China and the G-7 aggregate. The model was to reproduce the above three facts with three implied shocks (wedges), home bias in the final goods production in China, productivity in the intermediate goods production in China, and import tariffs. Then such a model was simulated to investigate the effects of

[9] For details, see Fujiwara, Otsu, and Saito (2008).

each shock on the welfare of the G-7 countries. The authors concluded that with the balanced trade constraint, opening up per se was welfare improving for China but had little impact on the welfare of the rest of the world, but productivity growth in China was welfare improving for both China and the G-7 countries. Furthermore, it was shown that removing the balanced trade constraint would have improved Chinese welfare and deteriorated the welfare of the rest of the world.

In his comments on the paper, **Imrohoroglu** discussed important issues related to the robustness of the results and computation of the total factor productivity (TFP). In particular, the importance of the sensitivity analyses with different values of the elasticity of substitution and home bias in the Armington aggregator was stressed. Although the data limitation was acknowledged, it was recommended that the authors look into data such as bilateral trade data to compute the TFP in China. Finally, as part of the agenda for future research, he suggested evaluating the welfare implication in the model with technology diffusion, such as a link from the imports of capital goods leading to an increase in the productivity of Chinese final goods production.

First**,** following the comments by Imrohoroglu, **Fujiwara, Otsu, and Saito** admitted the necessity to compute the TFP in China and showed that the results did not change a lot with different values of elasticity. From the floor, there were such comments as that the fact that an opening policy was modeled as the preference shift not as an actual reduction of any barriers to trade should have huge implications on welfare; the implied tariffs did not look like the actual data; and how greater varieties of goods being available to the rest of the world as the result of China's opening up affected the welfare of the rest of the world. For the first comment, they responded that the shift in the home bias was the technological change and added that it was difficult to produce the jump in the openness with other shocks. Regarding the second comment, they noted it would be better to consider the shocks in the paper as wedges. Finally, in reply to the question, they agreed that a model with endogenous variety as in Melitz (2003) should be a natural extension in the future to evaluate the welfare tension between more varieties versus fewer terms of trade improvements in the rest of the world.

## An Estimated Monetary DSGE Model with Unemployment and Staggered Nominal Wage Bargaining[10]

**Gertler** presented a model that was not susceptible to the critique of Barro (1977). In the existing model, employment adjusted on the intensive margin along with staggered nominal wage bargaining. This wage rigidity was the key in accounting for labor market

[10] For details, see Gertler, Sala, and Trigari (2008).

volatility and also influenced the short-run output/inflation tradeoff as shown in Blanchard and Galí (2007). Yet such a model implied that there were unexploited gains from renegotiation. Gertler estimated the variant of a conventional monetary dynamic stochastic general equilibrium (DSGE) model as in Christiano, Eichenbaum, and Evans (2005) and Smets and Wouters (2007) that allowed for unemployment and staggered nominal wage bargaining, where unemployment was introduced via a variant of the Diamond-Mortensen-Pissarides search and matching framework and wage rigidity via the staggered Nash bargaining as in Gertler and Trigari (2006). As employment adjusted along the extensive margin, this model addressed the Barro critique and was consistent with evidence at the same time. Finally, he showed that wage rigidity improved the quantitative performance and the model could obtain the similar fit of the data as in Smets and Wouters (2007). Furthermore, he added that more work was needed to ensure the robust identification of key labor market parameters.

In his comments on the paper, **Krause** pointed out that this was the first paper to combine Calvo-style nominal wage rigidity with the Nash bargaining framework, the authors extracted new economic insights, namely, the spillover effect from the aggregate wage to the firm-level wage, and the fit of the model could be compared with the benchmark model as in Smets and Wouters (2007). Then he added several comments as to how much the hiring cost function mattered; why the model performed very well without wage rigidity contrary to Shimer (2004); intensive margin adjustments, which were absent in the model, seemed to be important for the short run; and it seemed unreasonable that real wage rigidity entered by non-structural indexation.

**Gertler** responded to Krause's comments that the quadratic adjustment might interact with the wage rigidity and different estimates of the exogenous forcing process were obtained regarding the volatility in the model with and without wage rigidity. Several participants also insisted that adjustments in hours worked were important, and some related this problem to whether the model actually addressed the Barro (1977) critique. **Gertler** responded that there was a lot of variation in the low frequency in hours per worker which was not due to Frisch elasticity, but he agreed about the importance of taking this point into account. There were further questions on the plausibility of priors, indexation, and Calvo-style rigidity. **Gertler** responded that the results did not change with looser priors, they incorporated indexation to check how large it was, and Calvo-style rigidity was incorporated just for computational convenience.

## Robust Learning Stability with Operational Monetary Policy Rules[11]

**G. Evans** examined stability under least-squares learning of rational expectations equilibrium for alternative interest rate rules in New Keynesian models. Based on some empirical evidence, he introduced discounted (constant gain) least-squares learning, which weighed recent data more heavily than older data. This learning algorithm implied that there was concern the economy might be subject to structural change. The "robust stability" of rational expectations equilibrium was defined as stability under discounted least-squares learning, for a range of gain parameters. He showed that for operational forms of policy rules in the sense of McCallum (1999), that is, rules which did not depend on contemporaneous values of endogenous aggregate variables, many interest rate rules, including instrument rules, optimal reaction functions under discretion or commitment, did not exhibit robust stability. He also showed that the expectations-based optimal rules, which responded to private agents' expectations in an appropriate way, delivered robust stability.

In his comments on the paper, **Bullard** remarked that stability under learning has not been sufficiently investigated in macroeconomics. He remarked that, in particular, instability under learning has not been sufficiently investigated because actual unstable learning dynamics are rarely observed. He claimed, however, that the instability shown in the paper and some historical examples, such as the breakdown of Bretton Woods, suggest that the issue of stability is potentially important for policymaking. He then cautioned policymakers against a naive application of rational expectations, because optimal monetary policies under the rational expectations hypothesis could never be optimal under learning if the policies produced instability. He finally raised some issues related to responding to agents' expectations, such as measurement of expectations and potential games among agents and policymakers.

From the floor, some participants claimed that the analysis using learning behavior would be more important in global dynamics than in local dynamics. **G. Evans** agreed with this point, explaining that such an analysis was carried out in other papers, which examined the issue of hyperinflation or a liquidity trap. There was a claim that the environment of the study might be unreasonable, because there were no structural changes in the actual economic environment even though private agents were worried about it. **G. Evans** claimed that the environment was just a natural benchmark. He then stated that in his other study he examined the value of an optimal constant gain when structural changes actually occurred. Some participants pointed out that stability under learning might depend on information available to policymakers when making forecasts

[11] For details, see Evans and Honkapohja (2007).

about current endogenous variables. **G. Evans** remarked that there might be a better way to introduce a more realistic setup regarding information availability, although it would require continuous time formulations, which were hard to introduce in this kind of analysis.

## Monetary Policy and Stock Market Boom-Bust Cycles[12]

**Christiano** sought to answer the question of whether monetary policy was responsible for the very high volatility in asset markets. He supposed a situation where asset price booms were triggered by an expectation of improved future productivity, which did not materialize. There, inflation-targeting central banks with sticky nominal wage contracts created the suboptimal volatility in asset prices. He concluded that boom-bust cycles could hardly be understood without monetary policy. The mechanism for the boom-bust cycles in the model was as follows. The expectation of improved future productivity resulted in lower expected marginal cost in the future and therefore in lower current inflation rates due to the sticky price and wage settings. Then the inflation-targeting central bank reduced its policy rate and eventually asset prices increased. This result contradicted conventional wisdom, which assumed inflation rising in stock market booms, but he showed that empirically inflation was low during the boom but tended to rise near the end and that his model could reproduce these facts. He further compared the performances of the standard Taylor rule with the Ramsey optimal monetary policy. He concluded that monetary policy in the form of the standard Taylor rule was suboptimal. Yet at the same time, it was shown that the modified Taylor rule, where the price inflation term was replaced by wage inflation, could mitigate the suboptimality of monetary policy.

In his comments on the paper, **Levin** began by emphasizing the pitfalls of macroeconometric equivalence and microeconomic dissonance in conducting welfare analysis of monetary policy. He then commented specifically on each of the three historical episodes. The stock market boom of 1928-29 was probably not induced by a large upward shift in expected future productivity growth, but may have reflected various imperfections in financial market regulations. During the 1960s, the deviations of real equity prices from trend were quite transitory, rather than exhibiting a sharp boom, and the bust of the 1970s may have reflected the sharp increase in oil prices and the unanchoring of long-run inflation expectations. Finally, while an upward shift in anticipated productivity growth may have triggered the stock market boom of the late 1990s, this mechanism cannot account for the subsequent bust in 2000-01, because

[12] For details, see Christiano *et al.* (2008).

surveys of professional forecasters indicate that expectations of long-run output growth remained elevated from 1999 until about 2003.

There were also questions from the floor about the relationship between the model's simulation and historical episodes. **Christiano** responded that it was very important to investigate whether there was evidence for this kind of boom-bust cycle in the historical episodes. Some asked about the implementation of the Ramsey policy for the expectation shock. **Christiano** stated that such a policy would be difficult to implement with the operational rule, but it should be checked whether desirable allocation under such a policy could be produced under the targeting criteria.

## Stepping on a Rake: The Role of Fiscal Policy in the Inflation of the 1970s[13]

The high inflation of the 1970s in the United States was often attributed solely to the errors of monetary policy. **Sims** provided an alternative view that the vagaries of fiscal policy played an important role for the high inflation in this period, based on the framework of the fiscal theory of the price level (FTPL). He showed that in the presence of uncertainty about future fiscal policy, monetary policy instruments, which followed the so-called Taylor principle, might lose potency or have perverse effects. This was because the rise of the interest rate against inflation would increase the rate of issue of nominal government debt, which accelerated the inflation rate if private agents believed that newly issued nominal debt was only partially backed by future taxes. He showed that if monetary policy pegged the interest rate, the equilibrium price level became unique and stable. He demonstrated this mechanism by presenting the impulse responses to fiscal/monetary policy shocks in two kinds of calibrated models: flexible/sticky price models and an estimated structural vector autoregression (VAR) model.

In his comments on the paper, **Smets** asked how the various additional features, such as sticky prices, habit formation, and long-term debt, mattered for the impulse responses. He pointed out that the impulse response of the sticky price model to a monetary policy shock was inconsistent with the price puzzle, which had been originally found by Sims (1980). In particular, the fact that the price puzzle was more prominent before the 1980s than after the 1980s appeared to be inconsistent with the hypothesis that U.S. policy had shifted from an active fiscal/passive monetary (AF/PM) regime in the 1970s to a passive fiscal/active monetary (PF/AM) regime in the 1980s. He also pointed out that the FTPL had implications for the impact of fiscal policy

[13] For details, see Sims (2008).

shocks on private consumption which were more in line with VAR evidence from the 1970s and 1980s. Finally, he asked which policy regime, AF/PM or PF/AM, was preferable from the normative viewpoint.

In the general discussion, **Sims** remarked that the existence of the price puzzle depended on some parameterizations, including the degree of price stickiness. He claimed, however, that in identifying a structural VAR model, he maintained a plausible assumption that a contractionary monetary policy shock at least eventually produced a decline in the inflation rate. Regarding normative policy regimes, he did not insist that AF/PM was preferable, because sometimes the same equilibrium could be supported in either PF/AM or AF/PM. He cautioned, however, that monetary economists should not ignore completely the role of fiscal policy in controlling the inflation rate. From the floor, there was a question as to why Japan's price level did not rise in the latter half of the 1990s, even though the Japanese government had a huge level of debt and Japan's monetary policy was severely constrained by the zero lower bound, which implied an AF/PM regime. **Sims** responded that Japan's experience was puzzling, but it would be important to understand what Japanese people had believed about future fiscal policy during that period.

## Panel Discussion on Frontiers in Monetary Theory and Policy

In the panel discussion chaired by **Nishimura**, **Woodford**, **Taylor**, **Gertler**, **G. Evans**, **Christiano**, **Sims**, **Obstfeld**, and **McCallum** stated their views on the achievements, limitations, and perspectives in their research field in short presentations. General discussion then followed.

### *Michael Woodford*

**Woodford** remarked that one of the most important topics for monetary policy analysis was the robustness of policy proposals. He then stated that a robust approach to monetary policy was to focus on (1) defining target criteria, (2) committing to a policy to satisfy the target, and (3) trying to ensure the target, given the information on current economic conditions. He claimed that this kind of policymaking was more robust than some approaches which introduced a particular rule for setting its instrument as a function of some indicators. He agreed with the implication of the paper of G. Evans, stating that the most robust approach was to satisfy the target by looking at people's actual expectations, because it was quite unclear to central banks how people's expectations were formed. Regarding Christiano's paper, he voiced doubt on the results of undesirable equilibria under a version of inflation targeting. He suggested that the

real problem would not be in a policy objective, but in a particular mechanical feedback rule. He proposed that one important area of future research was to provide the means to successfully implement a targeting procedure, based on realistic assumptions on information availability for central banks. He added that the other important topic was to examine how to define target criteria, which robustly approximated optimal policy in complex environments.

### *John B. Taylor*

Following the presentation by Woodford, **Taylor** also insisted that robustness was the real issue, on which he would like to see more research in the future. He added that given the technology of simulation and collecting models, it was much easier to carry out robust analyses than in the past. As a frontier for research, he pointed to the operations of monetary policy in the money markets. Regarding the recent financial turmoil, he stated that among several explanations such as increased risk and greater liquidity demand, the counterparty risk between banks explained nearly everything about the LIBOR-OIS spread. Then he discussed some of the actions proposed by the Fed, such as the Term Auction Facility. He showed that although at the beginning there might have been some effect, more recently the rate was rising as the amount of intervention increased. He concluded that it was difficult to find an effect. Much more work needed to be done, and this went to the heart of monetary policy, and this was a major policy issue for the United States and other central banks. He concluded that much could be learned from Japan too, since Japan had gone through this sort of financial turmoil in the 1990s.

### *Mark Gertler*

**Gertler** began by saying that there had been great progress in developing optimization-based macro models, but referred at the same time to the cynical view that newly developed groupthink might have set the stage for the next global economic contraction, because all the central banks were going to make the same mistakes using the same models. He then mentioned that these models were well suited to address the problems of the past, and listed a couple of challenges. As a first issue, the discussion over targeting headline or core inflation was raised. Given the way the cost of inflation was modeled in the New Keynesian framework, core rather than headline inflation should be targeted. He raised the question, however, as to whether such thinking should be revised in the face of the recent, very sustained increase in oil and commodity prices. As a second issue, he cited exchange rate management by emerging market economies. He mentioned that although theory preferred flexible exchange rates, many countries

stabilized their exchange rates, which could be a major factor in global inflation. He pointed out the necessity of introducing institutional restraints when applying optimization-based models to emerging economies. As a final point, he mentioned financial fragility. He stated that the existing models had not captured the potential for the liquidity disruptions that central banks were concerned with, and more explicit structural modeling of the financial institutions was needed to unravel questions such as the degree of financial fragility. In particular, he pointed to the enormous amount of funds now intermediated by institutions that were outside the regulatory structure.

## *George Evans*

**G. Evans** summarized the contributions of the learning literature, pointing to two major achievements: (1) theoretical foundations on the E-stability principle under least-squares learning and (2) applications to a wide range of models. Regarding the applications to monetary policy, some studies examined the stability under learning and others investigated the optimal monetary policy under learning. One important phenomenon under learning was the emergence of escape routes, which could explain the dynamics of hyperinflation or a liquidity trap. Another line of research introduced learning by policymakers or private agents in explaining the Great Inflation or the subsequent disinflation in the United States. As for the robustness of monetary policy, G. Evans remarked that the learning perspective, especially on the part of policymakers, should be introduced in the literature. He also mentioned a recent paper of his that showed asset price bubbles could emerge if agents were learning not only the expected rate but also the conditional volatility of return. As topics for future research, he raised the issue of dynamic model selection, in which agents had potentially misspecified models and chosen a model through learning procedure. He also mentioned other issues such as the incorporation of structural knowledge in learning procedure and the investigation of learning dynamics in models with heterogeneous agents.

## *Lawrence Christiano*

After stating that what was exciting about economic research was that it was driven by observations, **Christiano** predicted that the current financial turmoil in the United States was going to place financial frictions front and center on everyone's research agenda for at least a decade. Then he raised several challenges for DSGE modeling. First, he pointed out the uncovered interest rate parity puzzle as an amazingly difficult one to work with. He added that this puzzle was particularly interesting because the uncovered interest parity relationship came from the standard intertemporal Euler equations. If there was a problem with that equation, this meant there was a problem that went right

to the core of the models used intensively today. After pointing to the modeling of financial market imperfections and labor market frictions as remaining challenges, he presented the view that models based on limited information could be an alternative framework attracting much attention in the future. It was shown that the information confusion was potentially the explanation of why the inflation responded slowly to the monetary shock but quickly to the technology shock. At the same time, following the argument made by Gertler, he mentioned that there was an amazing, probably unhealthy, consensus at the moment as to models and therefore this was an unusual time in economics.

### *Christopher Sims*

**Sims** raised the issue of central bank balance sheets. Standard models introduced a unified government budget constraint in which the central bank was merged with the rest of the government. In such models, the question of how much capital the central bank had was irrelevant. Sims remarked that this kind of treatment worked well when the central bank had positive seigniorage and was completely independent from the treasury. However, in reality there are many central banks that had a chronic negative net worth or negative seigniorage. Sims said that for these central banks there might be a threat to the central bank independence, because if these central banks were perfectly independent of the treasuries then the central banks lost any fiscal resources. He added that since these central banks were unable to send positive seigniorage to their governments, the treasuries could try to force the central banks to finance government deficits. In such a case, a central bank's monetary policymaking would be significantly affected and the coefficient on the inflation rate in the Taylor rule would be bounded. He also claimed that to guarantee the central bank independence, some legislative oversight would be needed to check whether the central bank properly fulfilled its function of stabilizing inflation and the economy. Finally, he remarked that these issues were all linked with financial market problems, and economists needed models to discuss such issues in a coherent way.

### *Maurice Obstfeld*

**Obstfeld** presented a historical overview of how the two roles of central banking, that is, monetary policy and financial (or prudential) policy, played out in the evolution of the international monetary system. He explained that after the final breakdown of the gold standard in 1971, financial markets had been somewhat liberalized both at the national and international levels. Yet there was a serious inflation problem in the 1970s. Because of this experience, much work had been done concerning models of inflation targeting.

He stated, however, that research had not kept up with reality, because the recent DSGE models were not well designed to deal with the issue of financial crises, which were inherently discontinuous and highly nonlinear convulsions in financial markets. He stated that there had been some recent progress in the literature of international finance to investigate portfolio demands in incomplete markets, but this modeling is not sufficiently advanced to assess the bankruptcy risks inherent in financial institutions' cross-border asset and liability positions. He claimed that the issue should not be investigated in a purely domestic context, because international cross-border flows of funds were an essential feature of modern deregulated financial markets. He then remarked that it was important to investigate from a global perspective whether the central bank should have macro-prudential policies as an additional tool alongside interest rate policy. He explained that it was highly problematic to impose financial restrictions in a global context, because it yielded disadvantages for domestic institutions and there were opportunities for evasion that were less easy in a purely domestic context. He also claimed that the exchange rate mechanism for transmitting financial problems was one more important issue for investigation.

## *Bennett T. McCallum*

**McCallum** first mentioned that rational expectations were so much a part of economic analysis that many papers did not even bother to state that it was the hypothesis or assumption being used. Yet there were many issues such as indeterminacy, learnability, and so forth, instead of rational expectations, on which there really was not complete agreement. It was recommended that we find the most fruitful way to conduct scientific investigations in this area concerning expectations. Then he commented on the frontiers in monetary policy by considering the current monetary policy framework of the BOJ. First, he raised the question of whether it was good or bad to have a hierarchical mandate for price stability and macroeconomic stabilization. He added that the statement in the Bank of Japan Law could be interpreted in a hierarchical way, that is, as saying that monetary policy could contribute best to sound development of the national economy through the pursuit of price stability. Then he discussed the communication policy. He insisted that the goals of monetary policy should be made somewhat explicit, but central banks should not publish the path of future values of policy interest rates, because they were highly conditional and when conditions changed the public would inevitably get the impression that the policy had changed even when it had not in a fundamental sense. He added that we needed to know what central banks should be explicit about in communicating with the public. It might be just the policy rate, the policy design, or the objective function. He strongly recommended that the

communication be made through actions. He referred to the actions taken by the Deutsche Bundesbank, through which the public came to know and appreciate the priority of inflation prevention as an overall goal, not because of the clarity of that central bank's announcements, but because of its actions.

## *Discussions*

There were intensive discussions on the market liquidity. **Shirakawa** raised the question of what market liquidity was by saying that we did not know how it was generated and maintained, but monetary policy seemed to have something to do with it. **David Altig** (Federal Reserve Bank of Atlanta) pointed out the different definitions among panelists and questioned whether we could capture the liquidity in a model where policy was fundamentally about manipulating overnight interest rates as in the model of Woodford. Similarly, **Jan Marc Berk** (De Nederlandsche Bank) raised the issue of whether the current workhorse paradigm without monetary aggregates as presented at this conference might have some limits for explaining what was actually happening in the economy. Furthermore, **Kazumasa Iwata** (Professor Emeritus, University of Tokyo) responded to the presentation by Taylor that the contraction of the LIBOR-TIBOR spread was due to the combination of quantitative easing and injection of public funds to the banks. **Bullard** agreed with Gertler that an enormous amount of intermediation funds was provided outside the regulated banking system and asked what the appropriate policy response was to the situation.

**Taylor** agreed with the point raised by Shirakawa that what was needed was to find ways to measure what people said was liquidity. Although **Taylor** added that the concept of liquidity might not be a major issue as the chart for CD rates and LIBOR showed, it could be measured by such a method as the non-arbitrage models. **Sims** commented on this and replied that it was not very easy to draw a distinction between counterparty risk and liquidity. **Sims** added that if there existed an information problem on the value of assets, the liquidity problem could be a counterparty risk problem, where some assets would have counterparties underneath them that people were not sure about. On this point and the recent financial turmoil, **Nishimura** added that there was no reliable method to measure probability in tail events as of now and it was a serious problem to devise reasonable policy without reliable measurement of probability. Regarding the questions of Altig and Berk, **Gertler** replied that the liquidity in his and Christiano's models was about the balance sheet (of firms without enough capital), which could cause fluctuations. **Woodford** then responded that there was not that much connection between what the recent developments had shown was important and the traditional concern of institutions like the European Central Bank with monitoring the

growth of monetary aggregates. Furthermore, regarding the question raised by Bullard, **Woodford** added that to the extent the balance-sheet problem related to financial intermediaries other than commercial banks, traditional monetary aggregates were less relevant than they had been in the past. **Gertler** also responded that even if there were institutions outside regulation, they might ultimately go to the Fed either directly or indirectly for help in obtaining short-term funds, but this was not suggesting that we should impose a capital requirement on these institutions, since there were some important differences between these institutions and banks. **Taylor** added that the one group of institutions which had done quite well comprised the ones that had not been regulated. Therefore, **Taylor** warned that we should think carefully about whether to extend the regulatory supervisory responsibilities much further. **Taylor** agreed with the point raised by Iwata, but added that we did not always have to rely on public funds, because many institutions were providing capital to increase the level of capital, and the financial system now had a very promising flexible feature, where the credit crunch was not "crunching" as much as one might think, because there was actually a lot of capital out there.

**Charles Evans** (Federal Reserve Bank of Chicago) raised the issue of central bank communication and questioned how we should communicate as central bankers. **C. Evans** added that under a risk management or robust approach that was often discussed, policy could become very discretionary, which we should not aspire to.

**G. Evans** responded that he was not sure we should announce specific interest rate trajectories, but we could certainly announce the way in which monetary policy would be conditional. **G. Evans** added that, for example, by making the statement that interest rates would be low for quite some time but would increase substantially when it became absolutely clear the economy was no longer in recession, central banks could spell out the conditional trajectory. **Levin** also noted a substantial gap between monetary theory and the practice of monetary policy--at least in some major industrial economies--with regard to the adoption of an explicit long-term goal for inflation. **Levin** continued that the theory provides a compelling rationale for establishing an explicit inflation objective, but some policymakers have ongoing concerns that an explicit inflation goal might constrain the conduct of monetary policy with respect to stabilization of the real economy. **Miyako Suda** (BOJ) raised the importance of investigating voting activity for monetary policy decision making as a related frontier research agenda. **Sheryl Kennedy** (Bank of Canada) followed this argument: when there were for example, six or twelve decision makers, it would not be easy to put out an interest rate path or a policy rule that was agreed to by everybody. **Kennedy** added that this was the frontier for practitioners and we needed to investigate how to

communicate effectively in this circumstance.

**Wataru Takahashi** (BOJ-IMES) asked what kind of international coordination would be desirable under the ongoing globalization, which was a major issue as discussed at this conference. **Takahashi** also pointed out the possible gains from policy coordination against the current financial turmoil. **Taylor** replied to this that under rational expectations, staggered contracts, and capital mobility, there was not much gain from policy coordination as long as each country followed its optimal rule. **Taylor** added, however, that the problem with this result was that in reality many countries were not following the same optimal policy such as inflation targeting. **Taylor** concluded that under the circumstances where some countries adopted an exchange rate peg policy, there could be gains from coordinating in some way but they would not be based on the classic coordination literature.

There were also comments on the presentations made by panelists. **Kimball** discussed the arguments regarding core versus headline inflation. He argued that the reason why we should focus on core inflation was because it was supposed to be stickier, but we needed to investigate much more exactly as to which prices were stickier. **C. Evans** commented on the argument that there was too much agreement on models and questioned whether this meant that we needed to explore alternatives. **Toni Braun** (University of Tokyo) then followed that the consensus models were not well suited to answering the current credit issues that the United States was facing. **Braun** insisted that although there had been many banking events in the past, the important subject was the development of monetary theory focusing on this issue.

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## Appendix 1: List of Participants

| | |
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| **Yoga Affandi** | **Bank Indonesia** |
| **David Altig** | **Federal Reserve Bank of Atlanta** |
| **Yoichi Arai** | **University of Tokyo** |
| **Akira Ariyoshi** | **International Monetary Fund** |
| **Jan Marc Berk** | **De Nederlandsche Bank** |
| **Alex Bowen** | **Bank of England** |
| **Anton Braun** | **University of Tokyo** |
| **James Bullard** | **Federal Reserve Bank of St. Louis** |
| **Mathieu Chantalat** | **French Embassy** |
| **Lawrence Christiano** | **Northwestern University** |
| **Alberto Cogliati** | **Bank of Italy** |
| **Francisco Dakila, Jr.** | **Bangko Sentral ng Pilipinas** |
| **Richard Dennis** | **Federal Reserve Bank of San Francisco** |
| **Julen Esteban-Pretel** | **University of Tokyo** |
| **Charles Evans** | **Federal Reserve Bank of Chicago** |
| **George Evans** | **University of Oregon** |
| **Ippei Fujiwara** | **Bank of Japan** |
| **Kazuo Fukuda** | **Bank of Japan** |
| **Shin-ichi Fukuda** | **University of Tokyo** |
| **Esther L. George** | **Federal Reserve Bank of Kansas City** |
| **Mark Gertler** | **New York University** |
| **Masazumi Hattori** | **Bank of Japan** |
| **Dong He** | **Hong Kong Monetary Authority** |
| **Charles Horioka** | **Osaka University** |
| **Kiyoto Ido** | **Bank of Japan** |
| **Ayse Imrohoroglu** | **University of Sourthern California** |
| **Selahattin Imrohoroglu** | **University of Sourthern California** |
| **Mohd Fraziali Ismail** | **Bank Negara Malaysia** |
| **Kazumasa Iwata** | **Professor Emeritus, University of Tokyo** |
| **Shigeru Iwata** | **University of Kansas** |
| **Jarkko Jaaskela** | **Reserve Bank of Australia** |
| **Toshiki Jinushi** | **Kobe University** |
| **Keimei Kaizuka** | **Professor Emeritus, University of Tokyo** |
| **Takashi Kano** | **University of Tokyo** |
| **Sheryl Kennedy** | **Bank of Canada** |
| **Miles Kimball** | **University of Michigan** |

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| **Yukinobu Kitamura** | **Hitotsubashi University** |
| **Yutaka Kosai** | **Japan Center for Economic Research** |
| **Michael Krause** | **Deutsche Bundesbank** |
| **Jong Kyu Lee** | **The Bank of Korea** |
| **Samuel Lelarge** | **Banque de France** |
| **Andrew Levin** | **Board of Governors of the Federal Reserve System** |
| **Roong Mallikamas** | **Bank of Thailand** |
| **Enrique Marshall** | **Central Bank of Chile** |
| **Yoichi Matsubayashi** | **Kobe University** |
| **Bennett T. McCallum** | **Carnegie Mellon University** |
| **Ichiro Muto** | **Bank of Japan** |
| **Tomoyuki Nakajima** | **Kyoto University** |
| **Jean-Marc Natal** | **Swiss National Bank** |
| **Kiyohiko G. Nishimura** | **Bank of Japan** |
| **Maurice Obstfeld** | **University of California at Berkeley** |
| **Mitsuaki Okabe** | **Meiji Gakuin University** |
| **Tatsuyoshi Okimoto** | **Yokohama National University** |
| **Tsunao Okumura** | **Yokohama National University** |
| **Kjetil Olsen** | **Norges Bank** |
| **Keisuke Otsu** | **Sophia University** |
| **Simon Potter** | **Federal Reserve Bank of New York** |
| **Tuomas Saarenheimo** | **Bank of Finland** |
| **Masashi Saito** | **Bank of Japan** |
| **Jean-Luc Schneider** | **Organisation for Economic Co-operation and Development** |
| **Yosuke Shigemi** | **Bank of Japan** |
| **Mototsugu Shintani** | **Vanderbilt University** |
| **Etsuro Shioji** | **Hitotsubashi University** |
| **Masaaki Shirakawa** | **Bank of Japan** |
| **Christopher Sims** | **Princeton University** |
| **Frank Smets** | **European Central Bank** |
| **Miyako Suda** | **Bank of Japan** |
| **Hiroo Taguchi** | **Hosei University** |
| **Wataru Takahashi** | **Bank of Japan** |
| **Kenshi Taketa** | **Aoyama Gakuin University** |
| **John B. Taylor** | **Stanford University** |
| **Takayuki Tsuruga** | **Kansai University** |
| **Philip Turner** | **Bank for International Settlements** |
| **Juan Luis Vega** | **Banco de España** |
| **Toshiaki Watanabe** | **Hitotsubashi University** |
| **Tsutomu Watanabe** | **Hitotsubashi University** |

**Wako Watanabe** **Keio University**
**Michael Woodford** **Columbia University**
**Tomoyoshi Yabu** **Tsukuba University**
**Yi Cheng** **People's Bank of China**
**Jiro Yoshida** **University of Tokyo**
**Naoyuki Yoshino** **Keio University**

*As of May 27, 2008*

## Appendix 2: Program

### Wednesday, May 28, 2008

**Morning** — **Opening Remarks**

Chairperson: **Kiyohiko G. Nishimura**, Bank of Japan

Speaker: **Masaaki Shirakawa**, Bank of Japan

**Introductory Remarks**

Chairperson: **Charles Evans**, Federal Reserve Bank of Chicago

Speaker: **Bennett T. McCallum**, Carnegie Mellon University

**Session 1 : "Credit Frictions and Optimal Monetary Policy"**

Chairperson: **Charles Evans**, Federal Reserve Bank of Chicago

Presenter: **Michael Woodford**, Columbia University

Discussant: **Miles Kimball**, University of Michigan

**Mayekawa Lecture**

Chairperson: **Wataru Takahashi**, Bank of Japan

Presenter: **John B. Taylor**, Stanford University

**Afternoon** — **Session 2: "Global Impact of Chinese Growth"**

Chairperson: **Sheryl Kennedy**, Bank of Canada

Presenter: **Ippei Fujiwara**, **Keisuke Otsu** and **Masashi Saito**, Bank of Japan

Discussant: **Selahattin Imrohoroglu**, University of Sourthern California

**Session 3: "An Estimated Monetary DSGE Model with Unemployment and Staggered Wage Contracting"**

Chairperson: **Sheryl Kennedy**, Bank of Canada

Presenter: **Mark Gertler**, New York University

Discussant: **Michael Krause**, Deutsche Bundesbank

**Session 4: "Robust Learning Stability with Operational Monetary Policy Rules"**

Chairperson: **Enrique Marshall**, Central Bank of Chile

Presenter: **George Evans**, University of Oregon

Discussant: **James Bullard**, Federal Reserve Bank of St. Louis

**Session 5: "Monetary Policy and Stock Market Boom-Bust Cycles"**

Chairperson: **Enrique Marshall**, Central Bank of Chile

Presenter: **Lawrence Christiano**, Northwestern University

Discussant: **Andrew Levin**, Board of Governors of the Federal Reserve System

## Thursday, May 29, 2008

**Morning**

**Session 6: "Stepping on a Rake: The Role of Fiscal Policy in the Inflation of the 1970's"**

Chairperson: **Jan Marc Berk**, De Nederlandsche Bank

Presenter: **Christopher Sims**, Princeton University

Discussant: **Frank Smets**, European Central Bank

**Concluding Panel: "Discussion on Frontiers in Monetary Theory and Policy"**

Moderator: **Kiyohiko G. Nishimura**, Bank of Japan

Panelists: **Michael Woodford**, Columbia University
**John B. Taylor**, Stanford University
**Mark Gertler**, New York University
**George Evans**, University of Oregon
**Lawrence Christiano**, Northwestern University
**Christopher Sims**, Princeton University
**Bennett T. McCallum**, Carnegie Mellon University
**Maurice Obstfeld**, University of California at Berkeley

**Concluding Remarks**

Chairperson: **Kiyohiko G. Nishimura**, Bank of Japan

Speaker: **Maurice Obstfeld**, University of California at Berkeley

## Appendix 3: Biography of Haruo Mayekawa

Haruo Mayekawa joined the Bank of Japan in 1935, and served as the Bank's Governor from 1979 to 1984. (For details, please see the attached personal history.) He is remembered today as one of the most respected governors in the Bank's history. He contributed to the internationalization of the Bank of Japan and of Japan as a whole, and worked to stabilize inflation and macroeconomic activity during the second oil crisis in the early 1980s. In addition, he established the Bank's Institute for Monetary and Economic Studies. He also chaired the advisory council to the Prime Minister that in 1986 published the influential "Mayekawa Report," which proposed a number of policy prescriptions for the Japanese economy, with the aim of improving Japan's position in the international economy.

In the 1960s, as the Director-General of the Bank of Japan's Foreign Department and as Executive Director, Mr. Mayekawa worked hard in service of the Bank's internationalization. Having already focused on issues of international finance earlier in his career,* he recognized the necessity of building good relationships with other central banks and international organizations. He played a major role in the Bank of Japan's rejoining the Bank for International Settlements, participating in the meetings of the G-10 countries, and hosting the International Monetary Fund's annual meeting in Tokyo.

* In Japan, Mr. Mayekawa was known as the man who had experienced "three surrenders" during World War II: in 1943, he worked as the Bank of Japan's representative in Rome; subsequently, he was sent to the Bank's Berlin office; and following the capitulation of Germany, he escaped through Russia to Japan, experiencing Japan's unconditional surrender in Tokyo in August 1945. Following Japan's surrender, he succeeded in persuading the Occupation Forces to retain the yen as the nation's currency.

The second oil crisis began while he was serving as Governor. Having already learned the lessons of the first oil crisis, he sought to stabilize inflation expectations through monetary tightening, a policy that can be understood in hindsight as following the Taylor Principle. His policy prescription minimized damage caused by the second oil crisis, and won praise from leading economists abroad such as Milton Friedman. His policy achievement of maintaining low inflation expectations was considered to be the engine for sustainable growth without inflation in 1980s Japan.

In 1982, Governor Mayekawa established the Institute for Monetary and Economic Studies of the Bank of Japan. Because of his deep respect for academia, he believed in

the necessity of maintaining a high-quality research function in monetary and economic studies. In particular, he stressed the importance of fundamental research for understanding the nature of current economic issues. As the institute's founder, he recommended long-term rather than short-term analyses and esteemed the freedom and autonomy of research at the Institute for Monetary and Economic Studies. At the same time, he set a high priority on promoting the exchange of research between the institute's economists and academics both in Japan and abroad. This priority is reflected especially in the visiting scholar system, which helps enhance the Bank's research capability.

After retiring from the Governor of the Bank of Japan, in 1985, Mr. Mayekawa was selected to chair an advisory council to the Prime Minister, the "Study Group on Adjustment of the Economic Structure for International Cooperation." The report published by this group, known as the "Mayekawa Report," contained policy prescriptions to mitigate Japan's trade imbalances and promote sustainable growth in the international economy. The main recommendations stressed the importance of (1) increases in domestic demand, (2) structural transformation of industries, (3) market opening, (4) financial liberalization and internationalization, and (5) promotion of international cooperation. These recommendations formed the basic guideline for subsequent Japanese economic policy and thus promoted deregulation and further internationalization.

Last but not least, Mr. Mayekawa is remembered very fondly by many, including those both inside and outside the Bank of Japan. He enjoyed relaxing after work at pubs with young central bankers, and at international meetings was known familiarly as "Mike" and earned a great deal of both respect and affection. At the same time, he was a very modest person. He refused the First Order, and once said that he disliked any order that ranked people hierarchically. Because of his great humility, if he were alive today he would doubtlessly disapprove of our naming this commemorative lecture after him for the institute's international conference, but we hope nevertheless he would understand our firm wish to commemorate his example.

Haruo MAYEKAWA

Date of Birth: February 6, 1911

Education: 1935, LL.B., The University of Tokyo

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|---|---|
| 1935 | Joined The Bank of Japan |
| 1941-43 | Representative in Rome |
| | Representative in Berlin |
| 1949-54 | Director, Secretariat of the Policy Board |
| 1955-58 | Deputy Director, Foreign Department |
| 1958-60 | Chief Representative in the Americas (New York) |
| 1960-63 | Director, Foreign Department |
| 1963-70 | Executive Director |
| 1970-74 | Deputy President, The Export-Import Bank of Japan |
| 1974-79 | Deputy Governor, The Bank of Japan |
| 1979-84 | Governor, The Bank of Japan |