MACROECONOMIC RISK CHAIR
NEWSLETTER N°11

The fifth annual conference of the Macroeconomic Risk Chair was held at Paris School of Economics on September 15, 2022. Following this conference, we had the opportunity to interview **Klaus Adam** (University of Mannheim) about his research.

This newsletter includes an interview of Klaus Adam, a brief description of the research papers discussed at the conference and the presentation of a research paper on efficient allocations under ambiguous model uncertainty.

Optimal Monetary Policy when r*<0

Roberto Billi (Sveriges Riksbank), Jordi Galí (CREI, UPF, BSE), Anton Nakov (European Central Bank),
Optimal Monetary Policy when r*<0, Working Paper, September 2022.

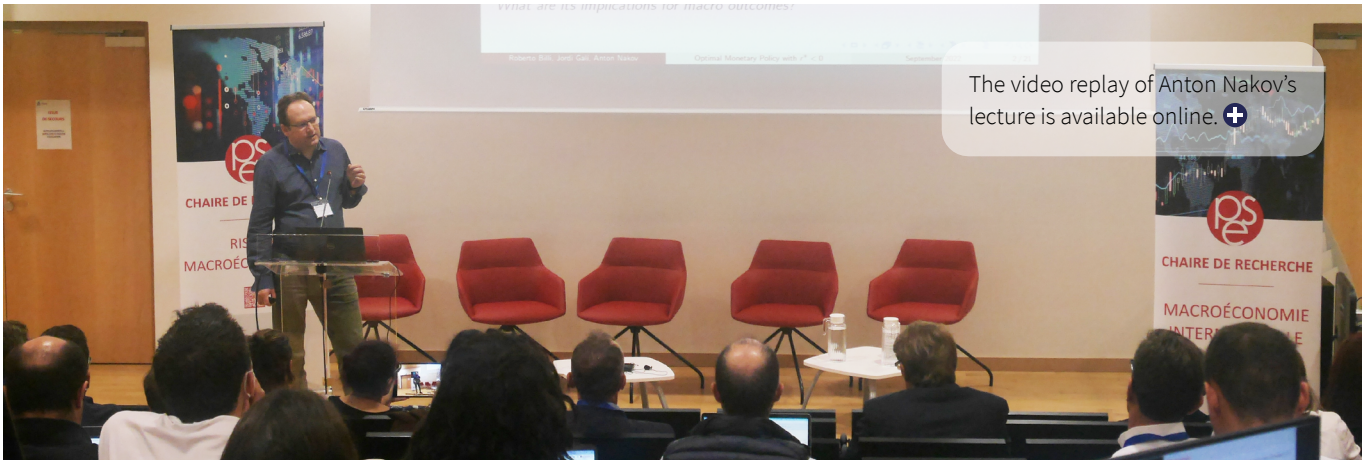
The last decade has seen the emergence of a debate on the possible decline in the natural interest rate (r* hereafter) and its implication on the design of optimal monetary policy. An economy experiencing a lower natural interest rate on average will see its monetary policy more often constrained by the zero lower bound (ZLB hereafter) and will face larger macroeconomic instability. New Keynesian models have so far only studied this decrease in the natural rate of interest through shocks that push r* temporarily into negative territory, with the average r* remaining positive.

Roberto Billi, Jordi Gàli and Anton Nakov develop a New Keynesian model at the ZLB with a negative mean r*. The permanent decrease in the natural rate of interest is micro-founded through an overlapping generation framework: as the probability of retirement is high, there is an incentive to save which in turn pushes down the natural interest rate into negative territory. **In this new environment, the authors formalize the optimal design of monetary policy through an endogenous regime-switching model.** The optimal policy takes the form of a Taylor rule with absolute values for inflation and output gap. It can be re-written as a system of rules where the weights depend on the signs of inflation and output gap. Whenever at least inflation or the output gap change signs, the weights in the Taylor rule will also change. As such, the central bank will modify how much it cares about both inflation and output gap depending on how they evolve. Under this rule, the central bank will implement the optimal nominal interest rate and will only deviate when inflation and/or output deviate from their optimal values. The specificity of the rule is that off-equilibrium deviations in the nominal interest rate will only be positive, making sure the ZLB constraint is never violated.

The authors calibrate their model and find as a general result that the transition is gradual: after a shock, inflation first sharply decreases into negative territory and then starts to slowly converge to its steady state value. Similarly, the real interest rate increases to 0 straight after the shock before converging, while the nominal interest rate remains at 0 through the whole simulation because of the ZLB. **Therefore, the dynamics of the model show both deflation straight after the shock and a negative output gap.** This is due to the fact that the central bank cares more about keeping low inflation than minimizing the output gap. Assuming then fluctuations in the natural rate of interest, the nominal interest rate remains at 0 after a shock because of both the ZLB and a form of forward guidance that relies on anticipation for low interest rates («low for longer»). In this environment, the central bank appears unable to limit fluctuations in inflation and output gap around the steady state. However, for large increases in the natural interest rate, the central bank may deviate from the zero nominal interest rate and increase it to a positive level.

> Off-equilibrium deviations in the nominal interest rate will only be positive, making sure the ZLB constraint is never violated.

All in all, this paper shows that the assumption of a permanent fall in the real interest rate leads the central bank to be more constrained by the ZLB and to struggle implementing the optimal values for inflation and output gap. However, there exists an optimal monetary policy design, which relies on endogenously allowing the central bank to switch from one regime to another one.



The video replay of Anton Nakov's lecture is available online.

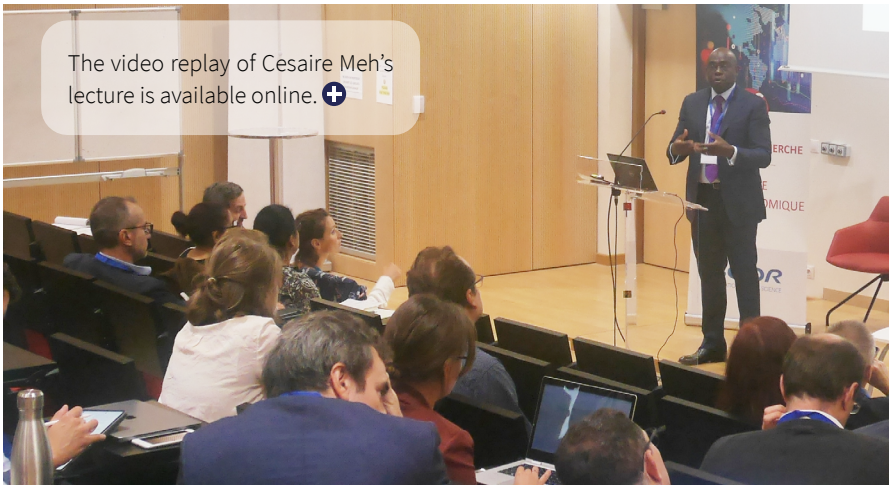
Gazing at r*: A Hysteresis Perspective

Paul Beaudry (Bank of Canada), Katsiaryna Kartashova (Bank of Canada), Cesaire Meh (Bank of Canada),
Gazing at r*: A Hysteresis Perspective, Working Paper, January 2023.

The on-going decline in long-term real interest rates has been documented extensively over the last decade. Several explanations have been proposed to explain why long-term interest rates have been declining, such as: an aging population, increasing inequality or a slowing down in productivity growth. Standard macroeconomic models assume that monetary policy affects the economy through nominal interest rates in order to stabilize fluctuations around the optimum, therefore being exempted of any effects on the long-term real interest rates. **However, monetary policy could have actually played a role in the observed decrease in long-term real interest rates.**

> An aggressive monetary policy creates hysteresis by making a low-interest-rate steady state more likely.

Paul Beaudry, Katsiaryna Kartashova and Césaire Meh propose a new model to understand the impact of monetary policy on long-term interest rates. They develop a New Keynesian overlapping generation (OLG) set-up with an effective lower bound. The OLG structure allows to formalize savings decision as being driven by both retirement and inter-temporal substitution motives. It gives rise to a long-run households' demand for assets that is non-monotonically increasing in the real interest rate. The C-shaped curve of assets demand leads to multiple equilibrium interest rates, for which the stability will depend on how active the monetary policy is. In other words, **even if monetary policy remains neutral in the long-run, it will affect the set of feasible steady state interest rates, their stability properties and their basin of attraction.** When the monetary policy becomes more aggressive, the economy might be stuck in a low-real-rate environment. Indeed, the high-real-rate environment becomes more fragile to small negative inflation shocks. This is where the hysteresis mechanism comes from: how active the monetary authority is will affect the interest-rate state of the economy. The authors also find that an expansionary fiscal policy can help escaping the low-real-rate environment. More generally, they show that a large positive inflation shock could help breaking away from low real rate.



The authors test their hypothesis empirically by checking whether the increase in the wealth-to-income ratio over the period 1989-2019 was mainly driven by a *within-group* effect or a *between-group* effect. The existence of multiple steady state equilibrium interest rates would be supported in the data by a desired wealth accumulation for all households spurred by income effects rather than an accumulation induced by changes in demographics or income distribution. Using data from the Survey of Consumer Finances, they show that the *within-group* component contributes to around 60% of the total increase, while the *between-group* component contributes to around 40%. The empirical results therefore appear to support the authors' hypothesis. Intuitively, if the *within-group* component contributes the most to the observed changes in the wealth-to-income ratio, it must be that household demand for wealth has increased, keeping age and income constant.

The paper provides a framework explaining how monetary policy could affect long-run real interest rates. **When the households' demand for assets demand exhibits non-monotonicity in real interest rates, multiple equilibrium interest rates emerge.** In this environment, an aggressive monetary policy creates hysteresis by making a low-interest-rate steady state more likely. However, the economy can return to a high interest rate equilibrium thanks to a large positive inflation shock or a substantial increase in public debt.

The Inflationary Effects of Sectoral Reallocation

Francesco Ferrante (Federal Reserve Board), Sebastian Graves (Federal Reserve Board), Matteo Iacoviello (Federal Reserve Board),
The Inflationary Effects of Sectoral Reallocation, Working Paper, September 2022.

The post-Covid 19 macroeconomic environment has been characterized by high inflation and a large dispersion in prices at the industry level in the United States. Indeed, inflation has been mainly led by a large increase in goods' prices. The massive reallocation of demand from services to goods triggered by lockdowns have led to tension in supply chains. Because of bottlenecks, some industries have struggled to meet an increasing demand and set higher prices.

To quantify this mechanism, Francesco Ferrante, Sebastian Graves and Matteo Iacoviello (2022) develop a multi-sector New Keynesian model with hiring costs and heterogeneous price rigidity across sectors. **Asymmetric convex hiring costs allow to formalize bottlenecks at the industry level. Firms can only gradually increase their labor force to keep up with the demand.** Since inputs - labor and intermediate goods - are not perfect substitutes, a gradual adjustment in labor then leads to a substantial increase in prices. Furthermore, heterogeneity in price rigidity across industry can amplify inflationary pressures if sectors struggling to meet their demand exhibit more flexible prices. **Typically, good-producing firms are assumed to have more flexible prices.** In this framework, this will aggravate inflationary pressures as good-producing firms are also the ones experiencing a sudden increase in demand.

> The massive reallocation of demand from services to goods triggered by lockdowns have led to tension in supply chains.

The authors first analyze the effects of a reallocation shock through a change in consumers' preferences, toward more goods. They calibrate the model to match the industry structure of the United States and find that the shock leads to an increase in inflation of around 4 percentage points. Heterogeneity in price rigidity makes the inflationary effects around 25% larger. At the industry level, the reallocation shock explains well prices dynamics observed in the data, both across sectors and over time. Following the shift in consumers' preferences, industries which face an increase in demand also display larger inflation. The model also reproduces well the transmission of inflation through the supply chain: the more upstream a firm is with respect to the goods produced, the larger the inflationary effect (with the opposite being true for services).

To account well for disruptions of supply chains that some industries experienced during the Covid crisis, the authors then add sector-specific productivity shocks and an aggregate labor supply shock, to mimic the so-called Great Resignation. **When the three shocks occur simultaneously, the model predicts an increase in inflation of around 5 percentage points, with the demand reallocation shock remaining the driving force of the inflationary pressures.** Finally, the authors test for a demand reversal: it would increase even more inflation pressures compared to the baseline shock. Indeed, such a shock will trigger gradual adjustment in the services sectors adding up inflationary pressures.

Overall, this paper shows how asymmetric hiring costs and heterogeneity in price rigidity at the industry level can explain the inflation currently observed in the data. Following a sudden reallocation of demand, sectors cannot adjust their production instantaneously because of a lack of inputs. This leads to an increase in prices in line with what has been observed in the data for the United States.

Essential Business Cycles

Michele Andreolli (LBS), Natalie Rickard (LBS), Paolo Surico (LBS)
Essential Business Cycles, Working Paper, *forthcoming*.

Most business cycles models assume homogeneous goods. However, the elasticity of households' expenditures to their income depends on the type of goods consumed. **During recession, households tend to first cut spending on non-essential goods, while essential goods respond less to negative income shock.** Therefore, heterogeneity in goods matters for business cycle dynamics, as shifts in consumption bundles will have general equilibrium consequences which can alter the transmission of monetary policy.

In this paper, Michele Andreolli, Natalie Rickard and Paolo Surico (2022) develop a New-Keynesian model with two types of households, two types of goods and non-homothetic preferences. The main mechanisms they highlight are a *direct* and an *indirect* effect of a change in the consumption bundle after a negative income shock. The *direct* price effect is characterized by a fall in non-essentials prices relative to the essentials prices after a decrease in households' demand for non-essentials. The latter also triggers a labor market general equilibrium *indirect* effect through a substantial decline in employment and wages in sectors producing non-essentials. These direct and indirect effects of negative income shocks add up and lead to a double penalty for low-income households. An increase in the prices of essentials relative to non-essentials weights more on low-income households as the share of essentials in their consumption basket is higher than for the high-income households. Low-income workers also account for a higher share of the labor force in non-essentials sectors than in essentials: the indirect channel will therefore affect them more through the decrease in wages and employment. **At the aggregate level, if low-income households have high marginal propensity to consume, this double penalty will amplify the effect of the negative shock.** It will then lower even further aggregate spending and demand.

> These direct and indirect effects of negative income shocks add up and lead to a double penalty for low-income households.

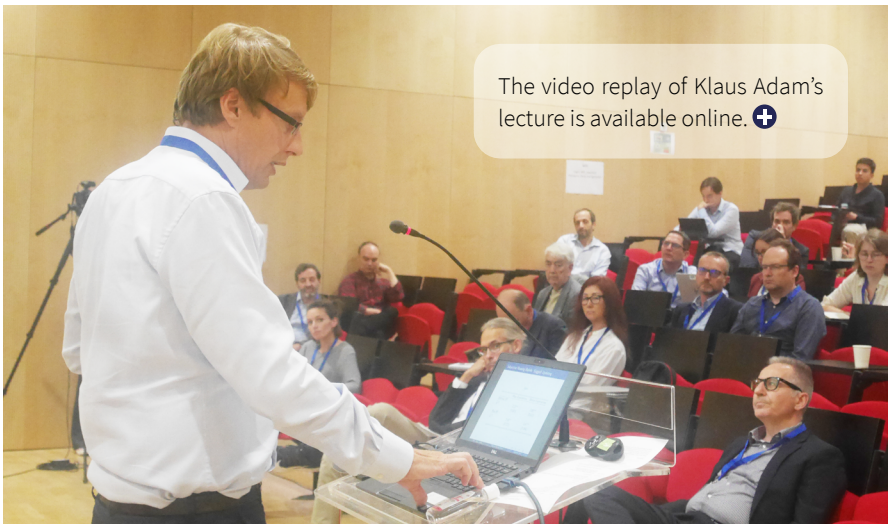
The authors test their main mechanisms through descriptive statistics and empirical work. Their empirical approach relies on a precise classification of consumption and production's data into essentials and non-essentials using cross-sectional data. Consumption goods are classified thanks to estimated income elasticity of demand: when the estimated elasticity is lower (larger) than one, the products is classified as essentials (non-essentials). Intermediates industries are classified based on the downstream final consumption they contributed to: if the share of output a specific industry produced is mainly contributing to essential final consumption, it will be categorized as essential. The authors find support for both the direct and indirect channels, the latter being the strongest effect observed in the data. Consumption of non-essentials is also found to react more to a negative monetary policy shock than consumption of essentials, and the decline in non-essentials employment accounts for all of the decline observed in aggregate employment.

To sum up, this paper shows that heterogeneity in consumption goods matters to the distributional effects of an economic downturn. Because of a shift in high-income households' demand of non-essentials, low-income households suffer from both price and labor market effects. **A new amplification mechanism emerges from the interaction between heterogeneity in goods - essentials vs. non-essentials - and heterogeneity in households - the low-income households also having higher marginal propensities to consume.**

Subjective Housing Price Expectations, Falling Natural Rates and the Optimal Inflation Target

AN INTERVIEW WITH KLAUS ADAM

Klaus Adam (University of Mannheim), Oliver Pfäuti (University of Mannheim), Timo Reinelt (University of Mannheim)
Subjective Housing Price Expectations, Falling Natural Rates and the Optimal Inflation Target, Working Paper, March 2022.



Let's first discuss the paper you presented in the keynote lecture of our annual conference at PSE.

You argue that to understand housing dynamics, it's essential to account for the fact that households' beliefs about housing prices are subjective. In that respect, what do you think make housing prices different from other goods' prices?

First, housing is the most important asset for many households in the economy. This means that the price of housing can affect households in ways that few other assets can. **Second, housing is a long-term asset, which means that expectations about the future resale value feature prominently in the valuation of housing.** For other goods the resale value is often not very relevant because these goods depreciate quickly over time. Variations in resale price expectations thus matter much less.

What are the key empirical regularities that you uncover about housing prices?

Housing prices display a lot of persistence over time, i.e., boom and bust periods tend to last long periods of time. **On top of this, housing prices display what is called momentum,** i.e., increases in the housing price from one year to the next tend to be followed by further increases in the subsequent 1-2 years. And the same is true for price decreases.

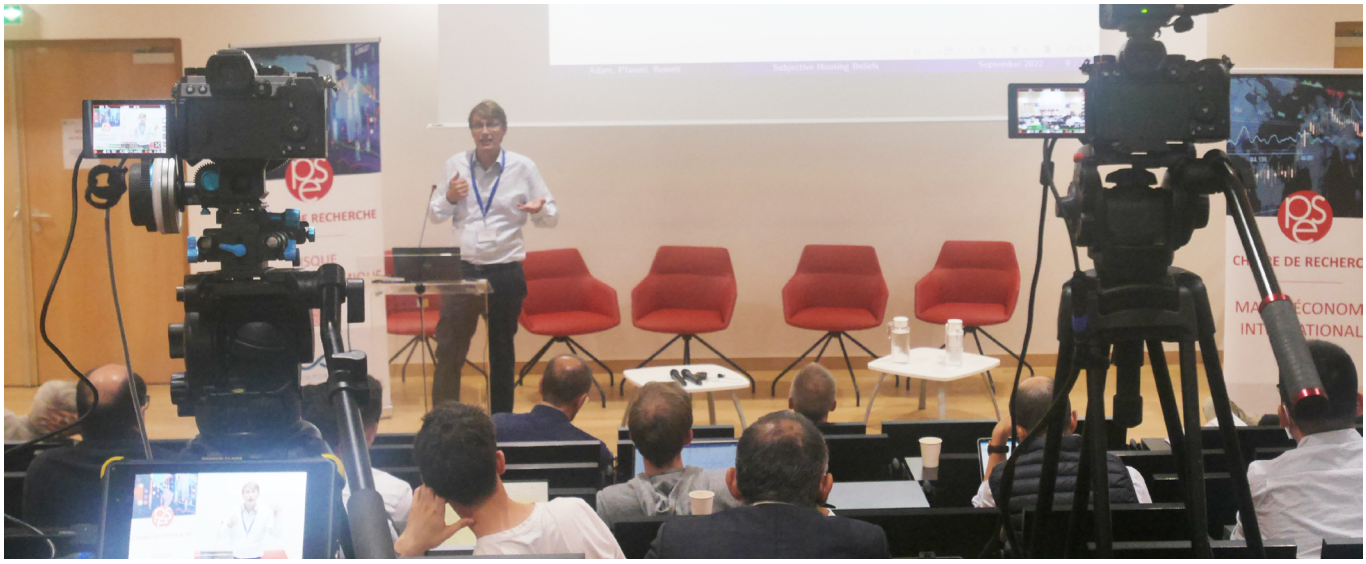
> Housing prices display a lot of persistence over time, i.e., boom and bust periods tend to last long periods of time.

What's the impact of subjective perception of housing prices on the real economy and on the allocation of resources?

Subjective optimism about future housing prices drives – through a higher perceived resale value – the current housing price up. In response to high housing prices and high house price expectations, housing supply tends to extend, i.e., more houses will get built. In extreme cases this can lead to a rather large economic boom and an over-supply of housing relative to other goods. When there is pessimism about future housing prices, current housing prices are low as a result, then there will be too little construction. This can drive the economy into a recession.

One of the several points you make in your paper is that a falling natural interest rate tends to increase the volatility in housing prices. Through which mechanism does this occur?

When real interest rates are low, variations in subjectively expected capital gains affect housing prices by more, simply because investors discount future housing prices by less. This means that any increase in subjectively expected future prices gets translated into higher current prices. Then, when households extrapolate from past house price increases, as the survey evidence suggests, the price increase fuels further an increase in housing price optimism. As a result, housing prices



display more momentum than in an environment in which real interest rates are high.

Coming to policies, how do subjective households' beliefs matter specifically for central bankers and more generally policy makers? How do your policy recommendations differ from the ones in models with rational expectations?

There are a number of implications for monetary policy that arise from the presence of subjective housing beliefs. Most importantly, the presence of these beliefs makes it more difficult for the central bank to stabilize the economy compared to a situation where beliefs are always anchored by fundamentals.

The presence of subjective housing beliefs makes it more difficult for the central bank to stabilize the economy compared to a situation where beliefs are always anchored by fundamentals.

Specifically, subjective optimism or pessimism requires that monetary policy adjusts nominal interest rates to lean against the demand pressures generated by wildly fluctuating housing prices. This can be difficult when real interest rates and inflation rates are generally low because the lower bound constraint on nominal rates will make it very difficult or the central bank to achieve this. As a result, it can become optimal to target a somewhat higher inflation rate than what is implied by a setting that assumes that housing price beliefs are anchored to fundamentals.

Can macro-prudential policies be of any help? How could we improve the current macro-prudential framework to support central banks fulfilling their mandate?

Macro-prudential policies can certainly help with containing belief-driven housing booms and busts. **Yet, our research suggests that the tools currently available are – even if swiftly deployed –to weak to eliminate the problem.** As a result, monetary policy will very likely have to deal with housing booms and bust also in the future, despite the deployment of macro-prudential tools.

Now, a couple of more general questions on your research.

You've done an impressive amount of work on the optimal design of monetary policy, let's start from there. What's your take on the different changes the Fed and the ECB made to their monetary policy framework in 2020 and 2021? How do you think those new features could help handling the current crisis better than the old frameworks?

The reviews carried out by the Fed in 2020 and the ECB in 2021 were very much inspired by the experience of a period in which advanced economies witnessed very low rates of inflation and very low real interest rates. The adjustments to the monetary policy frameworks incorporated the lessons learned from this particular period. The nature of monetary policy challenges has now changed rather dramatically. It's unlikely that the inflationary pressures we see today will quickly subside and it is a distinct possibility that the period of very low real interest rates may also come to an end. The changes made to the monetary policy frameworks may thus simply not be very relevant for the problems central banks face nowadays.

When departing from rational expectations, what are the main

challenges in formalizing subjective household perceptions? You applied this concept to housing prices and optimal monetary policy in the paper we already mentioned. Do you think this could be used to answer other important macroeconomic research questions?

The main difficulties consist of coming up not only with a quantitatively credible description of how people form expectations in a given limited setting, say housing markets, but also with a theory that tells us how these expectations would change if the environment or policy were to change. Subjective believe setups often achieve the first, but have difficulties with the second part. Rational expectations are clear about the second part but miss important ways the first part. I think this is where the tension lies. Overcoming it would really widen considerably the applicability of the framework to other issues.

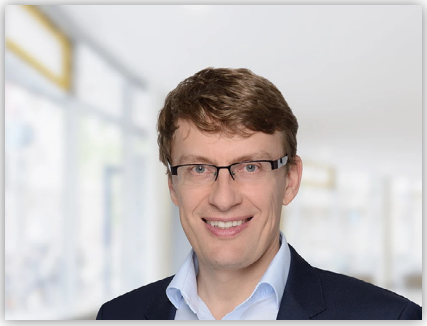
And finally, on the new challenges of monetary policy:
In the current highly uncertain economic environment, is there any hope that coordination across central banks can limit the implementation of contractionary policies? If yes, how can we foster such coordination?

I am not sure that coordination is what is needed right now. The risk of central banks overdoing their job and bringing about too low rates of inflation appears quite limited. It's true that all central banks started to tighten policy, but they are not working against each other say pulling in different directions. Instead, they all pull on the same string. And that's why i think that coordination is not very important.

The risk of central banks overdoing their job and bringing about too low rates of inflation appears quite limited.

There has been more and more pressure on central banks to be active in more areas than it used to: how do you see the evolution of the role of central banks? In this context, what would be the challenges to such a role for the central bank - especially in terms of transparency and accountability to the citizens?

After a long period of time where high inflation rates were not a problem, central banks are busy again with their core business, namely ensuring that inflation remains low and stable. This is the job they were created for. Other objectives are relevant too, but they will move to the background, as long as the inflation situation is not under control. And the political fights that will have to be fought to bring inflation down again will be substantial. This makes it costly for central banks to meander into policy areas that are more tangential to central bank's core objectives. Overall, if central banks pursue a broad set of objectives, they are not going to remain independent from political pressures for long. And political independence is what is needed to control inflation.



Klaus Adam is professor of Economics at the University of Mannheim. He previously held a professorship at the University of Oxford and Nuffield College and also worked for the European Central Bank. He is a member of the Academic Advisory Board of the German Ministry of Finance, Research Professor at the Deutsche Bundesbank, editor of the International Journal of Central Banking and associate editor for the Journal of Monetary Economics.

Efficient Allocations under Ambiguous Model Uncertainty

Chiaki Hara (Kyoto University), Sujoy Mukerji (Queen Mary University of London), Frank Riedel (University of Bielefeld), Jean-Marc Tallon (Paris School of Economics)

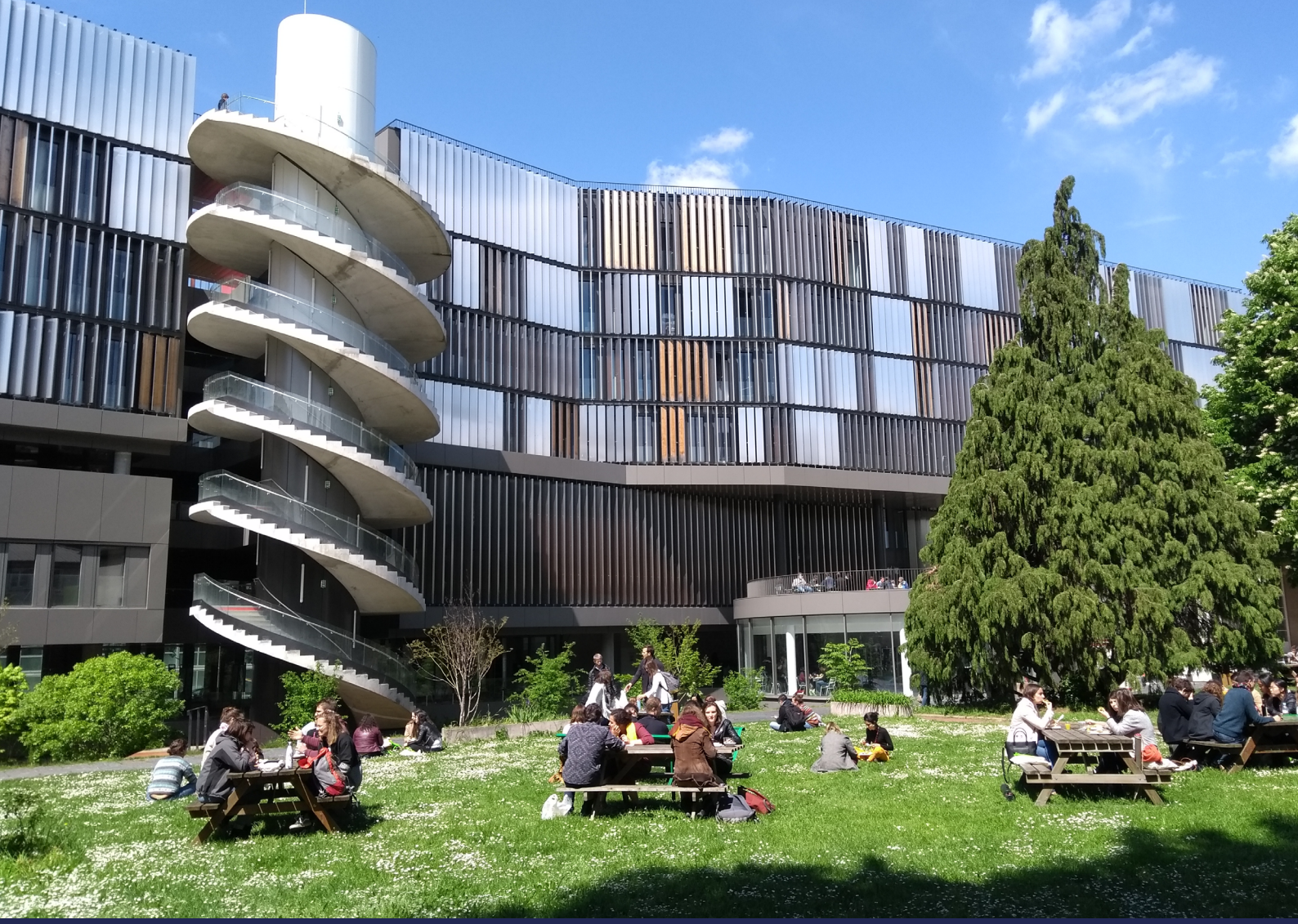
Efficient Allocations under Ambiguous Model Uncertainty, Macroeconomic Risk Chair Working Paper n°2023-09, January 2023.

In this paper, Chiaki Hara, Sujoy Mukerji, Frank Riedel and Jean-Marc Tallon investigate consequences of ambiguity on efficient allocations in an exchange economy. Ambiguity is embodied in the model uncertainty perceived by the consumers: they are unsure what would be the appropriate probability measure to apply to evaluate consumption plans, and keep in consideration alternative probabilistic laws. Importantly, the degree of ambiguity aversion can vary across consumers. This heterogeneity has key implications regarding (1) the efficient allocation, and (2) its associated pricing kernel.

The paper focuses on environments where, under expected utility, the efficient consumption sharing rule is a linear function of aggregate endowment. In contrast, when consumers feature smooth ambiguity preferences with heterogeneous ambiguity aversion, it is shown that the efficient sharing rule systematically deviates from the linear benchmark. Intuitively, it becomes efficient to provide a smoother expected utility - across models - to the more ambiguity-averse consumers. **Consequently, the efficient sharing rule favors the most ambiguity-averse consumers in the worst models - think recessions - while the least ambiguity averse consumers are favored in the best models|think expansions.** Thus, under regularity conditions, the efficient allocation tends to allocate a larger share of resources to more ambiguity-averse consumers in recessionary times.

The authors then characterize the representative consumer and use it to find implications of heterogeneity in ambiguity aversion for the pricing kernel. As the assortative matching between ambiguity aversion and worse models in the efficient allocation may suggest, if consumers are heterogeneously ambiguity averse then the representative consumer features decreasing ambiguity aversion - and not constant ambiguity aversion, as assumed in common practice. The decreasing ambiguity aversion of the representative consumer implies that the market price of risk varies more pronouncedly between states associated with worse models and states associated with more optimistic models. **In other words, the market price of risk is higher in recessionary states and lower in good states.** This property is empirically compelling since the Sharpe ratio for the U.S. aggregate stock market is countercyclical and highly volatile. More generally, ambiguity aversion is shown to increase the elasticity of the pricing kernel, thereby increasing the Hansen-Jagannathan bound.

These results are particularly relevant to analyze households who need to forecast variables such as rainfall or temperature in the context of climate change. One may also consider households who try to forecast an unobservable hidden state, high growth or low growth, given observed quarterly realizations of the GDP. A third example is that of decision making in the face of a contagion engendered by a novel virus, for which decisions have to be made before learning the exact behavior of the virus.



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