0. Summary

The IIF Workshop *Forecasting in a Changing Environment* was held at Universidad Autónoma de Madrid (Spain) on December 9-10, 2021. The aim was to bring together a group of renowned scholars and practitioners in economic forecasting, which has been a challenging task, especially since the arrival of the pandemic COVID-19. The result was a lively forum with talks and discussions that continued during coffee breaks on several occasions. The number of participants on site was 47 and some more followed the sessions through Zoom. We are very grateful to our speakers Mark Watson (U. of Princeton, USA), Gloria González Rivera (U. of California at Riverside, USA), Daniel Peña (U. Carlos III de Madrid, Spain), Laurent Ferrara (Skema Business School of Paris, France, Mohsen Hamoudia (PREDICONSULT, Paris, and ESDES Business School, Lyon, France), Greg Allenby (Ohio State University, USA), Peter Young (Lancaster University, UK) and Javier Pérez (Bank of Spain), the discussants, members of the round table for sharing with us their work, experience and thoughts. We also want to thank our sponsors, and especially the IIF, that gave us the initial support to kick-off the event.

1. Date and place

The workshop *Forecasting in a Changing Environment* was held at Universidad Autónoma de Madrid (UAM), Spain on December 9th and 10th, 2021.

Local trains from the city center arrive in campus quite often with a frequency between 4 to 11 minutes. The cost of the ticket is 1.85 euro (each way), so it was cheap and easy for participants to get to UAM.

2. Organizers

The scientific committee was composed by Pilar Poncela (UAM) and Esther Ruiz (Universidad Carlos III de Madrid, Spain). Aránzazu de Juan and Rocío Sánchez-Mangas (both from UAM) joined Pilar Poncela in the local organizing committee at UAM.

3. Goal and results

The goal of the workshop was to bring together a group of renowned scholars and analysts with the aim of sharing their forecasting experiences in these turbulent times.

Economic forecasting covers a wide range of topics and subfields: nowcasting the state of the economy, financial forecasting, marketing, etc., just to mention a few. Models and techniques are diverse, ranging from small scale models to big data analytics.

On top of that, the COVID-19 pandemic has provoked the most severe recession observed since the XX century. All in all, forecasting economic time series nowadays is a complicated task. This workshop brought together a group of experts in the field with the
aim of sharing their forecasting experiences in these changing times. It is one of the workshops organized by the MacroFor section (of the IIF) during 2021.

As a result, we had a workshop with 8 presentations that were followed by comments by the selected discussants before the floor was open to the public. The presentations lasted 40 minutes. Each discussant had 10 minutes and the audience had 5-10 minutes for additional comments and questions. The sessions were very lively, and we had to continue with some of the discussions during coffee breaks!

The list of our distinguished speakers comprises Mark Watson (U. of Princeton, USA), Gloria González Rivera (U. of California at Riverside, USA, and IIF past president), Daniel Peña (U. Carlos III de Madrid, Spain), Laurent Ferrara (Skema Business School of Paris, France, former IIF director and head of the MacroFor section), Mohsen Hamoudia (Consultant and former IIF president), Greg Allenby (Ohio State University, USA), Peter Young (Lancaster University, UK) and Javier Pérez (Bank of Spain).

The complete list of talks with their discussants can be found in the annex and at the web workshop webpage [https://workshopforecasting2021.com/](https://workshopforecasting2021.com/)

The sessions were finished with a lively round table.

### 4. Participation

The total number of participants in place (in situ, on a face-to-face basis) was 47. Additionally, more than 20 persons joined the Zoom sessions.

The professional background of most participants was the academia, although we had people also from central banks, the Treasury, the Tax Agency, the Russian embassy and from consultancy. Regarding gender, 33 out of the 47 participants were male. Geographically, most participants on site were from Spain, although we had also people from Italy, France, Portugal and the USA.

### 5. Budget

The sources of funding and the amounts they covered were (all amounts in euro):

- IIF (2530€)
Fundación Ramón Areces (paid the hotel for all speakers and the flight tickets for some of them). They contacted the speakers directly for their travel expenses, so we do not know the exact amount they covered.

- Universidad Carlos III de Madrid (2610€)
- Universidad Autónoma de Madrid, including fees from participants that were handled by UAM (4345€)

The expenses of the workshop were as follows:

- Travel expenses to speakers (not covered directly by Fundación Ramón Areces): 2833€
- Taxi, shuttle and buses: 1055 €
- PCR and antigen tests for speakers: 103 €
- IT support: 318 €
- Web page: 853€
- Catering (other than gala dinner): 2071€
- Gala dinner 1649€
- Scholarships for students and gifts to people that helped with the event: 178€
- Badges and other material + printing: 419 €

6. Annex

PROGRAMME

Workshop on “Forecasting in a changing environment”

Madrid, December 9-10, 2021

December, 9th

16.00-16.05: Opening

Chair Session: Pilar Poncela

16.05-17.00: Mark Watson (Princeton University), Comovement of Economic Activity During the Covid Recession, with Danila Maroz (Harvard University) and James H. Stock (Harvard University)

Abstract: Recessions are not all alike. They arise from different causes and evolve from different initial conditions. Sectors behave differently in different recessions. That said, there are well-documented regularities: consumption falls less than income; consumption of durables falls more than consumption of services; employment lags production, and so forth. This paper looks at comovement of different economic sectors during the Covid recession and asks whether these comovements were consistent with historical precedent. We find large, but relatively short-lived, deviations from regular patterns of comovement.
We carry out the analysis using a large cross section of real economic indicators, sampled monthly, for the United States. A small-dimensional dynamic factor model (DFM) estimated using pre-Covid data is used to measure the historical patterns of comovement. Extrapolating this pre-Covid DFM over the post February 2020 period shows how the sectors of the economy would have behaved had they followed their pre-Covid patterns. We find large deviations from these historical patterns for some sectors. Taken as a whole, these deviations are themselves well described by a DFM with one factor, and the resulting ‘Covid factor’ and factor loadings serve as a parsimonious representation of the special nature of the Covid recession and its immediate aftermath. Estimation of the DFM over the Covid period is complicated by large outliers and dramatic increases in volatility.

This paper is related to two strands of literature. First, it is motivated by the descriptive literature on business cycles going back to Burns and Mitchell (1946) and earlier, and the use of dynamic factor models to describe this comovement, notably Sargent and Sims (1977), Stock and Watson (1989, 2002), Forni and Reichlin (1998), and many others. This paper is also related to a recent literature that investigates special methods to handle the unique features of the Covid-recession. Examples include Carriero, Clark, Marcellino and Mertens (2021), Lenza and Primiceri (2020), Diebold (2020), Antolin-Diaz, Drechsel and Petra (2021), and especially Ng (2021), which also modifies a pre-Covid DFM to better fit the Covid recession. The paper includes a discussion of the efficacy of these methods in the context of our findings on changes in comovement.

Discussant: Gabriel Pérez Quirós (Bank of Spain)

Coffee Break: 17.00-17.20

Chair Session: Eva Senra

17.20-18.15: Greg Allenby (Ohio State University), Forecasting Price Changes from a Merger Using Stated Preference

Abstract: Mergers and acquisitions lead to a consolidation of the operations of firms that may lead to a change in long-term prices. If a merger leads to a market consolidation, then prices are expected to raise as competition decreases. If a merger is between firms operating in separate markets, then post-merger prices are expected to stay the same in the absence of other market forces. The degree to which prices change depends on the degree of cross-price responsiveness between the acquiring and acquired products. In this talk I examine the use of conjoint analysis, a stated-preference survey technique to characterize demand in a market, and a Nash price equilibrium analysis to forecast the effect of a merger on long-term equilibrium prices.

Discussant: Antonio Martín Arroyo (Universidad Autónoma de Madrid)

Abstract: In a changing environment, forecasting the demand for new products and services is key and very important in light of the investments put behind a launch. In addition, with strong economic competition around the world, evolving customers expectations, the emergence of new technologies and innovation, estimating and forecasting the potential market is risky. It is estimated that around 70-80 percent of new product launches in the consumer packaged goods (CPG) industry fail.
Forecasting the demand of new products could be achieved using judgmental methods – surveys of buyer’s intentions, Delphi method, market test, etc … – and statistical modeling ones such as time series and multivariate techniques.
However, thanks to the preponderance of data stemming from the information explosion in all activities, Machine Learning has gained more importance than ever. Some have reported ML could be the key solution to many statistical modeling methods issues and could be assessed as alternatives to statistical models for time series forecasting. But, in some other studies, authors found that statistical methods are better in terms of both accuracy measures used and for all forecasting horizons examined.
Machine Learning procedures (MLPs) need data to make predictions. Generally, we don’t have data, or little, for any kind of new products (replacement products, product line extensions, new to company, new to world). So, can any Machine Learning algorithm forecast those? Can we use Machine Learning for example on the historic pattern of an existing product on a new product’s forecast (Analogy method)?
This presentation is aimed to assess the feasibility of each method to forecast any kind of new products. Based on some studies, we evaluate respective performance when applicable.

Discussant: Enrique Quilis (Agencia Tributaria)

December, 10th

Chair Session: Nuno Crato

9.20-10.15: Laurent Ferrara (SKEMA Business School and Australian National University), Commodity price uncertainty comovement: Does it matter for global economic growth?, with A. Karadimitrpoulou (University of Piraeus) and A. Triantafyllou (ESSEX Business School)

Abstract: Global economic activity is surrounded by increasing uncertainties from various sources. In this paper, we focus on commodity prices and estimate a global commodity uncertainty factor by capturing comovement in volatilities of major agricultural, metals and energy commodity markets through a group-specific Dynamic Factor Model. Then, by computing impulse response functions estimated using a Structural VAR model, we find that an increase in the common commodity price uncertainty results in a substantial and persistent drop in investment and trade, for a set of emerging and advanced economies. We also show that a global commodity uncertainty shock is more detrimental for economic growth than usual financial and economic policy uncertainty shocks. Last, our methodology turns out to be an efficient way to disentangle the "good" and "bad" macroeconomic effects of oil price uncertainty:
when an oil price uncertainty shock is common to all commodities, then the macroeconomic effect is likely to be negative, but when this shock is only specific to the oil market, the effect generally tends to be positive in the short run.

**Discussant:** Antoni Espasa (Universidad Carlos III de Madrid)

**10.15-11.10: Javier Pérez** (Bank of Spain), *Should macro forecasters use conflict, social unrest and policy uncertainty indicators? An application for Latin America*, with Marina Diakonova (Banco de España), Luis Molina (Banco de España), Hannes Mueller (Barcelona GSE) and Christopher Rauh (Cambridge University)

**Abstract:** Conflict, social unrest and political-policy uncertainty affect macroeconomic developments. Thus, looking at measurable (mostly text-based) indicators of such type of events may help anticipate economic shocks in real-time. We test such hypothesis for three representative economies from Latin America, that present a history of social unrest episodes: Brazil, Colombia and Mexico. First, we assemble a database of traditional macro-financial monthly indicators, and show their usefulness to forecast quarterly GDP. The modeling framework is the time series mixed-frequencies MIDAS approach. Next, we incorporate in the models different types of text-based indicators that proxy social unrest, political conflict and violence and economic policy uncertainty. In addition, we evaluate the usefulness of adding to the models standard political risk indicators, including those reflected in ratings of international agencies. We show the extent to which country-specific policy-political and social unrest indicators are useful to forecast in real-time country-specific macroeconomic variables in the selected Latin American economies.

**Discussant:** Eva Senra (Universidad de Alcalá)

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**11.10 – 11.30: Coffee Break**

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**Chair Session: Esther Ruiz**

**11.30-12.25: Peter Young** (Lancaster Environment Centre and Data Science Institute), *Continuous-time Data-Based Mechanistic (DBM) Models and Their Importance in a Changing Environment*

**Abstract:** In some areas of study, discrete-time black-box models, that are so well known in the forecasting community, provide an important tool in understanding and forecasting the behavior of dynamic systems. In most areas of science and engineering, however, continuous-time differential models have been the normal means of describing such dynamic systems since the time of Newton and Leibniz. In this scientific and engineering context, as well as in other areas such as macro-economics, models with a clear physical interpretation are required to make decisions; as well as performing tasks that require a knowledge of the system’s internal behavior, such fault or behavioural diagnosis, monitoring the changes in physical characteristics and scenario analysis. Continuous-time models have significant advantages in these kind of
applications. Unlike discrete-time models, where the parameter values are a function of the data sampling interval, continuous-time model parameters are independent of the sampling rate; they normally provide a unique description of the dynamic system; they are physically meaningful; and they often have associated units that enhance their meaning in such physical terms. This presentation will briefly introduce continuous-time transfer function models (the algebraic, operator representation of differential equations) for linear and nonlinear systems; outline how such models are statistically identified and recursively estimated from time series data; and discuss the advantages of such models in an environmental context. It will then show how continuous-time models are applied in practice, with two examples where they have been used recently in the study of climate change and forecasting the COVID-19 epidemic.

**Discussant:** Marcos Bujosa (Universidad Complutense de Madrid)

**12.25-13.20:** Gloria González-Rivera (University of California, Riverside), Expecting the unexpected: Growth in stress, with V. Rodríguez-Caballero (ITAM) and E. Ruiz (UC3M)

**Abstract:** Large and unexpected moves in the factors underlying economic growth should be the main concern of policy makers aiming to strengthen the resilience of the economies. We propose measuring the effects of these extreme moves in the quantiles of the distribution of growth under stressed factors (GiS) and compare them with the popular Growth at Risk (GaR). In this comparison, we consider local and global macroeconomic and financial factors affecting US growth. We show that GaR underestimates the extreme and unexpected fall in growth produced by the COVID19 pandemic while GiS is much more accurate.

**Discussant:** Alfonso Novales (Universidad Complutense de Madrid)

**13.30-14.50:** Lunch

**Chair Session:** Alfonso Novales

**15.00-15.55:** Daniel Peña (Universidad Carlos III de Madrid), *A Test for the Number of Factors in Dynamic Factor Models*, with Angela Caro (UC3M)

**Abstract:** An eigenvalue ratio test for the number of dynamic factors is presented. The test combines the advantages of those proposed by Ahn and Horenstein, for the eigenvalues of the covariance matrix, and Lam and Yao, for the cumulative sum of lagged covariance matrices. A pooled correlation matrix is defined as a weighted combination of the main observed correlation matrices and the proposed test is based on the ratio of its consecutive eigenvalues. Some theoretical results are given to justify the good expected properties of the test and a Monte Carlo study is presented showing its good finite sample performance compared to previous approaches. The usefulness of the test is also illustrated in an example with real macroeconomic data.
Discussant: Nuno Crato (Universidad Complutense de Madrid)

15.55 – 16.20: Coffee Break

16.20-17.55: Round Table. Chair: Miguel Jerez (Universidad Complutense de Madrid), 
Forecasting in a Changing Environment. Speakers: Antonio Aznar (Universidad de Zaragoza), Nuno Crato (ISEG Lisbon School of Economics and Finance), Antoni Espasa (Universidad Carlos III de Madrid), Agustín Maravall (Bank of Spain), Alfonso Novales (Universidad Complutense de Madrid)

17.55-18.00: Farewell

21.00 Social dinner