BANCO DE PORTUGAL
EUROSYSTEM

18

SPILLOVERS

Research in Economics at Banco de Portugal • Biannual • Year X • July 2022

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Overview

This year marks the 10th anniversary of the launch of *Spillovers*, the bi-annual research newsletter of the Banco de Portugal. The challenging environment in which central banks operate and the growing complexity of their activities increases the relevance of research departments and the importance of novel and impactful research. However, there is equally a commitment to effectively communicate and enhance the visibility of research, and in this regard, the newsletter has played a paramount role in reporting Banco de Portugal's research outputs and activities.

Spillovers discloses regular updates on publications in international journals and other research related activities. Based on the JEL codes of the publications listed in Spillovers, the main categories of publications over this 10-year period, have been Macroeconomics and Monetary Economics; Financial Economics; Mathematic and Quantitative Methods; International Economics; and Labor and Demographics Economics. This is according to Molovana et al. (2020)[1], in line with most European central banks and US Feds. The authors suggest that the first two categories reflect the two main objectives (price and financial stability), and the two main sets of instruments (monetary policy and prudential policy) generally assigned to central banks. The third category reflects the strong rigorous basis of the policy decision-making process in central banks, and consequently the need for quantitative research inputs for policy discussion.

In addition, contributions to other fields such as Microeconomics; Urban, Rural, Regional, Real Estate and Transportation Economics; Public Economics; Industrial Organization; and Health Education and Welfare have also been made.

1 S. Malovana, M. Hodula and Z. Rakovska, 2020. "Researching the Research: A Central Banking Edition," Research and Policy Notes 2020/03, Czech National Bank.

Given the recognized importance of the openness, interaction and cooperation with other active researchers to develop high quality research, the Bank maintains a consistent and reputable series of internal and external seminars, and the regular organization of scientific conferences. 2022 has been a particularly active year (summaries are provided in this issue of *Spillovers*). The first was a Workshop on Labour Economics, June 20-21, which was jointly organized with Banco de España. This Workshop is planned to be organized every two years (rotating between Portugal and Spain). This years' edition had the participation of several internationally renowned labour economists, including Nobel Laureate (2021) David Card. The second, New Trends and Developments in Econometrics, July 1-2, covered econometric topics relevant for banking, finance, macroeconomics and microeconomics. The third, the 8th Banco de Portugal Conference on Financial Intermediation, July 15-16, focused on the cost of debt financing, climate change and financial intermediation after the Great Recession. In addition, the Bank also hosted on July 5-6 the 11th MoFiR Workshop on Banking.

The Bank strives to maintain its research contributions and activities open to the research community and society in general, to constantly contribute to increase the Bank's national and international reputation. *Spillovers* will continue to play an important role in the promotion, communication and reporting of research outputs with the aim to establish greater connections with researchers and the wider economic and research community. As stated in the overview of the first issue of *Spillovers* in 2013 written by Nuno Alves and Mário Centeno, *The strength of research at Banco de Portugal lies in the quality of its staff*, and we trust now as was trusted then that this quality will continue to translate into relevant *Spillovers*.

Paulo M. M. Rodrigues

Interview

Esther Ruiz • Professor of Econometrics at the Department of Statistics, Universidad Carlos III de Madrid and Senior Editor of the International Journal of Forecasting (https://sites.google.com/view/esther-ruiz-ortega)

Considering your field of research, which are the new developments/research directions in econometrics you consider the most relevant over the next 5 years?

Indeed, one of the main objectives when analysing economic and financial variables observed over time as, for example, inflation, unemployment or growth, is to forecast their future evolution. These forecasts are crucial for policy makers and investors as, for example, when constructing the national budget or deciding about a future investment. Over the last years, researchers have been including measures of the uncertainty surrounding forecasts to have a complete characterization of the variables of interest. Future values of economic and financial variables are subjected to a large number of shocks and, consequently, a realistic forecast should include a set of possible realizations together with their probabilities of occurrence, what is known as the conditional density function (conditional because it can depend on the past evolution of the variable of interest or of the other related variables). In 1997, the Bank of England introduced the "fan chart" where forecasts of the conditional density function of inflation in the United Kingdom are displayed. Since then, accurate estimation and forecast of conditional density functions became one of the goals of policy makers and investors wanting to design optimal policies. However, in uncertain times (pandemics, wars, climate change), forecasting conditional density functions becomes more difficult than ever. It is important that econometric research put the focus on tail forecasting, i.e. forecasting of potential realizations of the variables of interest with low probability of being finally observed. Developing the methodology appropriate to forecast conditional density functions in the presence of extreme events, such as wars or pandemics, is challenging because one should use instruments able to deal with the simultaneous presence of nonlinearities and structural changes. Machine Learning procedures can be useful in this direction.

Also, it is important for the econometric methodology to develop instruments which are able to establish what the main factors behind the conditional densities of the variables of interest are and to forecast when these factors are stressed. Designing the response of the variables of interest in the presence of stressed factors can be fundamental for the construction of realistic scenarios and counterfactual analysis. These instruments will be useful to measure risks and to design of strategies to strengthen the resilience of the economy.

Big data is becoming a hot topic in Economics and Econometrics. What are in your opinion the potential opportunities and challenges that Big data will create for Econometrics?

Nowadays Big Data is available in a large number of areas related to economics. We encounter big data in the form of web scraped data, mobility data, credit card transactions, scanner prices and text-based indicators, data collected by smart sensors at home, among many others. Big Data refer to data sets characterized by what is known as the four Vs: volume, variability, velocity and veracity. Each of these characteristics represent challenges and opportunities. Let us consider first volume. Due to the large volume of data, Big Data can often exceed typical storage, processing and computing capacity of conventional databases and of standard data analysis techniques. However, this large volume also presents opportunities for economists and policymakers to learn about economic choices with a higher degree of precision. Using big data can be extremely useful to deal with questions which were difficult to be answered before.

When talking about variability and velocity of Big Data, the main challenge is that raw data is increasingly diverse and complex and it is observed at an increasing rate. Therefore, heterogeneity and nonlinearities are expected, which may require new econometric skills. Furthermore, note that Big data can be short in the time dimension making it difficult to identify trends or seasonal patterns in the data. At the same time, the diversity and velocity of the data, make it perfect for problems in which standard data can have problems because it is observed in an aggregate fashion and with a rather long delay. I am thinking about the usefulness that Big Data has already shown for problems such as nowcasting or to explain the economic evolution during the Covid pandemic. Note that Big Data is often considered in isolation rather than in addition to more standard indicators. It is worth more research in this direction.

Finally, an important challenge of Big Data is related with veracity, i.e. the usefulness of the results obtained using it. The econometrician can face important challenges related to data quality issues. For example, she can encounter selection biases depending on how and by whom data are being generated. Researchers need checks to avoid

unintentional biases. Furthermore, it is also important to remark that these data may involve partnering with firms that may eventually limit researcher freedom.

Machine Learning in Economics is establishing itself as an interesting and useful field of research. How do you see the future co-existence of Machine Learning and Econometrics?

I see a brilliant and necessary co-existence between Machine Learning (ML) and Econometrics. On the one hand, ML procedures should be incorporated in the toolkit of modern econometricians who do not want to be left behind in a world where Big Data is all around. ML has shown to be very useful to deal with difficult problems involving nonlinearities, time-varying parameters or heterogeneity. There is evidence about techniques based on random forest type models being particularly useful for in macroeconomic forecasting, while standard models based on Least Squares, Maximum Likelihood or Bayesian inference performing poorly, with nonlinearity being the true game changer for prediction. For example, it seems that the most promising avenue for economic forecasting during the pandemic is to allow for general forms of nonlinearity by using ML procedures. On the other hand, ML tools focus mainly on prediction with interpretability and causal inference having a marginal role. Econometricians know how models should be interpreted and how to construct and test causal statements. Consequently, their skills are highly valuable in expanding ML algorithms to perform better causal inference.

What are in your opinion the pros and cons of making powerful, user friendly and (too) easy to use statistical software widely available?

The pros are obvious as the availability of easy to use statistical software allows a wide range of researchers and policymakers to be able to analyse data and, consequently, a more informed knowledge about the economic activity will be possible. However, from my point of view, there are two dangers for this availability. First, according to my experience as editor of an international academic journal focused on forecasting, some researchers may use the software without having a deep knowledge of the statistical instruments behind it and, consequently, the chances for erroneous and/or misleading conclusions increase. The second con that I have observed is the possibility of bugs. As there is no responsibility about the software, which is not exploited from a commercial point of view, the possibility of bugs increases. Similarly, unless there is a strong community behind the software, there is no guarantee that new technical developments are going to be incorporated and the software may become obsolete with time.

Interview

Sílvia Gonçalves • Professor of Economics at the Department of Economics of McGill University and co-editor of the Journal of Financial Econometrics (https://www.mcgill.ca/economics/silvia-goncalves)

Considering your field of research, which are the new developments/research directions in econometrics you consider the most relevant over the next 5 years?

My research area within econometrics is the bootstrap. This statistical method of inference substitutes complicated analytical formulas for simulation-based computations and often outperforms inference based on asymptotic distributions. As the models and data structures used in economics and finance become more complex, new bootstrap methods are required. Many of the recent developments in the bootstrap literature in econometrics revolve around this need. For instance, bootstrapping panel data models requires replicating the time series and cross sectional dependence in the data, invalidating a simple application of the i.i.d. bootstrap. In addition, the presence of fixed effects creates bias that is often hard to estimate analytically. The bootstrap can replicate this bias if implemented appropriately. Similarly, accounting for spatial and more generally cluster dependence in the bootstrap samples requires special methods and there is a recent growing literature on this topic.

Big data is becoming a hot topic in Economics and Econometrics. What are in your opinion the potential opportunities and challenges that Big data will create for Econometrics?

The availability of big data opens up new possibilities for how empirical work is conducted. For example, instead of the traditional practice of using value and quantity data collected from surveys designed by government agencies to construct price deflators, it is now possible to utilize scanner data that detail the prices of individual products purchased by consumers. Other examples of new data include transactions data for auctions and stock trades, which can be used to study the efficiency of markets, and social media data, which can be used to investigate consumer expectations and sentiment. While the recent emergence of big data creates new opportunities for economists, it also creates many challenges. Many of the tools that have been developed for big data are predictive in nature, and, as such, lack the structure that is needed for economic interpretation. A natural next step is to build on this past work of data scientists and statisticians to develop methods that are useful for economic analysis.

Machine Learning in Economics is establishing itself as an interesting and useful field of research. How do you see the future co-existence of Machine Learning and Econometrics?

Machine learning offers sophisticated computing algorithms that can be used with big data. A very nice survey of the co-existence of machine learning and econometrics is Mullainathan and Spiess (2017) ("Machine Learning: An Applied Econometric Approach", *Journal of Economic Perspectives*, Vol. 31, 87-106). Machine learning algorithms target prediction. This explains why its application in finance is so popular. When inference on (structural) parameters is the main focus, machine learning algorithms can still be useful, especially when inference involves a pre-processing step that involves prediction. One example is the first step of an instrumental variable regression, where machine learning algorithms can be used to generate the predicted values of the endogenous variables using many instruments.

What are in your opinion the pros and cons of making powerful, user friendly and (too) easy to use statistical software widely available?

The pros is that more people can easily apply the new tools. The danger is that these tools are used as black boxes and the output is difficult to interpret and replicate.

In every issue, we ask experts to briefly present and discuss two papers written by staff members. In this issue, the guest is Prof. Ana Fernandes

Ana Fernandes is Full Professor of economics at the Bern University of Applied Sciences. Her research work has covered macro and agency problems as well as imperfections in financial markets. As of late, her research broadly focusses on the topic of gender inequality in the labor market and spans a wide variety of issues: from gender discrimination in hiring to finding inclusive solutions to raise the presence of girls and women in technological fields.

Featured published paper

Kozeniauskas, Nicholas, Pedro Moreira, and Cézar Santos. 2022. "On the cleansing effect of recessions and government policy: Evidence from COVID-19." *European Economic Review*,144: 104097.

The notion that recessions may have a cleansing effect — moving resources from the least productive to the most productive firms — and hence raising overall productivity goes back a long time in economics. The COVID-19 pandemic presents itself as a very interesting test period for the presence of such cleansing effects with one important caveat: the role of economic policy. Because the limitations to economic activity were largely unprecedented (consider for example the second quarter of 2020), governments in most developed countries deployed a host of measures targeted at limiting bankruptcies in order to ultimately protect employment. If successful, exit prevention would have dampened or altogether eliminated the potential cleansing effect of the pandemic-induced recession.

Using firm level data covering the universe of Portuguese firms coupled with a survey implemented during the second quarter of 2020, Kozeniauskas, Moreira and Santos (2022) proficiently address these questions. They first examine whether the recession directed resources (e.g. employment and sales) toward more productive firms, an instance of the cleansing effect of recessions; that having been the case, they proceed to verify whether this reallocation of resources was potentiated by the policies or hampered by them. The latter possibility would be indicative of there having been a stifling impact from those policies.

Their results indicate that higher-productivity firms reduced their employment less, during the recession, and, while sales outcomes were similar across the productivity distribution, higher-productivity firms were more successful at avoiding closures. These regularities are consistent with the recession having a cleansing effect. Importantly, the relationship between productivity and employment is not driven by differential access to the governmental paid furlough policy (a policy for which high productivity companies were likely less eligible and which could make employment reductions costlier for them). Further, they also document that higher productivity firms were less likely to tap onto any of the recession specific policies (such as debt moratoria, governmental credit lines and tax deferrals, in addition to the previously mentioned paid furlough policy).

In an additional step, they show that higher productivity was a factor reducing firm exit previous to the recession. However, the strength of this beneficial effect of productivity on firm exit became lower during the recession. This means that high productivity became less of an advantage in being able to avoid exit.

Taken together, Kozeniauskas et al. interpret these results as evidence that the governmental policies limited the cleansing effect of the recession: they were used more intensively by less productive firms and this would have allowed those firms to hang on to the market relatively longer by comparison with more productive companies.

Featured article from *Banco de Portugal Economic Studies*

Joana Cima, Ana Catarina Pimenta, Miguel Portela and Marta Silva (2022) "Workforce skills and firm productivity, *Banco de Portugal Economic Studies*.

How do the skills of individual workers impact firm productivity? And does it matter if the workforce is very heterogeneous within firms? Answering these questions would shed light on the underlying causes of overall productivity differences across firms.

While one would expect the skill level of individual workers to have a positive effect on firm productivity, the impact of skill dispersion within companies is less obvious: skill dispersion may have a positive effect on productivity provided the impact of knowledge transfers from most to least skilled workers outweighs potential free-riding effects.

One important step in evaluating the impact of average skills and their dispersion on productivity is the measurement of skills themselves. The literature has proposed several approaches to the measurement of worker skill and its dispersion. The existing approaches have important limitations which Cima, Pimenta, Portela and Silva (2022) skillfully address.

One first step is to consider the components of worker skill. Education and experience or age are natural sources of skill variation — although factors specific to the worker/firm combination are also likely to have an important impact on productivity. Relying on a very detailed panel for Portuguese companies, Cima et al. estimate an index of worker skill which incorporates three different worker dimensions: age, education, and the worker's unobserved ability. The latter is measured as an individual fixed effect from a wage equation which incorporates company and worker fixed effects. This skill index measure has the advantage of incorporating all three potential drivers of worker skill. Further, the estimate of worker ability takes into consideration potential firm/worker unobserved heterogeneity.

Using this index, they proceed to examine the impact of the average level of skill and its dispersion (at the firm level) on firm productivity — measured as value added per worker. In line with the literature, they find that the average level of skill in a company is positively related to the firm's productivity whereas the standard deviation of the distribution of firm skill relates negatively to company productivity. Specifically, a one standard deviation increase in the average worker skill is associated, on average, with an increase in firm productivity of approximately 3.5%. (The corresponding effect for the standard deviation is -0.6%). Moreover, these effects are statistically significant. The results are robust to a thorough sensitivity analysis.

Finally, they examine whether the relationship between skill (average and dispersion) varies at different levels of firm productivity. They proceed to evaluate this question by running separate regressions at different percentiles of the conditional productivity distribution.

They find that the relation between average skill level and productivity intensifies in more productive percentiles; for the dispersion of skill, they do not detect varying effects along the conditional productivity distribution.

Recently published

Our economists publish in a wide range of economic and finance journals and scholarly books.

General Economics and Teaching

Forthcoming

- Guimarães, P. and Barbosa, M. (2022). "The state of Portuguese research in economics: 20 years after". *Portuguese Economic Journal*. JEL Codes: A10.

Mathematical and Quantitative Methods

- Demetrescu, M. and Rodrigues, P. M. M. (2022). "Residual-augmented IVX predictive regression". *Journal of Econometrics*, 227 (2), 429-460. JEL Codes: C12, C22, G17.
- Demetrescu, M., Georgiev, I., Rodrigues, P. M. M. and Taylor, A. M. R. (2022). "Testing for episodic predictability in stock returns". *Journal of Econometrics*, 227 (1), 85-113. JEL Codes: C12, C22, G17.

Forthcoming

- Demetrescu, M., Georgiev, I., Rodrigues, P. M. M., and Taylor, A. M. R. (2022). "Extensions to IVX methods of inference for return predictability". *Journal of Econometrics*. JEL Codes: C12, C22, G17.

Macroeconomics and Monetary Economics

- Brotherhood, L., Calvalcanti, T., Da Mata, D., and Santos, C. (2022). "Slums and Pandemics". *Journal of Development Economics*. 157, 102882. JEL Codes: E17, I10, I18, D62, O18, C63.

- Kozeniauskas, N., Moreira, P., and Santos, C. (2022). "On the cleansing effect of recessions and government policy: Evidence from Covid-19." *European Economic Review*,144: 104097. JEL Codes: E24, D22, H81.

Forthcoming

- Brotherhood, L., and Santos, C. "Vaccines and Variants: A Comment on "Optimal Age-Based Vaccination and Economic Mitigation Policies for the Second Phase of the Covid-19 Pandemic". *Journal of Economic Dynamics and Control*. JEL codes: E17, C63, D62, I10, I18.
- Valle e Azevedo, J., Ritto, J., and Teles, P. "The Neutrality of Nominal Rates: How Long is the Long Run?". *International Economic Review*. JEL Codes: E31, E32, E52, E58.

Financial Economics

- Raposo, C., Custódio, C., and Bonfim, D. (2022). "O financiamento das PME portuguesas". Fundação Francisco Manuel dos Santos. JEL Code: G38.

Forthcoming

- Bonfim, D., Cerqueiro, G., Degryse, H., and Ongena, S. (2022). "On-site inspecting zombie lending", *Management Science*. JEL Codes: G21, G32.

Public economics

Forthcoming

- Hernández, A., Picos, F., and Riscado, S. (2022). "Moving towards fairer regional minimum income schemes in Spain". *Journal of European Social Policy*, vol.0 (0) pages 1-15. JEL Codes: H53, H75, I38.

Labor and Demographic Economics

- Hartog, J., Raposo, P., and Reis, H. (2022). "Fluctuations in the wage gap between vocational and general secondary education: lessons from Portugal." *Journal of Population Economics*, vol. 35(2), pages 643-675, April. JEL Codes: J31, I26.

Urban, Rural, Regional, Real Estate, and Transportation Economics

- Huget, R., Lourenço, R. F. and Rodrigues, P. M. M., (2022). Chapter: Exuberance and contagion in the Portuguese housing market: A perspective on disaggregate local residential prices. in *"The real estate market in Portugal: Prices, rents, tourism and accessibility".* Rodrigues, Paulo M. M. (Eds.), Fundação Francisco Manuel dos Santos, 27-48. JEL Codes: R15, R21, C32

New titles in the *Occasional Papers* series

Climate change and the economy: an introduction • António Antunes, Bernardino Adão, João Valle e Azevedo, Nuno Lourenço and Miguel Gouveia. JEL Codes: E21, E60, F40.

This work presents in an accessible way the functioning of the natural climate system and the mechanisms through which global warming occurs. The warming of the Earth's surface and the evolution of precipitation throughout the 20th century are documented, including for the Portuguese case. The channels of transmission of climate change to the economy are also analysed. The likely impact on the level of global GDP is negative, with a range of estimates very sensitive to the occurrence of phenomena that are difficult to predict. It also discusses economic policy proposals addressing the problem of fossil carbon emissions. Significant carbon taxation will likely have to coexist with the existing carbon emission permit system. The role of central banks in mitigating the effects of excessive CO_2 emissions is analysed, highlighting regulatory reporting with a focus on environmental issues and the assumption of concerns related to sustainability and corporate responsibility. Finally, model-based estimates of economic costs associated to

climate change are presented. In this example, we conclude that the adoption of an optimal global policy would save Portugal about 0.5º C of warming.

Modelling the financial situation of Portuguese firms using micro-data: a simulation for the COVID-19 pandemic • Ricardo Martinho, Francisco Augusto, Carla Marques

We develop a model to simulate firms' balance sheet, income and cash statements and we use it to study the Portuguese firms' financial situation in the aftermath of the COVID-19 shock (2020-2023 horizon). After a significant negative shock to firms' activity in 2020, firms' aggregate profitability recovers until 2023, when it surpasses the pre-pandemic level. During this period, the firms' aggregate capital ratio increases marginally while the cash ratio rises significantly. The increase in the dispersion of firms' financial ratios points to increasing insolvency risks in worst performing firms, particularly for smaller firms and firms in sectors most affected by the pandemic crisis. The proportion of firms with negative equity or insolvent between 2020 and 2023 rises. However, the increase in firms with negative equity is smaller than in the sovereign debt crisis period (2010-2014). The increase is less pronounced when the metrics are weighted by firms' total assets. These results are robust to numerous changes in model assumptions and parameters.

A composite firm-level competitiveness indicator • Fernando Martins, Hugo Reis, Manuel Coutinho Pereira, Rita Ponte, Eva Pereira, Ana Martins, Cloé Magalhães, Mário Lourenço

Based on microeconomic data from companies' financial statements, this report presents an Enterprise Competitiveness Indicator (ECI) at the firm level. The ECI aggregates six relevant dimensions for the analysis of competitiveness: return, production costs, productivity, access to resources, risk and quality orientation. Information available allows the calculation of the indicator for five European countries (Portugal, Spain, France, Italy and Belgium), in the period between 2008 and 2018.

The results obtained show that in the period under analysis, the median value of the ECI for Portugal was always below that recorded in the other four countries considered, although this divergence has decreased in recent years. The differential between the competitiveness of Portuguese firms relative to their European counterparts is determined mostly by the dimensions associated to productivity, access to resources and, to a lesser extent, quality orientation. The relative position of the ECI for Portugal does not change substantially when the analysis is carried out by firm size or sector of activity, with the exception of electricity, gas and water, where the indicator is in an intermediate position vis-a-vis the other four countries considered.

This Occasional Paper is only available in Portuguese for the time being.

New titles in the *Working Papers* series

Technical working papers intended for publication in leading finance, economics and econometrics journals. Find here the complete list of working papers.

Business cycle clocks: Time to get circular • António Rua and Nuno Lourenço

Assessing the momentum of the business cycle is of utmost importance for policymakers and private agents. In this respect, the use of business cycle clocks has gained prominence among national and international institutions to depict the current stage of the business cycle. Drawing on circular statistics, we propose a novel approach to business cycle clocks in a datarich environment. The method is applied to the main euro area countries resorting to a large dataset covering the last three decades. We document the usefulness of the circular business cycle clock to capture the business cycle stage, including peaks and troughs, with the findings being supported by the cross-country evidence.

The Augmented Bank Balance-Sheet Channel of Monetary Policy • Carla Soares, Diana Bonfim, Farzad Saidi, Glenn Schepens, Florian Heider and Christian Bittner

This paper studies how banks' balance sheets and funding costs interact in the transmission of monetary-policy rates to banks' credit supply to firms. To do so, we use credit-registry data from Germany and Portugal together with the European Central Bank's policy-rate cuts in mid-2014. The pass-through of the rate cuts to banks' funding costs differs across the euro-area currency union because deposit rates vary in their distance to the zero lower bound (ZLB). When

the distance is shorter, banks' financing constraints matter less for the supply of credit and there is more risk taking. To rationalize these findings, we provide a simple model of an augmented bank balance-sheet channel where in addition to costly external financing, there is screening of borrowers and a ZLB on retail deposit rates. An impaired pass-through of monetary policy to banks' funding costs reduces their ability to lever up and weakens their lending standards.

Optimal cooperative taxation in the global economy • Pedro Teles, Juan Pablo Nicolini and V. V. Chari

How should countries cooperate in setting fiscal and trade policies when government expenditures must be financed with distorting taxes? We show that even if countries cannot make explicit transfers to each other, every point on the Pareto frontier is production efficient, so that international trade and capital flows should be effectively free. Trade agreements must be supplemented with fiscal policy agreements. Residence-based income tax systems have advantages over source-based systems. Taxing all household asset income at a country-specific uniform rate and setting the corporate income tax to zero yield efficient outcomes. Value-added taxes should be adjusted at the border.

How Bad Can Financial Crises Be? A GDP Tail Risk Assessment for Portugal • Duarte Maia, Marina Feliciano and Ivan De Lorenzo Buratta

By monitoring the evolution of risks to economic activity over time, we quantify the likelihood and severity of future negative economic growth. Following the Growth-at-risk approach, we explore the non-linear relationship between the current financial situation and the distribution of future GDP growth for Portugal. We find that both financial vulnerability and risk have a negative effect on the left tail of the one-year-ahead GDP growth distribution. Financial vulnerability has the largest impact on GDP growth at the medium to long term horizon while financial risk is only significant at the short term horizon. The GDP-at-risk measure signals economic recessions, no matter whether fueled by financial stress or imbalances, reaching negative values before 2008 and stagnating at low levels before the European Sovereign Debt Crisis. To provide policymakers with better tools to signal an increase in the likelihood of a crisis, we compute a set of complementary risk measures. Among those analyzed, the distance between the tails of the conditional distribution of GDP growth complements GDP-at-risk in anticipating economic recessions since it signals the Great Financial Crisis with a clear downward trend before 2008. The moments of the GDP growth distribution have some power in signalling recessions, as they identify changes in the characteristics of the distribution. Finally, we argue that the expected shortfall and longrise can complement the GDP-at-risk measure since they encompass information which is not limited to a single percentile of the distribution.

Comparing estimated structural models of different complexities: What do we learn? • José R. Maria and Paulo Júlio

We estimate various models of different complexities for the Portuguese economy. These differ along three key dimensions: the disaggregation of the final goods structure, the existence of a financial sector, and the complexity of the fiscal environment. Simpler models do get the key bullet points of storytelling right, but exacerbate the role of existing mechanisms. More complex models adress this problem, at the cost of greater potential mispecification. A more complex fiscal environment introduces a rule that adjusts labor taxes according to deviations in the fiscal balance from a target level. This mechanism may cushion or enhance the effects of other disturbances. The financial sector originates important differences in impulse responses, driven by inflationary domestic pressures that trigger a reduction in the real cost of credit. Many estimation outcomes are largely indistinguishable across models, such as smoothed shocks, standard deviations, and correlations with output growth.

Survival of the fittest: Tourism Exposure and Firm Survival • Hugo Reis, Paulo M.M. Rodrigues and Filipe B. Caires

In this paper, we estimate a discrete-time hazard model to study firm survival in the Portuguese Tourism sector. This sector has experienced a remarkable performance over the last decades. When compared to other sectors, tourism firms are more likely to exit: (i) if they are young (less than 10 years of existence); and (ii) if they belong to the lower tail of the firm distribution (i.e. belong to the group of worse performers). Within tourism related sectors, we find that firms whose activities are offered mostly to tourists, such as travel agencies and hotels, are always among the best performers in terms of survival. Moreover, despite of Tourism being one of the most volatile sectors in periods of high uncertainty, results show a higher survival resilience among established tourism associated firms.

Mind the Build-up: Quantifying Tail Risks for Credit Growth in Portugal • Duarte Maia, Marina Feliciano and Ivan De Lorenzo Buratta

We quantify the effect of cyclical systemic risk and economic sentiment on non-financial corporations and households' (total) credit growth for Portugal between 1991 Q1 and 2020 Q2, following the Growth-at-risk methodology. We focus on the right-hand tail of the future credit growth distribution, as credit booms are potentially detrimental to financial stability. A set of measures of the upside tail risk in credit growth is computed to provide policymakers with more information to anticipate credit build-ups. We find that financial vulnerabilities and industrial sector economic confidence increase the upper tail risk of credit growth realizations for non-financial corporations in the short term (4 quarters horizon). At the medium to long term (12 quarters horizon), the impact of those indicators almost cancels each other out. As regards households, increasing financial vulnerabilities and consumers' economic confidence display opposite effects on the upper tail risk of credit growth, at short and medium to long terms. Credit-at-risk anticipates credit build-ups preceding financial crises and decelerations corresponding to recessions. The upper tail to median and the upper to lower tail distances identify the upper tail dynamics as the main responsible for future credit growth uncertainty. Expected longrise reinforces Credit-at-risk results while the probabilities of observing future credit growth above its mean and credit growth one standard deviation above its current value exhibit high levels before 2008 for both non-financial corporations and households, followed by deep falls during recessions which signal credit busts. For all the measures, the 2013-2018 increase in tail risk depends on the structural change in credit growth dynamics observed in the early 2000s. The most recent results highlight the predominant role of confidence indicators, further dampened in 2020 by the COVID-19 effects on the economic outlook.

Forgetting Approaches to Improve Forecasting • Paulo M. M. Rodrigues and Robert Hill

There is widespread evidence of parameter instability in the literature. One way to account for this feature is through the use of time-varying parameter (TVP) models that discount older data in favour of more recent data. This practise is often known as forgetting and can be applied in several different ways. This paper introduces and examines the performance of different (flexible) forgetting methodologies in the context of the Kalman filter. We review and develop the theoretical background and investigate the performance of each methodology in simulations as well as in two empirical forecast exercises using dynamic model averaging (DMA). Specifically, out-of-sample DMA forecasts of CPI inflation and S&P500 returns obtained using different forgetting approaches are compared. Results show that basing the amount of forgetting on the forecast error does not perform as well as avoiding instability by placing bounds on the parameter covariance matrix.

Determinants of cost of equity for listed euro area banks • Gabriel Zsurkis

The objective of this paper is to identify the banks' cost of equity determinants. We rely on a two-step approach. First, we estimate the cost of equity (COE) for listed euro area banks through multi-factor models, which are widely used in the asset pricing literature. We propose a new specification with overall market, banking sector and country risks and conclude that it has the best performance among all considered alternatives to mimic the bank's realized returns dynamics. Then, this specification is employed to estimate the banks' return sensitivities to each of the common risk factors and the COE. In the second step, we consider bank-specific and country-level variables and infer whether they explain the estimated COE time series dynamics and differences in COE across banks. We conclude that changes in ECB's interest rates and government bond rates were crucial to explain the evolution of the COE between 2012 and 2020. Moreover, we find that some variables related to business and financial cycles, and bank-specific variables such as Nonperforming Loan ratio, Tier1 ratio and Return on Assets are also important.

From the *Banco de Portugal Economic Studies*

Banco de Portugal *Economic Studies* aims to publish theoretical and applied studies prepared by economists at Banco de Portugal, often co-authored with external researchers. All articles are signed and are of the sole responsibility of their respective authors. The articles aim to contribute to an informed and high-quality debate on the Portuguese economy. The journal intends to be a reference publication in that debate, and is directed to a relatively specialized public on economic issues.

January 2022

Energy mix and intensity in Portugal: Portraits from aggregate and firm-level data • João Amador

Characteristics of parties and duration of insolvency cases in Portugal • Manuel Coutinho Pereira and Lara Wemans

A micro-level analysis of corporate income taxation in Portugal • Cláudia Braz, Sónia Cabral and Maria Manuel Campos

Workforce skills and firm productivity • Joana Cima, Ana Catarina Pimenta, Miguel Portela and Marta Silva

April 2022

Financial literacy of 15 years-old in Portugal: Evidence from PISA 2018 • Hugo Reis and Lara Wemans

The competitiveness of the Portuguese economy: A view from a composite indicator • João Amador, Ana Fernandes and Guida Nogueira

An assessment of companies' competitiveness in Portugal and in some European countries • Mário Lourenço, Cloé Magalhães, Fernando Martins, Manuel Coutinho Pereira and Hugo Reis

Seminars

2022

Feb. 16 **Can the Cure Kill the Patient? Corporate Credit Interventions and Debt Overhang** • Fabrice Tourre (Copenhagen Business School)

Mar. 2 **Trade, Jobs, and Worker Welfare** • Paulo Bastos (World Bank)

9 **Fiscal Rules and Discretion with Risk of Default** • Liyan Shi (Tepper School of Business, Carnegie Mellon University)

16 **GDP Solera: The Ideal Vintage Mix** • Enrique Sentana (CEMFI)

23 **A Sufficient Statistics Approach for Aggregating Firm-Level Experiments** • David Thesmar (MIT Sloan School of Management)

30 **Induced Automation: Evidence from Firm-level Patent Data** • David Hémous (University of Zurich)

Apr. 1 **Consistent Evidence on Duration Dependence of Price Changes** • Robert Shimer (Kenneth C. Griffin Department of Economics – University of Chicago)

8 **Changing Income Risk Across the US Skill distribution: Evidence from a generalized Kalman filter** • Kyle Herkenhoff (Federal Reserve Bank of Minneapolis)

20 **Marriage, Labor Supply and the Dynamics of the Social Safety Net** • Costas Meghir (Yale University)

May 2 **Feasible Stimulus and Constrained Monetary** • Farzad Saidi (University of Bonn and CEPR)

11 **Frictions and adjustments in firm-to-firm trade** • Isabelle Mejean (Sciences Po)

18 **Search Frictions and Advertising in an Online Labor Market.** • Daniel Haanwinckel (UCLA Economics)

25 **The Aggregate Effects of Supply-Chain Delays** • Kim Ruhl (University of Wisconsin)

31 **Two Illustrations of the Quantity Theory of Money Reloaded** • Juan Pablo Nicolini (Federal Reserve Bank of Minneapolis)

Jun. 1 **Blockchain Analysis of the Bitcoin Market** • Antoinette Schoar (MIT Sloan School of Management)

7 **Gas, Guns, and Governments: Financial Costs of Anti-ESG Policies** • Ivan Ivanov (Board of Governors of the Federal Reserve System)

15 **Narratives and Market Returns: A Semi-supervised Topic Modeling Approach** • Kuntara Pukthuanthong (University of Missouri)

22 **The Fraudster and the Bank** • Nuno Palma (University of Manchester)

28 **The Origins of Monetary Policy Disagreement: The Role of Supply and Demand Shocks** • Carlos Madeira (Banco Central de Chile)

Jul. 11 **Worker beliefs about outside options** • Nina Roussille (London School of Economics)

Conferences and Other Events

Jun. 20-21 **Workshop on Labour Economics**

The Banco de Portugal and Banco de España hosted their joint Labor Economics Workshop, from June 20 to June 21, 2022 in Tavira, Algarve (https://www.bportugal.pt/evento/workshop-labor-economics).

This workshop was an important forum for the discussion and presentation of research on Human Capital and Labour Market Institutions.

The topics addressed during these two days covered important research questions and represent important contributions to state-of-the art empirical research on Labor economics. Specifically, this year's conference counted with important contributions by: the 2021 Nobel prize in economics **David Card** (University of California, Berkeley) on Wage Flexibility under Sectoral Bargaining, **Alan Manning** (London School of Economics) on The wage elasticity of recruitment, **Christian Dustmann** (University College London) on Knowledge Spillovers, Tournaments and Individual Careers, **Till von Wachter** (UCLA) on Unemployment benefit generosity, Labor supply, and Job Outcomes, **Attila Lindner** (University College London) on Firm Heterogeneity and the Impact of Payroll Taxes, **Tito Boeri** (Bocconi University) on Evidence from a Randomized Experiment on Sick Leave Monitoring in the Public Sector, **Mónica Costa Dias** (University of Bristol) on High-Education Sorting and Social Mobility, **Pedro Portugal** (Banco de Portugal) on What lies behind returns to schooling: The role of worker sorting and peer quality, and **Laura Hospido** (Banco de España) on Dual Returns to Experience.

The event was a success and an excellent opportunity for exchanging ideas for researchers and economists.

By Hugo Reis

Jul. 1-2 New Trends and Developments in Econometrics Conference

The Banco de Portugal hosted its 3nd *Conference on New Trends and Developments in Econometrics*, from July 1 to July 2, 2022 in Ponta Delgada, Azores (https://www.bportugal.pt/evento/conference-new-trends-and-developments-econometrics-0).

This conference presents an important forum for the discussion and presentation of new developments and the assessment of econometric methods for use in banking, finance, macroeconomics and microeconomics. These developments are of considerable importance as they address issues related to the complex environment in which banks nowadays operate, the complexity of financial instruments, the functioning of markets and institutions, and the important challenges that central banks have to face.

The topics addressed during these two days covered important research questions and novel contributions to econometric theory and for empirical economic research. Specifically, the works presented focused developments in Panel data econometrics, Bootstrap methods, Macroeconometrics, Duration dependence, and Wage inequality.

Specifically, **Damian Kozbur** (University of Zurich) presented his paper on *Inference for Dependent Data with Learned Clusters*; **Esther Ruiz** (Universidad Carlos III Madrid) presented developments in the context of growth at risk, *Expecting the unexpected: Economic growth under stress*; **Koen Jochmans** (Toulouse School of Economics) discussed *Bootstrap inference for fixed-effect models*; **Stephane Bonhomme** (University of Chicago) presented *Dynamic Panel Data: A Functional Viewpoint*; **Carlos Daniel Rodrigues A. Santos** (Nova SBE) presented his work on *Firm size, volatility, and business cycles*; **Pedro Portugal** (Banco de Portugal and Nova SBE) discussed *Heterogeneity and duration dependence in price inertia: A simple nonlinear fixed effect estimator*; **Peter Reinhard Hansen** (University of North Carolina) introduced *A New Parametrization of Correlation Matrices*; **Pedro Raposo** (Católica Lisbon SBE) presented methods and results on *Measuring wage inequality under right censoring*; **Nikolay Iskrev** (Banco de Portugal) introduced a *Spectral decomposition of the information about latent variables in dynamic macroeconomic models*; **Adriana Cornea-Madeira** (University of York) discussed *Bootstrap methods for impulse responses obtained by local projections* and **Sílvia Gonçalves** (McGill University) discussed *When do state-dependent local projections work?* Details of the presentations and links to papers can be found on the conference Website.

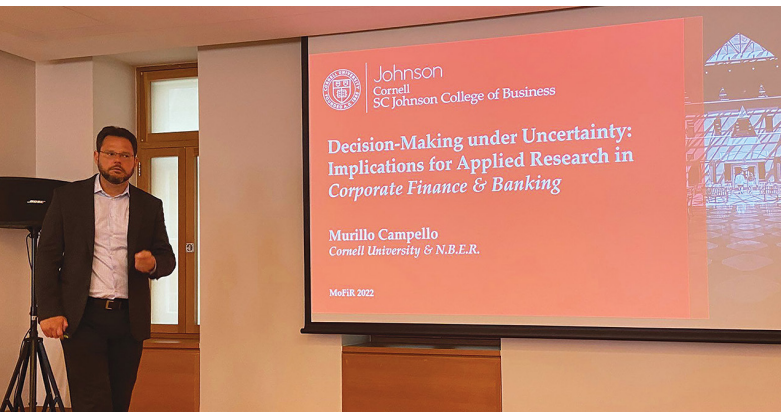
Overall, a very successful and fruitful event for researchers and economists, during which very interesting discussions and exchange of ideas took place.

By Paulo M.M. Rodrigues

Jul. 5-6 11th MoFiR Workshop on Banking

On July 5 and 6, Banco de Portugal hosted the 11th MoFiR Workshop on Banking. This was a joint initiative of Banco de Portugal and Católica Lisbon School of Business and Economics and had the financial support of research grants from Fundação para a Ciência e Tecnologia and Fundação Francisco Manuel dos Santos. The workshop was initially planned for 2020. That edition was held online, due to the pandemic, but in 2022 it was finally possible to host this event in Lisbon. The scientific committee received 172 submissions and only 12 papers could be accepted.

Governor Mário Centeno offered his opening remarks to start the workshop. The first session covered two topics that rank very high in the agendas and concerns of central banks: climate and war. These are only two examples of the timely topics discussed in the conference. The papers presented also discussed policies under the realm of central banks and financial authorities, such as macroprudential policy and financial regulation. Other topics that central banks



are concerned with were also discussed, such as corporate indebtedness, bankruptcies, forbearance, evergreening, and lending to distressed borrowers. Other topics that are often not immediately linked to central banks but that deserve their attention were also discussed during these two days. These include the role of lending in economic growth and financial inclusion.

In the first day of the workshop, Murillo Campello gave a keynote lecture on Decision-Making under Uncertainty and the Implications for Applied Research in Corporate Finance and Banking. Most of the decisions adopted by central banks are taken under uncertainty and research is necessary to guide decision-making in uncertainty. The lecture offered an overview of the role of uncertainty in the recent literature on corporate finance and banking and challenged researchers in the audience to consider better ways to do so in future research.

By Diana Bonfim

Jul. 15-16 8th Banco de Portugal Conference on Financial Intermediation

On July 15 and 16, the 8th Banco de Portugal Conference on Financial Intermediation was held in Lisbon. António Antunes, deputy head of the Economics and Research Department, gave his opening remarks.

The **first session** focused on the costs of debt financing. Excessively accommodative monetary policy can be contractionary through the financing of zombie firms. Olivier Wang showed that in a low rate environment with weakly capitalized banks, zombie firms can crowd out healthy ones, leading to delays in the recovery from temporary economic shocks. Investment and growth can also be compromised due to debt overhang problems, as shown by João Santos. Firms with difficulties in servicing their debt might face more challenges in sustaining access to credit. But the decisions of owners and managers are also crucial. When over indebted, managers may decide to forego investments and growth opportunities, with inevitable implications on economic growth and productivity. The risks to economic growth do not come only from over indebted firms. Over indebted sovereigns are also a reason for concern, as noted by Antonio Mele.

The **second session** focused on another topic that ranks high in the agenda of central banks: climate change. Martin Oehmke discussed how capital requirements can be used to deal with climate related risks to financial stability. Eleonora Sfrappini presented evidence that banks are already shaping their lending decisions based on their expectations on future financial regulation on climate change. Finally, Hyeyoon Jung closed the first day of the conference with a paper on climate stress testing.

In the **third session** of the conference, three papers were presented on topics related to financial intermediation after the Great Recession. Marco Pagano presented evidence on loan guarantees granted during the pandemic in the euro area. Gil Nogueira discussed the heterogeneity in the transmission of monetary policy. Finally, Javier Suarez talked about the interactions between banks and money market funds.

Each of the nine papers presented was followed by constructive and insightful discussions given by Ernst-Ludwig Von Thadden, George Pennacchi, Charlie Kahn, Franklin Allen, Steven Ongena, Loriana Pelizzon, Elena Loutskina, Janet Gao, and Douglas Gale.

By Diana Bonfim

Meet our researchers

António Santos is an economist in the Financial Intermediation Division of the Economics and Research Department at Banco de Portugal since 2017. He holds a M.Sc. in Economics from Nova School of Business and Economics, where he has been working as an invited teaching assistant and grader since 2015. His general areas of research are credit risk and macroeconomics. His work has been published in the Banco de Portugal Economics Studies journal.

Please, tell us about the research you are carrying on at DEE

My research focus has been primarily on improving and extending the set of tools to assess credit risk in loan portfolios. In particular, I have been working in developing credit risk models that can incorporate interdependencies between economic sectors and take into account that default rates and loss given default rates vary together. This strand of research contributes to the mission of evaluating the state of Portuguese financial institutions, taking advantage from the richness of the micro data sets at the loan and firm level available at Banco de Portugal.

Moreover, I am also interested on the practical questions that arise from the empirical analysis of new, comprehensive and interconnected large data sets, and on how they enable researchers to explore conventional economic themes under a fresh perspective. I have devoted time to put forward efficient ways of managing and communicating these data, in particular during the pandemic crisis.

Another topic of major interest has been the macroeconomic developments of the Portuguese economy and have looked at its growth accounting in a stochastic frontier setup. More recently, I have been working with co-authors on a simple model of firm lifecycles to study to what extend are firm outcomes determined by initial conditions or post-entry shocks, and the relevance of different frictions to firm growth.

I would like to thank my colleagues at DEE for promoting a friendly and stimulating research environment and highlight the invaluable help and mentoring of my co-authors.

Sara Riscado is an economist in the Public Finance and Structural Studies Division at the Economics and Research Department of Banco de Portugal since 2020. She holds a PhD in Economics from the European University Institute in Florence. Before joining Banco de Portugal, she worked both in academia and in public and international organizations. Her main research interests cover public and labour economics and microsimulation modelling.

Please, tell us about the research you are carrying on at DEE

My research work focusses on assessing the impact of fiscal policies. I have started this line of research before joining Banco de Portugal, when I was working as an economic analyst for the European Commission's Joint Research Centre in Seville. There I got familiar with microsimulation techniques, which have proven to be a useful modelling tool to understand the heterogeneous impacts of fiscal policies across different groups of individuals and, in this way, provide relevant evidence-based support to policy making.

I am very happy to continue this research at Banco de Portugal and contribute to enlarge the portfolio of modelling tools used in the Department. In particular, I am using a microsimulation model to assess the impacts of tax and benefit measures, directed at families with children, on reducing child poverty and on changing labour market incentives. The project hopes to contribute to the identification of the most effective measures to fight child poverty as well as to estimate their cost, conveying in this way important information for the policy maker. In the future, I expect to explore further the use of microsimulation techniques to study the distributional effects of inflation on households' disposable income. Now on the side of the firms, I am also involved in a project that aims at understanding whether tax incentives deter firms' growth and productivity. Again, I hope that the results of this research work may contribute to the design of better public policies.

Finally, I am glad to have found a very welcoming group, that have contributed greatly to the improvement of my work and, in more personal terms, to a fast and enjoyable integration in a new institution!

Visiting fellows 2022

Banco de Portugal offers cash grants to support research projects in the field of Economics, with a view to promoting interchange between the scientific and academic communities and the Bank, and to contributing towards the improvement of theoretical and applied research in Portugal.

Applicants wishing to develop research projects in the Economics and Research Department must hold a Doctorate degree or be about to finalise their Doctorate degree. Preferred topics include monetary and labour economics, financial intermediation, banking, and studies on the Portuguese economy.

Application instructions are available. Applications are invited from all interested parties.

Further information may be obtained via email: conferences@bportugal.pt.

Consultants

Miguel Portela • University of Minho

Upcoming events and announcements

Seminars 2022

Sep. 14 David Schoenherr • Princeton University
Sep. 15 Marco Bassetto • Federal Reserve Bank of Minneapolis
Sep. 19 João Guerreiro • Northwestern University
Sep. 21 Fernando Alvarez • Kenneth C. Griffin Department of Economics - University of Chicago
Oct. 12 Mariassunta Giannetti • Stockholm School of Economics
Oct. 21 Lance John Lochner • University of Western Ontario
Oct. 26 Mark Aguiar • Princeton University
Nov. 2 Martí Mestieri • Federal Reserve Bank of Chicago
Nov. 16 Joseph Kaboski • University of Notre Dame

Courses

Jul. 18-22 **Dynamic Programming** • John Leahy • University of Michigan

Conferences

Nov. 14 **11th Conference on the Portuguese economic development in the European context**
Dec. **BPLIM's Workshop**

Correspondence to the editor

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This newsletter, as well as other online information about Economic Research at Banco de Portugal is available **here**.

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