Wage rigidities in an estimated DSGE model of the UK labour market

Summary of Working Paper no. 408 Renato Faccini, Stephen Millard and Francesco Zanetti

Dynamic, stochastic, general equilibrium models examine the relationships between economic variables by using economic theory to explain the underlying behaviour of households, firms and the policymaker. They enable us to explore the effects of random ('stochastic') shocks as they work through the economy. Consequently, they have become a powerful tool in the effort to investigate how movements in economic variables relate to the behaviour of inflation. In the New Keynesian framework sticky prices imply that movements in interest rates affect real aggregates and the dynamic behaviour of inflation is driven by the cost to a firm of producing an additional unit of output. This in turn depends crucially on the structure of the labour market. The standard New Keynesian model assumes that firms can immediately adjust employment and hours to whatever levels they wish. But empirical evidence from virtually all the major industrialised countries shows that, in practice, it is costly to adjust either employment or hours as firms have to pay hiring and training costs or overtime payments. These costs will clearly affect the cost of changing output via changes in employment and hours, and so will affect the response of inflation to changes in output. In this paper, we estimate a New Keynesian model characterised by these labour market frictions using UK data and investigate how staggered wage negotiations affect both the response of inflation to changes in economic variables and the ability of the model to fit the data.

In our estimation, we find the degree to which people are willing to work is relatively unresponsive to changes in wages. This low labour supply elasticity reflects the fact that employment is more volatile than average hours. We estimate the ratio of the value of not working to average wages to be about 50%. One feature of the model is that the difficulties of matching jobs to people creates a surplus that is divided between workers and firms in a proportion depending on 'bargaining power' of workers. We find this to be close to 0.9. It follows that wages are close to the marginal product of labour. Another feature is that utility people derive from consumption depends on past consumption, or 'habits', a device that is often used to explain the persistence of economic variables. We find that habit persistence is virtually absent, so the model with frictional labour markets does not need habits to generate persistence in the variables that are

made observable to the estimation. We also find that the monetary authority raises interest rates strongly in response to increases in inflation and that they smooth interest rate changes to a degree.

We establish that staggered wage-setting enables the model to fit the data more closely. Nominal wage stickiness has important implications for labour market dynamics. However, our estimates suggest that wage rigidities are irrelevant for inflation behaviour. Although, following a shock, wage rigidities have a direct effect on unit labour cost, their effect on real marginal cost is offset by the contribution of the component related to labour market frictions. This finding stands in contrast with those obtained in standard New Keynesian models where employment and hours can be adjusted immediately and without cost. In the absence of these costs, the dynamics of inflation are only driven by the unit labour costs and so wage rigidities will automatically generate inflation persistence by making unit labour costs more persistent.

Finally, the estimated model also allows us to assess what economic factors are driving UK economic fluctuations. We find that neutral and investment-specific technology shocks are important to explain fluctuations in the data. And, we are able to provide evidence that the volatility of aggregate shocks has somewhat decreased from the mid-1990s until the mid-2000s. These findings suggest that the 'Great Moderation' in macroeconomic volatility in the United Kingdom between the early 1990s and 2008 might have resulted from a lower volatility of shocks during the past decade.

While our results do unveil key features of the UK economy, it should be noted that we were unable precisely to estimate some important parameters of the model, such as the degree of nominal wage stickiness. This suggests a need to refine the model in ways that could improve its empirical performance. Furthermore, although the model developed here allows for a variety of supply and demand shocks to have effects on the economy, in practice, a variety of other aggregate shocks may play a role. Nevertheless, the model advances our understanding of UK inflation dynamics.

The contractual approach to sovereign debt restructuring

Summary of **Working Paper no. 409**   Sergi Lanau

The resolution of sovereign debt defaults is a complex process. For instance the last Argentine default took four years to settle and over 140 lawsuits were filed against the sovereign. In order to lessen these problems, the international community has been discussing the so-called 'contractual approach' to sovereign debt crises. In short, this approach suggests that debt contracts should include additional provisions to facilitate the resolution of defaults. Two of its main innovations are collective action clauses (CACs) and seniority clauses (SCs). A CAC is a supermajority voting rule to change the payment terms of a contract. For example, 75% of creditors could impose a decision on a dissenting minority; in the absence of CACs unanimity would be required. Their policy purpose is to improve creditor co-ordination. SCs establish a priority rule to repay debts in the event of a default: junior debt is not repaid until senior debt has been repaid in full. Without SCs, all debts have the same footing. This opens the door to debt dilution and could yield under or overborrowing.

Previous work has studied CACs and SCs assuming that the amount creditors recover after a default does not depend on their actions. Instead, the focus has been on the decisions taken by the debtor (for instance regarding fiscal policy). This paper shows that creditor incentives also respond to changes in the debt contract.

In this paper, the two main elements the creditors have control over are lobbying efforts and litigation for full repayment. As regards the first element, each creditor can put individual lobbying effort to extract more repayment from the sovereign. At a later stage, creditors can also litigate for full repayment. In the model, these lawsuits do not extract more money from the sovereign, they just affect the distribution of repayment that results from lobbying efforts. Both lobbying and litigation suppose a private cost for an individual creditor engaging in either activity.

The first result that follows from this framework is that individual lobbying effort has a positive effect on other creditors (an externality): repayment increases with effort and since it is shared among all creditors according to the contract, all creditors benefit from individual lobbying. The size of creditors is one key determinant of the decision to exert effort: small creditors do not lobby but large creditors do. If a

creditor is small, the small fraction of repayment they will receive would not compensate them for the cost of lobbying. The opposite is true of a large creditor.

CACs are also important for effort decisions. If some creditors litigate for full repayment, the rest of the creditors will receive a lower payment and will thus have a weak incentive to incur the lobbying cost. Without CACs, nothing can block the litigators, but in the presence of CACs a coalition of creditors can stop a minority from going to court. Then, CACs have the property of maximising repayment after a sovereign default.

SCs change the incentives to lobby for repayment. Without SCs, all debts have the same priority to recoup repayment and, as explained above, the size of the creditor determines effort. With seniority, a creditor that is holding junior debt may have little incentive to lobby (independently of their size) because repayment will in any case go to senior debts. If these senior loans are big, there would be nothing left for the junior creditor. Then, to avoid low repayment under SCs, creditors not only have to be relatively large but also hold the right mix of junior and senior debt.

The properties of CACs are reinforced when sovereign debt can be traded in the secondary market. Without CACs, creditors are likely to use secondary markets to buy cheap debt and litigate for full repayment. With CACs, litigation is avoided and creditors use secondary markets to buy up enough debt to make lobbying profitable from an individual perspective.

It is worth stressing that this paper does not derive any welfare implications of CACs and SCs. Welfare cases can be made for and against high repayment. If a sovereign has limited access to capital markets, higher repayment in the event of a default could relax the borrowing constraint *ex ante*. In contrast, low repayment could be desirable if a country has been hit by an exogenous shock such as a natural disaster.

To sum up, this paper argues that not only debtor incentives change with innovations in sovereign debt contracts, creditors also respond to new contracts and affect debt repayment. Therefore, it is important to assess the likely response of both debtors and creditors to policy measures aimed at reducing the complexity of sovereign debt renegotiations.

Are EME indicators of vulnerability to financial crises decoupling from global factors?

Summary of **Working Paper no. 410**   Guillermo Felices and Tomasz Wieladek

Traditional indicators of vulnerability to financial crises in emerging market economies (EMEs) suggest a substantial reduction in vulnerability in recent years. Ratios associated with the onset of a crisis — such as reserves relative to short-term debt, total external debt relative to GDP and the current account balance relative to GDP — have improved significantly compared to their levels of the 1990s and at the turn of the millennium.

A careful look at the data reveals that the improvement witnessed prior to the onset of the current crisis seemed to be present across all regions, despite a great variety in economic policies and levels of development. Therefore some of the improvements in vulnerability indicators seen in EMEs in the past decade may have been driven by the contemporaneous benign global conditions experienced by the world economy.

But the improvement observed in the past decade led several economists to believe that this time was different. The improvement in these indicators of external vulnerability, it is argued, may partly reflect the reforms in macroeconomic policies and institutional frameworks following the financial crises of the past two decades, such as the broad movement towards inflation targeting, flexible exchange rate regimes, the rapid growth of local currency bond markets, the diversification of the investor base, as well as better management of the composition of government debt by individual countries.

Investors and policymakers find it very difficult to disentangle whether these improvements were due to good luck or good policy. Better policies may lead to a permanent improvement in the resilience to adverse external economic shocks. If most of the improvement was driven by global factors on the other hand, vulnerabilities could re-emerge as global factors revert. Some questions then deserve careful attention. To what extent are the indicators of EMEs' external vulnerability driven by external factors? Is this link weakening or strengthening over time?

In this study we attempt to answer these important questions. Economic reforms and globalisation can change the exposure of vulnerability indicators to global factors. On the contrary, robust macroeconomic policy frameworks, such as 'leaning against the wind', could lead to a 'decoupling' from the global factor. We examine both international reserve growth and real exchange rate appreciation for decoupling, as previous studies found these to be the two most useful vulnerability indicators in predicting financial crisis across different countries and crisis episodes. Our results suggest that, on average, 60% of fluctuations in a given country's vulnerability indicators can be explained by global factors. Furthermore, we do not find strong evidence of decoupling in most EMEs during the past decade, implying that most of the improvement in vulnerability indicators has been driven by global factors.

Low interest rates and housing booms: the role of capital inflows, monetary policy and financial innovation

Summary of Working Paper no. 411   Filipa Sá, Pascal Towbin and Tomasz Wieladek

The run-up to the 2008 global financial crisis was characterised by an environment of low interest rates and a rapid increase in housing market activity across OECD countries. Some scholars argue that expansionary monetary policy has been significantly responsible for the low level of interest rates and the subsequent house price boom. Others contend that a scarcity of financial assets led to capital inflows to developed economies, depressing long rates in government bond markets and stimulating an increase in demand for housing. A third school of thought maintains that excessive mispricing of risk associated with financial innovation has led to a misallocation of capital to the real estate sector through securitisation, exacerbating the effect of interest rate movements on housing activity.

Each of these explanations has different policy implications. Should policymakers try to address external imbalances, increase financial regulation or redesign the monetary policy framework to prevent future crises? To shed light on this question, we analyse the impact of both monetary policy and capital inflows shocks on the housing sector across 18 OECD countries. We also assess whether the degree of mortgage market development or legislation permitting issuance of mortgage-backed securities amplify or dampen the impact of these shocks on the housing sector.

Our results suggest that both monetary policy and capital inflows shocks have a significant and positive effect on house prices, credit to the private sector and residential investment. The effects of both shocks are greater in countries with a higher degree of mortgage market development, with the effect of monetary policy shocks roughly doubling. This suggests that excessive financial innovation may act as a propagation mechanism. The existence of mortgage-backed securities has a much larger effect on the transmission of capital inflows shocks. Legislation permitting the issuance of mortgage-backed securities increases the impact of capital inflows shocks on real house prices, real residential investment and real credit to the private sector by a factor of two, three and five, respectively. These results suggest that persistent capital inflows, coupled with securitisation, played a significant role in the housing booms observed in some countries in the run-up to the financial crisis.

Mapping systemic risk in the international banking network

Summary of Working Paper no. 413   Rodney J Garratt, Lavan Mahadeva and Katsiaryna Svirydzenka

An astonishing feature of the 2008 financial crisis was how quickly and extensively the relatively small write-downs in US sub-prime mortgages spread to a situation where only two years later governments worldwide had to provide massive support to their banking systems. International banks played a key role in transmitting contagion through their claims on each other. This paper examines how the interconnectedness of the international banking system impacts the threat of systemic risk in the international banking network.

Cross-sectional systemic risk is the potential for shocks that hit one part of the system to be transmitted to the rest of the system. This potential can be analysed in a variety of ways. However, all approaches look at connections between different entities that are reflected in their balance sheets. A straightforward approach is to simulate shocks to bank balance sheets and examine the repercussions. However, this involves making many assumptions about the type and size of shock, how widespread it is, and how banks adjust to its occurrence. Our approach abstracts from specific details about shocks and looks more at the contagious capacity of the network.

The data we use are the 420 external claims that 21 international banking groups held on each other for each quarter over nearly 25 years. This data set was compiled by the Bank for International Settlements and banking groups are defined by the country where banks do their business.

The aim is to simplify the raw data on claims and liabilities into a map that succinctly summarises how financial contagion moves between international banking groups. We begin by specifying a network of financial linkages in which banks transmit stress to each other via two channels, a funding channel and a lending channel. Stress is transmitted through the funding channel when a bank refuses to rollover a loan and it is transmitted through the lending channel when a bank defaults on a loan. We then apply a network clustering technique developed by physicist Martin Rosvall and biologist Carl Bergstom to determine the most parsimonious yet accurate description of the network that can be used to map the movements of an imaginary traveller, whom we refer to as Mr Contagion. Because this approach is based on tracking movement, it is well suited to help draw a map for the contagion of financial stress.

Under this approach, clusters are formed when stress travels between the members of a cluster with sufficiently greater intensity than it does to the banking groups outside the cluster. As such, a cluster can be thought of as a collection of banking entities that are so interconnected that they can be treated as one group.

Clustering is done at each date from 1985 Q1 to 2009 Q3. The changes in clustering that are observed capture well-known changes in the international banking landscape that have occurred over the past quarter century. In the late 1980s, Japanese resident banks expanded their overseas operations and this move is reflected by the inclusion of Japan in a large supercluster, along with the United Kingdom, the United States and the Cayman Islands. That cluster breaks up by the beginning of the 1990s due to the emergence of the Japanese banking crisis. Over the next decade and a half, European banking groups increase in relative importance and accordingly we see many smaller, but still influential, clusters appear in our maps.

Changes in clustering only tell part of the story. We also examine the extent to which the international banking network became more broadly contagious over time. To do this it is necessary to choose a benchmark modular structure and examine changes in the extent to which contagion spreads out of the fixed clustering. The benchmark we use is the clustering for 1989 Q3 when the United Kingdom, Japan, the United States and the Cayman Islands were combined into one module. This allows us to see how the systemic risk associated with financial problems that originate within these major financial centres increased over time. The amount of contagion flowing outside the fixed modules from 1989 Q3 increased since the end of the 1980s and it peaked in 2008 Q2, just before Lehman Brothers' default, but still remains at a relatively high level.

It is important to understand that our results cannot be used to infer anything about the current riskiness of the system. The reason for this is that our contagion analysis only concerns the cross-sectional component of systemic risk and offers no insights as to changes in the average quality of banks' balance sheets over time.

A Bayesian approach to optimal monetary policy with parameter and model uncertainty

Summary of Working Paper no. 414   Timothy Cogley, Bianca de Paoli, Christian Matthes,
Kalin Nikolov and Tony Yates

It is widely acknowledged by policymakers and academics alike that uncertainty is pervasive in monetary policy making. This paper implements a recipe for dealing with the many types of uncertainty that confront monetary policy in a systematic way. It deals with uncertainty about the shocks hitting the economy; about the parameters that propagate shocks from one period to the next; and about what model best explains the world. We find the optimal policy by going through the following steps: first, we consider a candidate scheme for monetary policy. Then we work out what social welfare would turn out to be on average, if that policy were pursued, based on the chances of each of the possible outturns for the aspects of the world about which we are uncertain. We repeat this exercise for all candidate monetary policies, and then choose the one that yields the best outcome on average. In the recipe that we follow for finding the optimal policy, our estimate of the chance of the different outcomes for uncertain objects explicitly combines information from the data and information from other sources, such as our prior beliefs. In our application these priors could be used to express beliefs of the policymakers themselves, or could be given to us by a particular model, which rules out some outcomes as inconsistent with the model. In allowing for the incorporation of prior beliefs our approach is explicitly 'Bayesian', as it is essentially driven by Bayes' famous statistical rule that sets out how to update prior beliefs in the light of new evidence.

We make two shortcuts relative to an approach that would be truly optimal and truly Bayesian. First, we restrict attention to monetary policy schemes that involve the policy rate responding to a small number of observables in the model like inflation and output. Second, we rule out experimentation by policymakers. Other work has illustrated that there are (small) gains to be had from injecting otherwise unwarranted volatility into the economy since this acts to reveal more precisely how the economy works to the policymaker. We ignore experimentation partly for simplicity, partly because we do not lose much by making this shortcut (in the sense that policies inclusive of a motive for experimentation are shown not to be too different from those that exclude it), and partly because many policymakers have ruled out experimentation with the macroeconomy on the grounds that it is either hazardous or unethical.

We capture the model uncertainty facing policymakers by estimating four different models of the UK economy. This small suite is designed to encompass competing approaches to macroeconomic modelling. Some of the models are dynamic stochastic general equilibrium (DSGE) models — in which the laws of motion for aggregate variables come from working out how individual agents in the economy would solve the problems they face — and some are not. One model articulates frictions in financial markets, the others do not. One model explicitly describes an open economy, the others do not. Most models encode rational expectations — the assumption that agents in the model know as much as the economists who designed it — but one does not, and is sometimes viewed as a model of backward-looking agents. One model encodes a substantial degree of inertia in inflation, the others do not.

We find that optimal policy differs substantially across the different types of models. Optimal policy in the backward-looking model is for very stable interest rates. Interest rates are recorded to have little effect on goal variables in that model, and the dominant motive is to avoid fluctuations in the interest rate which we assume to be inherently costly. By contrast, in the DSGE rational-expectations models, optimal policy responds much more actively to fluctuations in inflation in particular. We find that these models give very bad outcomes if they are simulated with the policy that would have been optimal in the backward-looking model. Conversely, the backward-looking model gives much better outcomes if we simulate that model with the policy tailored to the DSGE models. The backward-looking model is therefore observed to be more tolerant of policies that deviate from the one that is optimal for that model. This has a bearing on the policy that we find is optimal for the suite as a whole. That policy tends to be tilted towards the policy that is optimal for the DSGE models, since in the event that they turn out to be true they will perform very badly if monetary policy is not sufficiently tailored to their demands, and the benefits from doing this outweigh the smaller costs of conducting a policy that is not suited to the backward-looking model.