Marco Lippi, Scientific Curriculum. Rome, May 2025

I graduated in Mathematics at La Sapienza, Rome, in 1965. In the following years my main research interests gradually shifted from Mathematics to Economics and Econometrics. In my career as a professor, I teached Mathematics, Economics, History of Economic Thought and Econometrics at the Universities of Perugia, La Sapienza (Rome), Modena, Scuola Sant'Anna (Pisa), ECARES (ULB, Bruxelles). I am at present a Fellow at the Einaudi Institute for Economics and Finance, Rome, where I have taught, until 2024, Linear Algebra in the Master Program RoME and Stochastic Processes for Macroeconomics in the PhD program RED. I am still regularly teaching at the Introductory Econometric Program, organized by the Italian Statistical Society (SIdE) in Bertinoro, Italy.

Classical economists. Labour Theory of Value. My graduation thesis on non-Desarguesian planes, written under the supervision of Beniamino Segre, was published as Lippi (1966), see below, Selected Works (III).

At the end of the sixties I was attracted by the heated debate opposing neoclassical economists on one side and neo-ricardians (Piero Sraffa's followers) and marxists on the other. In particular, I got involved in the discussion on the Marxian Theory of Value and Prices, precisely in the question known as the Transformation Problem. My work on the issue was the subject of some papers, see in particular Lippi (1973), (I), and the book Lippi (1979b), (I). My main argument was that, in the light of Sraffa's *Production of Commodities by means of Commodities*, the Labour Theory of Value cannot be corrected (no meaningful Transformation is possible from Labour Values to prices), but that, contrary to the common marxist opinion, the Labour Value is not necessary to the core of the Marxian theory of exploitation and class.

I also contributed to the Sraffian theory of prices in a joint-production system, providing a solution to the problem of negative prices, see Lippi (1979a), (I).

Aggregation and the microfoundation of Dynamic Macroeconomics. My research in Macroeconomics started at the beginning of the eighties with the question: what is the relationship between the dynamic shape of an equation between aggregate variables and the corresponding microequations. I was puzzled by some results obtained in the estimation of the relationship between the italian Industrial Production Index and the Aggregate Electric Energy Consumption. Although only current values were supposed to appear in the equation, I found that endogenous and exogenous dynamics were suggested by all criteria.

Lippi (1988) and Forni and Lippi (1997), (II), study the relationship between micro and macroequations:
(a) Macroequations may exhibit spurious dynamics; even static microequations like $y_{it} = a_i x_{it} + \varepsilon_{it}$, where x_{it} is exogenous and $x_{it} = \alpha_i x_{i,t-1} + u_{it}$, with a_i and α_i agent specific (no representative agent), produce a macroequation between the aggregates Y_t and X_t which contains lagged values of both Y_t and X_t for generic values of the microparameters.

(b) The coefficients of the macroequation are mixtures of the microparameters of both the microequations and of the exogenous micro processes.
(c) The macro disturbance terms are mixtures of both the disturbance terms of the microequations and the shocks driving the exogenous micro processes.

Based on these results, Forni and Lippi (1997), (II), conclude that comparing ARMAX models or VARs, estimated using macroeconomic aggregates, to theory-motivated microeconomic models, makes little sense without explicit consideration of the effects of aggregation. For a solution of this problem, based on Dynamic Factor Models, see below.

Trends and Cycles, Fundamentalness. The traditional decomposition of macroeconomic time series into a stationary cycle and a deterministic trend (most often a linear function of time) was superseded by the I(1) model at the beginning of the '80s, with the consequence that the identification and relative importance of trend and cycle became a much debated issue. I produced some papers in this field together with Lucrezia Reichlin between 1991 and 1994, see below, Selected Works (II).

In Lippi and Reichlin (1993, 1994c), (II), we made the point that a VAR model for the macroeconomic vector X_t implicitly assumes that the structural shocks driving the variables are fundamental for X_t, i.e. that the shocks can be recovered as a linear combination of current and past values of X_t (the same observation had been previously made in Hansen and Sargent (1991)). We argued that non-fundamentalness of the structural shocks is neither impossible nor unlikely, and that non-fundamental and fundamental shocks result in different trend/cycle ratios. More in general our point was that identification of the structural shocks in a VAR requires a solution of the fundamentalness problem.

Possible non-fundamentalness of the structural shocks in a linear multivariate model, almost unknown by empirical econometricians in the nineties, has become a much researched topic in macroeconometrics.

Solving the aggregation and fundamentalness problems, and more: High-Dimensional Dynamic Factor Models. The model used in Forni and Lippi (1997), (II), is based on the distinction between common, or macroeconomic, shocks, which affect all the variables in the economy, and specific shocks, which impact only one or a few variables. If the macroeconomic shocks were observable, their dynamic effect on the macrovariables could be estimated and no aggregation effect would arise.

Of course the macroeconomic shocks are not observable. The initial motivation for my research on High-Dimensional Dynamic Factor Models, in collaboration with Mario Forni, Marc Hallin and Lucrezia Reichlin, was then the estimation of the macroeconomic shocks. The main features of the model are:

(a) A big number of observable variables x_{it} (as compared to the variables normally included in a VAR). (b) Each variable x_{it} has the decomposition $x_{it} = \chi_{it} + \xi_{it}$, where the latent variables χ_{it}, called the common components, are strongly correlated across the variables x_{it}, whereas the latent variables ξ_{it}, called the idiosyncratic components, are weakly correlated. (c) The common components χ_{it} are dynamically driven by a small number of common shocks, called dynamic common factors, that is $\chi_{it} = a_i(L)u_t$, where u_t is a q-dimensional white noise and $a_i(L)$ is a q-dimensional filter.

The model was introduced between 2000 and 2002 in Forni et al. (2000) and Forni and Lippi (2001), see (II), and in Stock and Watson (2002a,b), (IV). The first two papers are characterized by spectral techniques, namely they use the principal components of the spectral density of the x's to obtain estimators of the common components χ_{it}, that are consistent as the number of variables and the number of observations tend to infinity. Stock and Watson instead use the principal components of the covariance matrix of the x's. Some issues related to the spectral approach, left unsolved in the first two papers, have been taken up and settled in Forni et al. (2015) and Forni et al. (2017), see (II). Important applications of the High-Dimensional Dynamic Factor Model have been:

(A) Common Components Structural VARs. In the typical large macroeconomic dataset the estimated common component of the main aggregates, GDP, Aggregate Consumption, Inflation, etc., can be interpreted as the result of cleaning the observed variables from measurement error. Thus such common components are the "true" macroeconomic variables. Forni et al. (2009), (II), together with Stock and Watson (2005), (IV), propose the application of SVAR analysis to the estimated common components rather than the macrovariables themselves. In the recent Forni et al. (2025a), (II), a complete theory of the Common Components SVAR is provided. Based on Anderson and Deistler (2008), (IV), the paper argues that generically the estimated common shocks span the same space as the structural shocks so that fundamentalness is not an issue with Common Components SVARs and no aggregation effect arises. In its empirical section, the paper shows that well known puzzles arising with SVAR applied to U.S. macroeconomic data disappear when the observed macroeconomic variables are replaced by their common components. In the same vein, Forni et al. (2025b), (II), show the advantages of Structural Dynamic Factor Models (an equivalent formulation of Common Components SVARs) over the standard SVAR models, as an empirical tool to complement Dynamic Stochastic General Equilibrium (DSGE) models.

(B) Forecasting of macroeconomic variables. It has been shown that factor-based forecasts provide substantial improvement upon univariate or small scale ARMA models. Papers in which forecasting is based on the spectral approach are Forni et al. (2005) and Forni et al. (2018), see (II); the latter contains a detailed comparison of the results obtained by the spectral approach with those obtained by the Stock and Watson's approach.

(C) Macroeconomic indicators. The model has been used to produce an early indicator of the medium-long term component of the Euro-area GDP, see Altissimo et al. (2010), (II). With the name Eurocoin, the indicator has been published by the italian Central Bank (Banca d'Italia), in collaboration with the Centre for Economic Policy Research (CEPR), for many years and is by now a well-known and much-cited reference.

Lastly, Barigozzi et al. (2020) Barigozzi et al. (2021), see (II), provide a complete theory of the Dynamic Factor Model when the variables are I(1) and the common components are cointegrated.

High-Dimensional Dynamic Factor Models have become a well established tool, used in Structural Macroeconomic Analysis, Forecasting and Assessment of the Business Cycle, with an impressive growth of interest by scholars, Central Banks and Financial Institutions. Looking for "dynamic factor models" in Google Scholar, you find a huge number of papers and the indication of substantial subfields, like (1) dynamic factor models forecasting, (2) dynamic factor models bayesian analysis, (3) generalized dynamic factor models, (4) approximate dynamic factor models, (5) dynamic factor models estimation, (6) macroeconomic dynamic factor models, (7) dynamic factor models time series, (8) dynamic factor models Markov switching. Neither I nor the colleagues who coauthored Forni et al. (2000) and Forni and Lippi (2001), written with the restricted purpose of solving aggregation problems, could have imagined such a momentous diffusion.

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Some scholars I advised for graduation, PhD thesis, or in the early stage of their career.

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