Var Models In Macroeconomics New Developments And Applications Essays In Honor Of Christopher A Sims Advances In Econometrics

This book discusses the econometric foundations of structural vector autoregressive modeling, as used in empirical macroeconomics, finance, and related fields.
This text presents modern developments in time series analysis and focuses on their application to economic problems. The book first introduces the fundamental concept of a stationary time series and the basic properties of covariance, investigating the structure and estimation of autoregressive-moving average (ARMA) models and their relations to the covariance structure. The book then moves on to non-stationary time series, highlighting its consequences for modeling and forecasting and presenting standard statistical tests and regressions. Next, the text discusses volatility models and their applications in the analysis of financial market data, focusing on generalized autoregressive conditional heteroskedastic (GARCH) models. The second part of the text devoted to multivariate processes, such as vector autoregressive (VAR) models and structural vector autoregressive (SVAR) models, which have become the main tools in empirical macroeconomics. The text concludes with a discussion of co-integrated models and the Kalman Filter, which is being used with increasing

frequency. Mathematically rigorous, yet application-oriented, this self-contained text will help students develop a deeper understanding of theory and better command of the models that are vital to the field. Assuming a basic knowledge of statistics and/or econometrics, this text is best suited for advanced undergraduate and beginning graduate students.

We compute government spending multipliers for the Euro Area (EA) contingent on the interestgrowth differential, the so-called r-g. Whether the fiscal shock occurs when r-g is positive or negative matters for the size of the multiplier. Median estimates vary conditional on the specification, but the difference between multipliers in the negative and positive r-g regimes differs systematically from zero with very high probability. Over the medium run (5 years), median cumulated multipliers range between 1.22 and 1.77 when r-g is negative, and between 0.51 and 1.26 when r-g is positive. We show that the results are not driven by the state of the business cycle, the monetary policy stance, or the level of government debt, and that the multiplier is inversely correlated with r-g. The calculations are based on the estimates of a factor-augmented interacted panel vector-autoregressive model. The econometric approach deals with several technical problems highlighted in the empirical macroeconomic literature, including the issues of fiscal foresight and limited information.

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How the creation of the Nobel Prize in Economics changed the economics profession, Sweden, and the world Our confidence in markets comes from economics, and our confidence in economics is underpinned by the Nobel Prize in Economics, which was first awarded in 1969. Was it a coincidence that the prize and the rise of free-market liberalism began at the same time? The Nobel Factor is the first book to describe the origins and power of the most important prize in economics. It tells how the prize, created by the Swedish central bank, emerged from a conflict between central bank orthodoxy and Sweden's social democracy. The aim was to use the halo of the Nobel brand to influence the future of Sweden and the rest of the developed world by enhancing the bank's authority and the prestige of market-friendly economics. And the strategy has worked spectacularly—with sometimes disastrous results for societies striving to cope with the requirements of economic theory and deregulated markets. Drawing on previously untapped archives and providing a unique analysis of the sway of prizewinners, The Nobel Factor offers an unprecedented account of the real-world consequences of economics and its greatest prize.

As the world is currently in the midst of financial and economic crises, this collection of expert contributions focuses on strategy formation and implementation at various organizational levels to address the challenges ahead. The latest economic turmoil and its ongoing impact on business performance are compelling top managers to develop effective business strategies and redefine the boundaries of their operational and

strategic activities. On one hand, tremendous challenges in the competitive business environment have become a source of global threats for many small entrepreneurs. On the other, investors faced with today's volatile economic conditions demand more gains on their capital investments to counter-balance the growing risk of global threats. This book explores the question as to whether it is possible to efficiently and effectively address these threats and obstacles. Are managers capable of planning and implementing strategic actions? What should the major managerial strategy be in order to overcome fluctuations in a market-oriented society? The strategies and practices recommended here are aimed to design continuous development competencies and contribute to the stability, recovery and sustainability of global business operations under volatile economic conditions. This refreshingly novel book seeks to establish managerial strategies and practices for effectively responding to challenges in the competitive business environment, as global volatility and fluctuations continue to worsen.

This book surveys big data tools used in macroeconomic forecasting and addresses related econometric issues, including how to capture dynamic relationships among variables; how to select parsimonious models; how to deal with model uncertainty, instability, non-stationarity, and mixed frequency data; and how to evaluate forecasts, among others. Each chapter is self-contained with references, and provides solid background information, while also reviewing the latest advances in the field.

Accordingly, the book offers a valuable resource for researchers, professional forecasters, and students of quantitative economics.

Economic forecasting is a key ingredient of decision making both in the public and in the private sector. Because economic outcomes are the result of a vast, complex, dynamic and stochastic system, forecasting is very difficult and forecast errors are unavoidable. Because forecast precision and reliability can be enhanced by the use of proper econometric models and methods, this innovative book provides an overview of both theory and applications. Undergraduate and graduate students learning basic and advanced forecasting techniques will be able to build from strong foundations, and researchers in public and private institutions will have access to the most recent tools and insights. Readers will gain from the frequent examples that enhance understanding of how to apply techniques, first by using stylized settings and then by real data applications--focusing on macroeconomic and financial topics. This is first and foremost a book aimed at applying time series methods to solve real-world forecasting problems. Applied Economic Forecasting using Time Series Methods starts with a brief review of basic regression analysis with a focus on specific regression topics relevant for forecasting, such as model specification errors, dynamic models and their predictive properties as well as forecast evaluation and

combination. Several chapters cover univariate time series models, vector autoregressive models, cointegration and error correction models, and Bayesian methods for estimating vector autoregressive models. A collection of special topics chapters study Threshold and Smooth Transition Autoregressive (TAR and STAR) models, Markov switching regime models, state space models and the Kalman filter, mixed frequency data models, nowcasting, forecasting using large datasets and, finally, volatility models. There are plenty of practical applications in the book and both EViews and R code are available online.

Structural vector autoregressive (VAR) models are important tools for empirical work in macroeconomics, finance, and related fields. This book not only reviews the many alternative structural VAR approaches discussed in the literature, but also highlights their pros and cons in practice. It provides guidance to empirical researchers as to the most appropriate modeling choices, methods of estimating, and evaluating structural VAR models. The book traces the evolution of the structural VAR methodology and contrasts it with other common methodologies, including dynamic stochastic general equilibrium (DSGE) models. It is intended as a bridge between the often quite technical econometric literature on structural VAR modeling and the needs of empirical researchers. The focus is not on providing the most rigorous theoretical arguments, but on enhancing the reader's

understanding of the methods in question and their assumptions. Empirical examples are provided for illustration.

Chapter four proposes a generalized impulse response function for joint bi-factor model which can be extended to the Bivariate Two-Markov-Chain VAR model, while the concept of the generalized impulse response is introduced by Koop et al. (1996) which can be used for both linear and nonlinear multivariate models. Compared with current popular generalized impulse response function in Markov-switching vector autoregressive models by Karame (2010, 2012), the joint bi-factor model contains two first-order Markov chains which can capture two different but related markets well, for instance, stock market and bond market. The empirical illustration of this generalized impulse response function makes use of estimation of the joint bi-factor model from chapter three. The generalized impulse response graphs show that both stock and bond markets react most strongly in the Bear market and react to the weakest in the Bull market when a unit stock shock occurs; both stock and bond markets react most strongly in the high bond return phases and react to the weakest in the low bond return phases when a unit bond shock occurs.

This valuable text provides a comprehensive introduction to VAR modelling and how it can be applied. In particular, the author focuses on the properties of the

Cointegrated VAR model and its implications for macroeconomic inference when data are non-stationary. The text provides a number of insights into the links between statistical econometric modelling and economic theory and gives a thorough treatment of identification of the long-run and short-run structure as well as of the common stochastic trends and the impulse response functions, providing in each case illustrations of applicability. This book presents the main ingredients of the Copenhagen School of Time-Series Econometrics in a transparent and coherent framework. The distinguishing feature of this school is that econometric theory and applications have been developed in close cooperation. The guiding principle is that good econometric work should take econometrics, institutions, and economics seriously. The author uses a single data set throughout most of the book to guide the reader through the econometric theory while also revealing the full implications for the underlying economic model. To test ensure full understanding the book concludes with the introduction of two new data sets to combine readers understanding of econometric theory and economic models, with economic reality.

Small-scale VARs have come to be widely used in macroeconomics, for purposes ranging from forecasting output, prices, and interest rates to modeling expectations formation in theoretical models. However, a body of recent work

suggests such VAR models may be prone to instabilities. In the face of such instabilities, a variety of estimation or forecasting methods might be used to improve the accuracy of forecasts from a VAR. These methods include using different approaches to lag selection, observation windows for estimation, (over-) differencing, intercept correction, stochastically time--varying parameters, break dating, discounted least squares, Bayesian shrinkage, detrending of inflation and interest rates, and model averaging. Focusing on simple models of U.S. output, prices, and interest rates, this paper compares the effectiveness of such methods. Our goal is to identify those approaches that, in real time, yield the most accurate forecasts of these variables. We use forecasts from simple univariate time series models, the Survey of Professional Forecasters and the Federal Reserve Board's Greenbook as benchmarks

Bayesian Multivariate Time Series Methods for Empirical Macroeconomics provides a survey of the Bayesian methods used in modern empirical macroeconomics.

"A common view in the literature is that the effect of energy price shocks on macroeconomic aggregates is asymmetric in energy price increases and decreases. We show that widely used asymmetric vector autoregressive models of the transmission of energy price shocks are misspecified, resulting in

inconsistent parameter estimates, and that the implied impulse responses have been routinely computed incorrectly. As a result, the quantitative importance of unanticipated energy price increases for the U.S. economy has been exaggerated. In response to this problem, we develop alternative regression models and methods of computing responses to energy price shocks that yield consistent estimates regardless of the degree of asymmetry. We also introduce improved tests of the null hypothesis of symmetry in the responses to energy price increases and decreases. An empirical study reveals little evidence against the null hypothesis of symmetry in the responses to energy price shocks. Our analysis also has direct implications for the theoretical literature on the transmission of energy price shocks and for the debate about policy responses to energy price shocks"--Page 1.

Vector autoregressive (VAR) models are among the most widely used econometric tools in the fields of macroeconomics and financial economics. Much of what we know about the response of the economy to macroeconomic shocks and about how various shocks have contributed to the evolution of macroeconomic and financial aggregates is based on VAR models. VAR models also have been used successfully for economic and business forecasting, for modeling risk and volatility, and for the construction of forecast scenarios. Since the introduction of VAR models by C.A. Sims in 1980, the VAR methodology has continuously evolved. Even today important extensions and reinterpretations of the VAR framework are being developed.

Examples include VAR models for mixed-frequency data, VAR models as approximations to DSGE models, factor-augmented VAR models, new tools for the identification of structural shocks in VAR models, panel VAR approaches, and time-varying parameter VAR models. This volume collects contributions from some of the leading VAR experts in the world on VAR methods and applications. Each paper highlights and synthesizes a new development in this literature in a way that is accessible to practitioners, to graduate students, and to readers in other fields.

Volume 36 of Advances in Econometrics recognizes Aman Ullah's significant contributions in many areas of econometrics and celebrates his long productive career.

This paper distills and identifies global liquidity (GL) momenta from the macro-financial data of advanced economies through a factor model with sign restrictions as policy-driven, market-driven, and risk averseness factors. Using a panel factor-augmented VAR, we investigate responses of emerging market economies (EMEs) to GL shocks. A policy-driven liquidity increase boosts growth in EMEs, elevating stock prices and currency values, while a risk averseness rise has an opposite effect. A market-driven GL expansion boosts stock markets and lowers funding costs, promoting competitiveness and current account. Inflation targeting EMEs fare better than EMEs under alternative regimes with respect to macrofinancial volatility.

Recently, it has been suggested that macroeconomic forecasts from estimated DSGE models tend to be more accurate out-of-sample than random walk forecasts or Bayesian VAR forecasts. Del Negro and Schorfheide(2013) in particular suggest that the DSGE model forecast should become the benchmark for forecasting horse races. We compare the real-time forecasting accuracy of the Smets and Wouters DSGE model with that of several reduced form

time series models. We first demonstrate that none of the forecasting models is efficient. Our second finding is that there is no single best forecasting method. For example, typically simple AR models are most accurate at short horizons and DSGE models are most accurate at long horizons when forecasting output growth, while for inflation forecasts the results are reversed. Moreover, the relative accuracy of all models tends to evolve over time. Third, we show that there is no support the common practice of using large-scale Bayesian VAR models as the forecast benchmark when evaluating DSGE models. Indeed,low-dimensional unrestricted AR and VAR forecasts may forecast more accurately.

This dissertation consists of three chapters dealing with different topics in time series econometrics including generalized method of moments (GMM) estimation and vector autoregressions (VAR). These econometric models have revolutionized empirical research in macroeconomics. Previous work by Hansen and Singleton (1982) showed that the GMM method can be applied to estimate nonlinear rational expectations models in a simple way that the models need not even be solved. The seminal work of Sims (1980) has demonstrated how VAR models can be used for macroeconomic forecasting and policy analysis. The objective of this dissertation is to provide some new econometric tools for applied research in macroeconomics using time series data. The first chapter develops an asymptotic theory for the GMM estimator in nonlinear econometric models with integrated regressors and instruments. We establish consistency and derive the limiting distribution of the GMM estimator for asymptotically homogeneous regression functions. The estimator is consistent under fairly general conditions, and the convergence rates are determined by the degree of the asymptotic homogeneity of regression functions. Similar to linear regressions, we find that the limiting

distribution is generally biased and non-Gaussian, and that instruments themselves cannot eliminate the bias even when they are strictly exogenous. Therefore, GMM yields inefficient estimates and invalid t- and chi-square test statistics in general. By implementing the fully modified method developed by Phillips and Hansen (1990), we obtain an efficient GMM estimator which has an unbiased and mixed normal limiting distribution. In the second chapter, we develop a novel shock identification strategy in the context of two-country/block structural vector autoregressive (SVAR) models to identify the transmission of credit shocks. Specifically, we investigate how credit shocks originating in the U.S. or euro area affect domestic economic activity in emerging Asia. Shocks within each block are identified using sign restrictions, whereas shocks across the two blocks are identified using a recursive structure (block Cholesky decomposition). This strategy not only enables us to distinguish the external credit shock from the other structural shocks, but also captures the responses of the domestic country. The main findings include that the transmission of credit shocks across countries through the channel of credit contagion is fast and protracted. The adverse effects of external credit tightening are mitigated by domestic credit policy easing in China, but lead to significant decreases in credit and GDP growth in the other emerging Asian countries. We also find that the external credit shocks play a non-negligible role in driving economic fluctuations in emerging Asia, although the role is smaller in China. In the last chapter, we use a global vector autoregressive (GVAR) model to forecast the principal macroeconomic indicators of the original five ASEAN member countries (i.e. Indonesia, Malaysia, Philippines, Singapore, and Thailand). The GVAR model is a compact model of the world economy designed to explicitly model the economic and financial interdependencies at national and international levels. Our

GVAR model covers twenty countries which are grouped into nine countries/regions. After applying vector error correction model (VECM) to estimate parameters in the GVAR, we generate twelve one-quarter-ahead forecasts of real GDP growth, inflation, short-term interest rates, real exchange rates, real equity prices, and world commodity prices over the period 2009Q1-2011Q4, with four out-of-sample forecasts during 2009Q1-2009Q4. Forecast evaluation based on the panel Diebold-Mariano (DM) tests shows that the forecasts of our GVAR model tend to outperform those of country-specific VAR models, especially for short-term interest rates and real equity prices. These results suggest that the interdependencies among countries in the global financial market play an important role in macroeconomic forecasting.

This dissertation consists of three essays. Chapter II uses the method of structural factor analysis to study the effects of monetary policy on key macroeconomic variables in a data rich environment. I propose two structural factor models. One is the structural factor augmented vector autoregressive (SFAVAR) model and the other is the structural factor vector autoregressive (SFVAR) model. Compared to the traditional vector autogression (VAR) model, both models incorporate far more information from hundreds of data series, series that can be and are monitored by the Central Bank. Moreover, the factors used are structurally meaningful, a feature that adds to the understanding of the "black box" of the monetary transmission mechanism. Both models generate qualitatively reasonable impulse response functions. Using the SFVAR model, both the "price puzzle" and the "liquidity puzzle" are eliminated. Chapter III employs the method of structural factor analysis to conduct a forecasting exercise in a data rich environment. I simulate out-of-sample real time forecasting using a structural dynamic

factor forecasting model and its variations. I use several structural factors to summarize the information from a large set of candidate explanatory variables. Compared to Stock and Watson (2002)'s models, the models proposed in this chapter can further allow me to select the factors structurally for each variable to be forecasted. I find advantages to using the structural dynamic factor forecasting models compared to alternatives that include univariate autoregression (AR) model, the VAR model and Stock and Watson's (2002) models, especially when forecasting real variables. In chapter IV, we measure U.S. technology shocks by implementing a dual approach, which is based on more reliable price data instead of aggregate quantity data. By doing so, we find the relative volatility of technology shocks and the correlation between output fluctuation and technology shocks to be much smaller than those revealed in most real-business-cycle (RBC) studies. Our results support the findings of Burnside, Eichenbaum and Rebelo (1996), who showed that the correlation between technology shocks and output is exaggerated in the RBC literature. This suggests that one should examine other sources of fluctuations for a better understanding of the business cycle phenomena.

Since the 1970s, globalization has created an economic environment of interdependency between nations. Now, many countries in European and the MENA (Middle East and Northern Africa) regions must grapple with the need to increase public revenue while maneuvering through a global "race-to-the-bottom" tax competition. The Handbook of Research on Public Finance in Europe and the MENA Region explores economic development and public finance by providing critical insight into the use of public finance and policy and illuminating the intricacies of these topics through discussion of theory, empirical work, and policy objectives.

This book is ideally designed for business professionals, policy makers, financers, students and researchers in the fields of public policy and economics.

This volume of Advances in Econometrics contains articles that examine key topics in the modeling and estimation of dynamic stochastic general equilibrium (DSGE) models. Because DSGE models combine micro- and macroeconomic theory with formal econometric modeling and inference, over the past decade they have become an established framework for analyzing a variety of issues in empirical macroeconomics. The research articles make contributions in several key areas in DSGE modeling and estimation. In particular, papers cover the modeling and role of expectations, the study of optimal monetary policy in two-country models, and the problem of non-invertibility. Other interesting areas of inquiry include the analysis of parameter identification in new open economy macroeconomic models and the modeling of trend inflation shocks. The second part of the volume is devoted to articles that offer innovations in econometric methodology. These papers advance new techniques for addressing major inferential problems and include discussion and applications of Laplace-type, frequency domain, empirical likelihood and method of moments estimators.

This volume of Advances in Econometrics 34 focusses on Bayesian model comparison. It reflects the recent progress in model building and evaluation that has been achieved in the Bayesian paradigm and provides new state-of-the-art techniques, methodology, and findings that should stimulate future research.

This book explores the role of national fiscal policies in a selected group of Euro-area countries under the European Economic and Monetary Union (EMU). In particular, the authors characterize the response of output to fiscal consolidations and expansions in the small Euro-

area open economies affected by high public and private debt. It is shown that the macroeconomic outcome of fiscal shocks is strongly related to debt levels. The Euro-area countries included in the investigation are Greece, Ireland, Italy, the Netherlands, Spain, and Portugal, over the sample period 1999–2016, i.e., the EMU period. The main econometric tools used in this research are structural vector autoregressive (VAR) models, including panel VAR models. The available literature relating to the subject is also fully reviewed. A further closely investigated topic is the potential spillover effects of German fiscal policies on the selected small Euro-area economies. Moreover, in the perspective of the evolution of the Euro Area towards a full Monetary and Fiscal Union, the authors study the effects of area-wide government spending shocks on aggregate output and other macroeconomic variables during the EMU period. The closing chapter of the book considers evidence on the consequences of austerity policies for European labour markets during recent years.

'Macroeconometric Models for Portfolio Management' begins by outlining a portfolio management framework into which macroeconometric models and backtesting investment strategies are integrated. It is followed by a discussion on the theoretical backgrounds of both small and global large macroeconometric models, including data selection, estimation, and applications. Other practical concerns essential to managing a portfolio with decisions driven by macro models are also covered: model validation, forecast combination, and evaluation. The author then focuses on applying these models and their results on managing the portfolio, including making trading rules and asset allocation across different assets and risk management. The book finishes by showing portfolio examples where different investment strategies are used and illustrate how the framework can be applied from the beginning of

collecting data, model estimation, and generating forecasts to how to manage portfolios accordingly. This book aims to bridge the gap between academia and practising professionals. Readers will attain a rigorous understanding of the theory and how to apply these models to their portfolios. Therefore, 'Macroeconometric Models for Portfolio Management' will be of interest to academics and scholars working in macroeconomics and finance; to industry professionals working in financial economics and asset management; to asset managers and investors who prefer systematic investing over discretionary investing; and to investors who have a strong interest in macroeconomic influences on their portfolio.

Abstract: This dissertation examines theoretical and empirical topics in macroeconomic dynamics. A central issue in macroeconomic dynamics is understanding the sources of business cycle fluctuations. The idea that expectations about future economic fundamentals can drive business cycles dates back to the early twentieth century. However, the standard real business cycle (RBC) model fails to generate positive comovement in output, consumption, labor-hours and investment in response to news shocks. My dissertation proposes a solution to this puzzling feature of the RBC model by developing a theoretical model that can generate positive aggregate and sectoral comovement in response to news shocks. Another key issue in macroeconomic dynamics is gauging the performance of theoretical models by comparing them to empirical models. Some of the most widely used empirical models in macroeconomics are level vector autoregressive (VAR) models. However, estimated level VAR models may contain explosive roots, which is at odds with the widespread consensus among macroeconomists that roots are at most unity. My dissertation investigates the frequency of explosive roots in estimated level VAR models using Monte Carlo simulations.

Additionally, it proposes a way to mitigate explosive roots. Finally, as macroeconomic datasets are relatively short, empirical models such as autoregressive models (i.e. AR or VAR models) may have substantial small-sample bias. My dissertation develops a procedure that numerically corrects the bias in the roots of AR models. This dissertation consists of three essays. The first essay develops a model based on learning-by-doing (LBD) that can generate positive comovement in output, consumption, labor-hours and investment in response to news shocks. I show that the one-sector RBC model augmented by LBD can generate aggregate comovement in response to news shock about technology. Furthermore, I show that in the two-sector RBC model, LBD along with an intratemporal adjustment cost can generate sectoral comovement in response to news about three types of shocks: i) neutral technology shocks, ii) consumption technology shocks, and iii) investment technology shocks. I show that these results hold for contemporaneous technology shocks and for different specifications of LBD. The second essay investigates the frequency of explosive roots in estimated level VAR models in the presence of stationary and nonstationary variables. Monte Carlo simulations based on datasets from the macroeconomic literature reveal that the frequency of explosive roots exceeds 40% in the presence of unit roots. Even when all the variables are stationary, the frequency of explosive roots is substantial. Furthermore, explosion increases significantly, to as much as 100% when the estimated level VAR coefficients are corrected for small-sample bias. These results suggest that researchers estimating level VAR models on macroeconomic datasets encounter explosive roots, a phenomenon that is contrary to common macroeconomic belief, with a very high frequency. Monte Carlo simulations reveal that imposing unit roots in the estimation can substantially reduce the frequency of explosion.

Hence one way to mitigate explosive roots is to estimate vector error correction models. The third essay proposes a numerical procedure to correct the small-sample bias in autoregressive roots of univariate AR(p) models. I examine the median-bias properties and variability of the bias-adjusted parameters relative to the least-squares estimates. I show that the bias correction procedure substantially reduces the median-bias in impulse response functions. Furthermore, correcting the bias in roots significantly improves the median-bias in half-life, quarter-life and up-life estimates. The procedure pays a negligible-to-small price in terms of increased standard deviation for its improved median-bias properties.

This volume is a collection of selected empirical studies on determinants of economic growth in Africa. Grouped into three parts, chapters examine the influence of financial sources and economic growth; sources of productivity growth; and prices, exchange rates and trade relationships with growth in regions in Africa or the continent as a whole. This edited book is authored by African experts in the field who employ diverse up-to-date data and methods to provide robust empirical results based on representative firms, household surveys and secondary country level data covering individuals or multiple countries on the continent. It contains a wealth of empirical evidence, deep analyses and sound recommendations for policymakers and researchers for designing and implementing effective social and national policies and strategies to prevent and to reduce poverty and its negative effects on poor households and in poor regions. The volume will be a useful resource for policymakers and researchers involved in promoting economic growth and fighting poverty. It will also appeal to a broader audience interested in economic development, resource economics, policies, economic welfare and inclusive growth.

Gross domestic product (GDP) comes under the heading of National Accounts, Which is a subject in macroeconomics. This study aims at to find appropriate VAR (Vector Autoregressive) model for the variables agriculture, industry and services in multivariate time series, to check out the causality among the variables agriculture, industry, and service. In addition to data description and forecasting, here the VAR model is also used for structural inference and policy analysis. But before these we must verify the validation of the model in different time period, because a forecasting model may lose its validity and suitability as time progresses.The basic aim of this study was to check out the causality or inter dependency between the variables agriculture, industry and services on GDP of Bangladesh. Also to forecast the increasing GDP using VAR model. From the above study and estimation, VAR is an appropriate model for the GDP of Bangladesh. The author also found various measures of forecasting accuracy for the model. Author have found strong evidence of inter dependency or causality among the three underlying variable.

This book is concerned with recent developments in time series and panel data techniques for the analysis of macroeconomic and financial data. It provides a rigorous, nevertheless user-friendly, account of the time series techniques dealing with univariate and multivariate time series models, as well as panel data models. It is distinct from other time series texts in the sense that it also covers panel data models and attempts at a more coherent integration of time series, multivariate analysis, and panel data models. It builds on the author's extensive research in the areas of time series and panel data analysis and covers a wide variety of topics in one volume. Different parts of the book can be used as teaching material for a variety of courses in econometrics. It can also be used as reference manual. It begins with an overview

of basic econometric and statistical techniques, and provides an account of stochastic processes, univariate and multivariate time series, tests for unit roots, cointegration, impulse response analysis, autoregressive conditional heteroskedasticity models, simultaneous equation models, vector autoregressions, causality, forecasting, multivariate volatility models, panel data models, aggregation and global vector autoregressive models (GVAR). The techniques are illustrated using Microfit 5 (Pesaran and Pesaran, 2009, OUP) with applications to real output, inflation, interest rates, exchange rates, and stock prices.

This volume explores dynamic factor model specification, asymptotic and finite-sample behavior of parameter estimators, identification, frequentist and Bayesian estimation of the corresponding state space models, and applications.

This book presents ground-breaking advances in the domain of causal structure learning. The problem of distinguishing cause from effect ("Does altitude cause a change in atmospheric pressure, or vice versa?") is here cast as a binary classification problem, to be tackled by machine learning algorithms. Based on the results of the ChaLearn Cause-Effect Pairs Challenge, this book reveals that the joint distribution of two variables can be scrutinized by machine learning algorithms to reveal the possible existence of a "causal mechanism", in the sense that the values of one variable may have been generated from the values of the other. This book provides both tutorial material on the state-of-the-art on cause-effect pairs and exposes the reader to more advanced material, with a collection of selected papers. Supplemental material includes videos, slides, and code which can be found on the workshop website. Discovering causal relationships from observational data will become increasingly important in data science with the increasing amount of available data, as a means of detecting

potential triggers in epidemiology, social sciences, economy, biology, medicine, and other sciences.

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