Macroeconometric Models for Portfolio Management

by

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Table of Contents

Preface

Macroeconometric models have become the fundamental tool in the academia and central bank community. It is now almost impossible to have a rigorous understanding of the global economies without such tools. The widespread use of macro models, particularly DSGE and increasingly GVAR models in the policymaking community, shows the usefulness of these models for analyzing and simulating economic experiments. Given the cheap data access and numerous software available for the users, the importance of macro models will only increase.

One area that is under-researched by the macroeconometric community is portfolio management. Often we can find numerous academic papers on macro models but are not related to portfolio management. In practice, the financial industry has a long track record of applying macroeconomic analysis for portfolio management but rarely refers to the academic literature of macroeconometrics. However, this trend is now changing as more systematic fund managers are employing quantitative models to forecast and trade their portfolio positions. The rise of algorithmic and systematic trading has driven the explosion of research in high-frequency econometrics, quantitative finance and machine learning as practitioners are keen to discover a more efficient, automatic way to model the economy and forecast the actions while staying profitable.

This book offers a detailed explanation of the various types of macro models and shows their applications by demonstrating with empirical tests. For each model, it begins with the construction, calibration/estimation and simulation. The book is intended for readers who have training in economics but have not yet been exposed to the research in macroeconometric models. Practitioners who work in the industry would also find it very handy as a guide to all major macro models and how they can be applied to portfolio management.

The first part of this book introduces the basics of financial-economic theories and how they are related to portfolio management. The second part looks at all major models that are found in macroeconometrics, such as DSGE, GVAR and FAVAR. It also contains chapters on volatility models such as GARCH. Numerous software packages are available either for free or at a low cost for the reader to apply these models.

The last part is focused on bringing the models to a portfolio management context. The most important purpose of this part is to demonstrate how macro model forecasts can be applied and translated into actual trading positions in light of the risk and reward preference by the investor. A backtesting workbook

is also included, and the reader will be able to backtest trading strategies with inputs from the forecasts. It allows the reader to enter either a long or short position based on the forecast. The reader can also fine-tune criteria such as expected risk and trading size. Returns will be calculated automatically to show whether the forecast and the trading strategy worked. The workbook can be downloaded from the book's homepage on Vernon Press.

It is my hope for this book to be a bridge between academia and industry. I'll be very grateful if the reader is encouraged to further pursue the subject matter.

Jeremy Kwok, London, 2021

List of acronyms

2SLS	Two-Stage least squares
3SLS	Three-stage least squares
ACF	autocorrelation function
ADF	Augmented Dickey-Fuller test
AIC	Akaike information criterion
APT	Arbitrage Pricing Theory
APW	APW statistic
AR	Autoregressive
ARCH	Autoregressive conditional heteroskedasticity
ARIMA	Autoregressive integrated moving average
BOE	Bank of England
BVAR	Bayesian VAR
CAPM	Capital Asset Pricing Model
CC	Cowles Commission
CUSUM	Maximal OLS cumulative sum statistic
DGP	Data generating process
DOF	Degree of freedom
DSGE	Dynamic stochastic general equilibrium model
ECB	European Central Bank
EMH	Efficient Market Hypothesis
ETF	Exchange-traded fund
FAVAR	Factor-augmented VAR
FED	Federal Reserve System -central banking system of the US
FOC	First-order conditions
FTSE	Financial Times Stock Exchange. The most prominent index being the FTSE100 for the UK market
G7	Group of Seven
GARCH	Generalised ARCH

GDP	Gross domestic product
GIRF	Generalised impulse response function
GLS	Generalised least squares
GMM	Generalised Methods of Moments
GVAR	Global VAR
IMF	International Monetary Fund
IRF	Impulse response function
IV	Instrumental variables estimation
JBT	Jarque-Bera test
LM	Lagrange Multiplier Test
MA	Moving Average
ML	Maximum Likelihood
MW	MW statistic
OMX	OMX Nordic - shares from the four stock markets in the Nordic countries
NF	No forecast
NYMEX	New York Mercantile Exchange
OFEVD	Orthogonalised forecast error variance decomposition
OIRF	Orthogonalised impulse response function
OLG	Overlapping-generations model
OLS	Ordinary least squares
OPEC	Organization of the Petroleum Exporting Countries
P&L	Profit and loss
PCA	Principal component analysis
PC	Principal components
QE	Quantitative Easing
QLR	Quandt statistic
RBC	Real Business Cycle
RMSE	Root mean squared error
S&P500	Market index that measures the performance of 500 large companies listed on US exchanges
SBC	Schwarz Bayesian criterion

SEM	Simultaneous equations model (Cowles Commission approach)
SMA	Simple moving average
SVAR	Structural VAR
TFP	Total factor Productivity
VAR	Vector autoregression
VaR	Value at Risk
VARX	VAR with exogenous variables
VECM	Vector error correction model
VECMX	VECM with exogenous variables
VR	Variance Ratio test
WTI	Crude oil West Texas intermediate

List of Figures and Tables

Figures

Tables

Part I:
Overall Framework and Financial Theories

Chapter 1

Introduction

1.1 Crystal balls

Imagine that you now have a crystal ball in front of you and it shows you the future. Just like the ones in fortune-telling, it tells you the future. It shows you exactly what will happen in the markets. What, then, does this knowledge of the future bring to you now? Most importantly, how are you going to act since you have glimpsed the future from this omniscient, prescient object? Does it imply that you will now become all-powerful and live happily forever?

Unfortunately, the short answer is no.

The long answer is it depends but it is complicated. Specifically, it depends on the crystal ball you have and, secondly, how you are going to act on it. The crystal ball—be it an oracle from insiders or a mathematical model which takes all the available information into account—will burp out forecasts that may or may not be accurate with a margin of error. Not only the output from the crystal ball can be inaccurate, but it can also be inappropriate, not suitable for actions. Even if the forecast is actionable, the logical question will then be: what are you going to do and how, exactly? Despite all these problems, the reader is tempted to ask: why bother forecasting? The answer is simple. The need to gain insight into the future will always be with us. It is a fundamental human urge to all things we do. This is an action that we cannot avoid and should be dealt with precisely. The crystal ball is certainly attractive, but the silver bullet isn't. Therefore the answer to this question is half crystal ball and half application of the crystal ball. To solve the problem of the crystal ball itself, this book seeks help from macroeconometrics. For the application of the crystal ball, it looks for the science and art of portfolio management.

The purpose of macroeconometrics is to model the national or global economies, thus enabling the modeller to create forecasts and simulations to predict what will happen in the future. This field has always been very attractive to not only academia but also central bankers and policymakers. This is evidenced by the wide adoption of the models in central bank research bodies such as the European Central Bank, the Fed, and the Bank of England. As a result, applications developed are mostly for monetary, fiscal and growth policy analysis. The publication of research related to macroeconometric models has been ever-increasing recently due to the available tools for computing these models. This allows the user to build complex models quite easily. As such, the application of this field is also of important interest not only to academia but also in the private sector due to its accessibility. Like other academic disciplines, macroeconometrics

also have different schools of thought with widely different approaches. In light of the failure of previous macro models, many solutions have been put forth. In general, there are two broad camps of models that are either data-driven or theory-driven, while some are in between. One of the most promising approaches that are data-driven but also allowed for theory is the method of Global Vector Autoregressive (GVAR) models. The GVAR approach is closely related to the VAR modelling approach but provides a relatively simple yet effective way of modelling interactions in a complex high-dimensional system such as the global economy, where it can contain many variables for each country. Other existing large models, such as the simultaneous equations model (SEMs) and Dynamic stochastic general equilibrium models (DSGEs), are the main working models in academia and industry. It is easy to see the values these models bring to decision-making in the context of portfolio management. Having a correctly estimated model is similar to holding a crystal ball informing the future. While there is no shortage of research for applications in the public sector, such as national government and central banks, there is little research on how to integrate these models for portfolio management in the industry.

Portfolio management is the economic science for determining an investment policy (such as buying equity for a long period, e.g., 20 years), forecasting returns (such as variables like GDP growth, inflation and their effect on equity or commodity prices), asset allocation (determining the portion of assets to allocate for the portfolio) and risk management for a portfolio of investments. This art is practised by fund managers, bankers and even ordinary retail investors. A fitting and accurate model for forecasting can generate enormous wealth for its users, and, therefore, it is easy to see that the models being used by private fund management companies are proprietary and are never publicized. In light of this knowledge gap, this book aims to fill the void by proposing a framework and application integrating macroeconometric models for managing a portfolio while considering its role in forecasting, asset allocation and risk management. An excel file with examples is also available to allow readers to use it immediately.

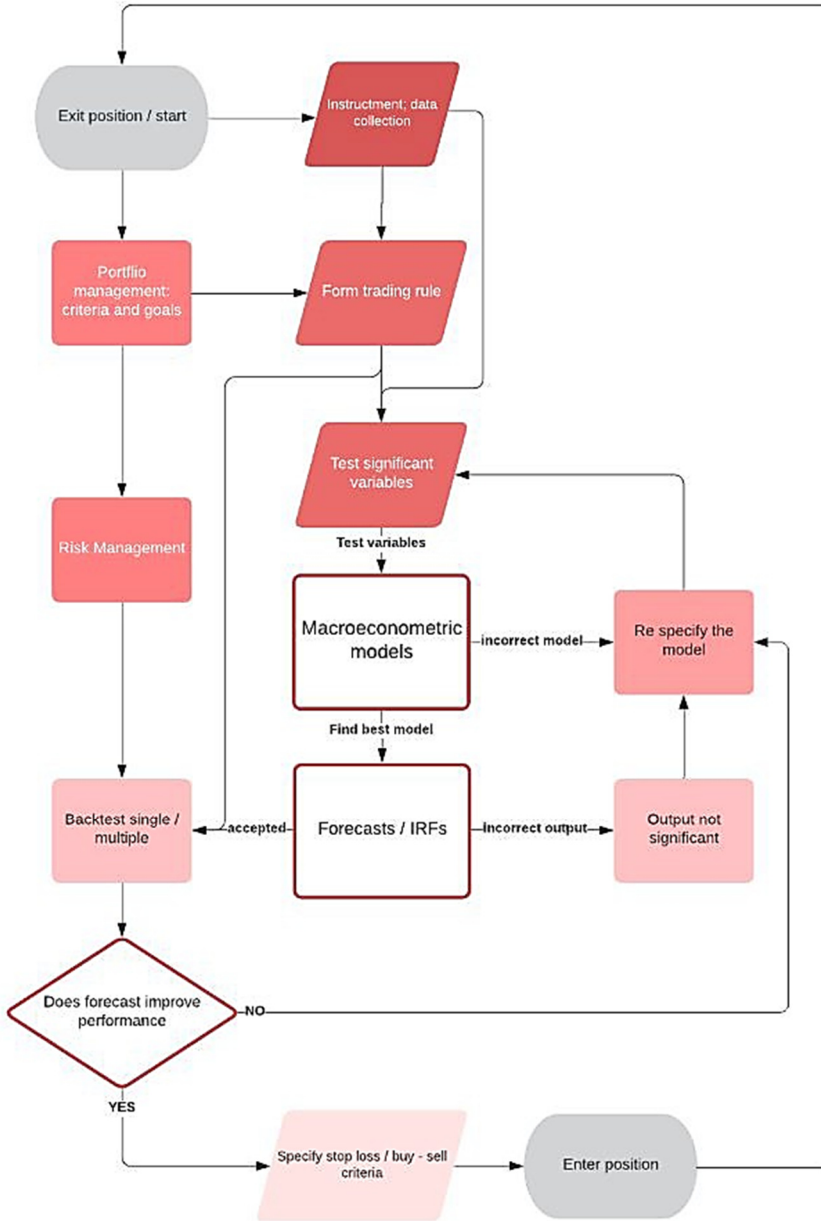
1.2 Overall framework

By the end of this book, the reader will be able to have an in-depth understanding of macroeconometric models and how to apply them to their portfolios. This book is presenting a new framework for economists and investors. However, it is not just a theoretical presentation. Readers will learn how to estimate the models and apply the forecasts into their portfolio with a backtested strategy. Specifically, the ensuing chapters in this book attempt to answer these questions:

1) Which forecast models to use and how to estimate?
2) Once estimated, how to validate whether the models work?
3) How to forecast from the models?
4) How to use forecasts as part of portfolio management?

5) How to backtest a trading strategy, given the forecasts?
6) How to translate the forecasts into trading positions given the risk and reward criteria?

Figure 1.1: Overall framework



An overall framework in figure 1.1 shows the flow of different components in this book. The framework connects the macroeconometric models to a backtesting workbook. The book follows this framework which shows the reader how to understand and apply the macroeconometric models (Part II, chapter 4-7), calibrate/estimate (chapter 8.9), produces forecasts and assesses their merits (chapter 9). Having produced the forecasts, part III of the book looks at the beginning, where the investor outlines an investment policy with criteria and goals (10). Trading rules that are fitted are then backtested in chapter 11. The last chapters (13, 14 and 15) then show the reader how this can be done with the excel workbook provided. After assessing the trading rule and forecast in light of the risk and rewards outlined in the portfolio criteria, the reader will be able to test and confirm which model is the best that allows maximum returns.

1.3 Road map

The book is divided into three parts. The first part introduces the overall framework and how classic financial theories are related to predictability and portfolio management. There are six chapters in part II. The CAPM model and EMH theory are the focus here as they are too influential to ignore by any modellers. The portfolio management chapters in Part III relate to chapters 1 and 2 by asking the readers' beliefs and how much they rely on the CAPM and EMH theory.

The chapters in part II first take the reader to the historical development of macroeconometrics before embarking on a journey to the major types of macroeconometric models. Chapter 4 provides an extensive account of the development within the field from the beginning of econometrics up to the recent research in DSGE and GVAR. Chapter 5 begins with a short demonstration of the smaller VAR models and their limitations, thus showing the need for larger, macro models. Chapter 6 also looks at the popular GARCH type models and show empirical tests on the assessment of these models. GARCH models are often used for modelling volatility. This chapter provides an option for the reader to use when estimating the expected risk of financial instruments in part II. Chapter 7 examines all major types of macro models such as GVAR, FAVAR and DSGE and how are they constructed, tested, and used for forecasting. The large scale models are notoriously difficult to estimate, and this has been treated with extensive care. Chapter 8 shows an experiment on how to validate and compare model performance. A forecasting contest was conducted between GVAR, FAVAR and DSGE models.

Part III is more practical and focuses on how to apply the models to use. Chapter 10 discusses how to formulate portfolio risk and reward and forecasts. Chapter 11 focuses on trading rules and how to backtest them. The last three chapter shows how to backtest a trading strategy with the aforementioned

portfolio criteria of risks and reward. It also shows how forecasts can be translated into an actual trading position. The final backtesting chapters 13 and 14 show that trading with accurate forecasts is much more profitable. The reader is advised to use the excel workbook when reading these chapters.

The workbook shows how the backtest can be applied to check whether a strategy would be profitable, given the historical data and trends. The first sample given is a simple backtest for testing one position strategy. This allows the reader to hold one position at any time, either buying or shorting. Therefore the reader's net position can either be short (-1), no holding (0) or long (+1). The indication of buy or sell here is indicated by the underlying strategy, which is described in the book. Once a signal is given, the reader will either buy or sell the underlying security. The profit and loss for each trade are calculated, and cumulative return is also calculated to indicate whether the strategy worked. Performance metrics are also calculated to provide a comprehensive picture.

The second part of this workbook is a backtest template that allows multiple positions. It also includes portfolio management criteria and tools that were mentioned in chapter 10. This allows the trader to backtest if holding multiple positions within the same instrument is a better strategy or not. Detailed portfolio criteria are also in place to adjust the position size to be traded, according to the risk criteria as stipulated at the start. This part was designed with flexibility in mind so that the reader can test multiple scenarios with the same dataset but with different criteria.

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Bibliography

Akerlof, G. A. & Shiller, R. J. (2010). *Animal Spirits: How Human Psychology Drives The Economy, And Why It Matters for Global Capitalism*. doi:10.1111/j.1475-4932.2009.00576.x

Kahneman, D. & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, *47* (2), 263–292. doi:10.2307/1914185

Acocella, N, Bartolomeo, G. D. & Hallett, A. (2016). *Macroeconomic Paradigms And Economic Policy: From The Great Depression to The Great Recession*. Cambridge University Press.

Adolfson, M., Lindé, J. & Villani, M. (2007). Forecasting performance of an open economy DSGE model. *Econometric Reviews*, *26* (2-4), 289–328. doi:10.1080/07474930701220543

Al-Haschimi, A. & Dées, S. (2013). Macroprudential applications of the GVAR. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of A Macro Model of The Global Economy for Policy Analysis* (pp. 151–165). doi:10.1093/acprof.arXiv:arXiv: 1011.1669v3

Amihud, Y. & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, *17* (2), 223–249. doi:10.1016/0304-405X(86)90065-6

Andersen, T. G., Bollerslev, T. & Meddahi, N. (2005). Correcting the errors: Volatility forecast evaluation using high-frequency data and realized volatilities. doi:10.1111/j.1468-0262.2005.00572.x

Ando, A, economic Review, F. M. T. A. & 1969, U. (1969). Econometric analysis of stabilization policies. *The American Economic Review*, *59* (2), 296–314. Retrieved from http://www.jstor.org/stable/1823683

Andrews, D. & Ploberger, W. (1994). Optimal tests when a nuisance parameter is present only under the alternative. *Econometrica*, 1383–1414. Retrieved from http://www.jstor.org/stable/2951753

Angelidis, T., Benos, A. & Degiannakis, S. (2004). The use of GARCH models in VaR estimation. In *Statistical Methodology*. doi:10.1016/j.stamet.2004.08.004

Armstrong, J. (2001). *Principles of Forecasting: A Handbook for Researchers and Practitioners*. Springer.

Bachelier, L. (1900). Théorie de la spéculation. *Annales scientifiques de l'École normale supérieure*. doi:10.24033/asens.476

Backé, P, Feldkircher, M & Slačík, T. (2013). Economic spillovers from the euro area to the CESEE region via the financial channel: a GVAR approach. *Focus on European Economic Integration*, *4*, 50–64. Retrieved from https://pdfs.semanticscholar.org/e6d1/bdf05ae47 29c25043a23d6c9b165e5195653.pdf

Bai, B. Y. J. & Ng, S. (2002). Determining the Number of Factors in Approximate Factor Models. *Econometrica*, *70* (1), 191–221. http://www.jstor.org/stable/2692167 Accessed: 08-07-2016.

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*. doi:10.1016/0304-405X(81)90018-0

Barber, B. M., Lee, Y. T., Liu, Y. J. & Odean, T. (2009). Just how much do individual investors lose by trading. *Review of Financial Studies*. doi:10.1093/rfs/hhn046

Barclay, M. J., Kandel, E. & Marx, L. M. (1998). The effects of transaction costs on stock prices and trading volume. *Journal of Financial Intermediation*. doi:10.1006/jfin.1998.0238

Bekaert, G, Hoerova, M & Lo Duca, M. (2013). Risk, uncertainty and monetary policy. *Journal of Monetary Economics*, *60* (7), 771–788. Retrieved from https://www.sciencedirect.com/science/article/pii/S0304393213000871

Bénassy-Quéré, A, Coeuré, B., Jacquet, P. & Ferry-Pisani, J. (2010). *Economic policy: Theory and practice*. New York: Oxford University Press.

Berger, D, Guerrieri, V & Lorenzoni, G. (2015). House prices and consumer spending. *The Review of Economic Studies*. Retrieved from https://academic.oup.com/restud/advance-article/doi/10.1093/restud/rdx060/4371413

Berkowitz, J. & O'Brien, J. (2002). How accurate are value-at-risk models at commercial banks? *Journal of Finance*. doi:10.1111/1540-6261.00455

Bernanke, B. S. (1986). Alternative explanations of the money-income correlation. In *Carnegie-Rochester conference series on public policy* (pp. 49–99). North-Holland.

Bernanke, B. S., Boivin, J. & Eliasz, P. (2005). Measuring the Effects of Monetary Policy: A Factor-Augmented Vector Autoregressive (FAVAR) Approach Author(s): Ben S. Bernanke, Jean Boivin and Piotr Eliasz Reviewed work (s): Published by Oxford University Press JSTOR is a not-for-profit serv. *The Quarterly Journal of Economics*, *120* (1), 387–422.

Black, F. (1972). Capital Market Equilibrium with Restricted Borrowing. *The Journal of Business*. doi:10.1086/295472

Black, F., Jensen, M. C. & Scholes, M. (1972). The Capital Asset Pricing Model: Some Empirical Tests. *Studies in the Theory of Capital Markets*. doi:10.2139/ssrn.908569

Blanchard, O. & Quah, D. (1988). The dynamic effects of aggregate demand and supply disturbances. *The American Economic Review*, *83* (5), 1387–1393. Retrieved from http://www.nber.org/papers/w2737

Blanchard, O. J. & Kahn, C. M. (1980). The Solution of Linear Difference Models under Rational Expectations Author (s): Olivier Jean Blanchard and Charles M. Kahn Published by The Econometric Society Stable URL: http://www.jstor.org/stable/1912186 REFERENCES Linked references are available. *Econometrica*, *48* (5), 1305–1311.

Blanchard, O. J. & Watson, M. W. (1986). Are business cycles all alike? In E. Robert J. Gordon (Ed.), *The American Business Cycle: Continuity and Change* (pp. 123–180). University of Chicago Press. Retrieved from http://www.nber.org/books/gord86-1

Blume, M. E. & Friend, I. (1973). A NEW LOOK AT THE CAPITAL ASSET PRICING MODEL. *The Journal of Finance*. doi:10.1111/j.1540-6261.1973.tb01342.x

Boivin, J., Kiley, M. T. & Mishkin, F. S. (2010). *How has the monetary transmission mechanism evolved over time?* National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w158790ANATIONAL

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Comparative Economics*, *31*, 307–327. Retrieved from http://linkinghub.elsevier.com/ retrieve/pii/0304393288901687

Bollerslev, T., Engle, R. F. & Wooldridge, J. M. (1988). A Capital Asset Pricing Model with Time-Varying Covariances. *Journal of Political Economy*. doi:10.1086/261527

Bonanno, G., Vandewalle, N. & Mantegna, R. N. (2000). Taxonomy of stock market indices. *Physical Review E - Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics*. doi:10.1103/PhysRevE.62.R7615.arXiv:0001268

Brayton, F. & Mauskopf, E. (1985). The Federal Reserve board MPS quarterly econometric model of the US economy. *Economic Modelling, 2* (3), 170–292. doi:10.1016/0264-9993(85)90022-7

Brayton, F., Levin, A., Tryon, R. & WIlliams, J. C. (1997). The Evolution of Macro Models at the Federal Reserve Board. *Carnegie-Rochester Conference Series on Public Policy, 47*, 43–81.doi:10.1016/S0167-2231(98)00004-9

Breusch, T. S. & Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica*. doi:10.2307/1911963

Bushman, R.M. and Smith, A.J., 2003. Transparency, financial accounting information, and corporate governance. *Financial accounting information, and corporate governance. Economic Policy Review*, *9*(1).

Bussière, M, Chudik, A & Sestieri, G. (2009). Modelling Global Trade Flows: Results from A GVAR Model. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstractid= 1456883

Cai, F. N. (2005). Does the Market Conspire Against the Weak? An Empirical Study of Front Running Behavior During the LTCM Crisis. *SSRN Electronic Journal*. doi:10. 2139/ssrn.292765

Campbell, J. Y. & Vuolteenaho, T. (2004). Bad beta, good beta. *American Economic Review*.doi:10.1257/0002828043052240

Campbell, J. Y., Lo, A. W. & MacKinlay, A. C. (2012). *The econometrics of financial markets*. doi:10.1515/9781400830213-004

Canova, F. (2007). *Methods for applied macroeconomic research*. Princeton University Press.

Carabenciov, I, Ermolaev, I, Freedman, C, Juillard, M, Kamenik, O, Korshunov, D & Laxton, D. (2013). A small quarterly projection model of the US economy. *IMF Working Paper 08/278*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstractid=1316746

Carnot, N, Koen, V & Tissot, B. (2011). *Economic forecasting and policy* (2nd). Palgrave Macmillan.

Cashin, P., Mohaddes, K. & Raissi, M. (2017a). China's slowdown and global financial market volatility: Is world growth losing out? *Emerging Markets Review, 31*, 164–175. doi:10.1016/J.EMEMAR.2017.05.001

Cashin, P., Mohaddes, K. & Raissi, M. (2017b). Fair Weather or Foul? The Macro-Economic Effects of El Niño. *Journal of International Economics*, *106*, 37–54. doi:10.1016/J.JINTECO.2017.01.010

Cass, D. (1965). Optimum growth in an aggregative model of capital accumulation. *The Review of economic studies, 1* (32), 233–240. Retrieved from http://www.jstor.org/stable/ 2295827

Castrén, O., Dées, S. & Zaher, F. (2010). Stress-testing euro area corporate default probabilities using a global macroeconomic model. *Journal of Financial Stability*, *6* (2), 64–78. doi:10.1016/J.JFS.2009.10.001

Cesa-Bianchi, A., Pesaran, M. H., Rebucci, A. & Xu, T. (2013). China's emergence in the world economy and business cycles in Latin America. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model*

of the Global Economy for Policy Analysis (pp. 195–211). doi:10.1093/acprof.arXiv: arXiv:1011.1669v3

Chacon, J. L. T. (2015). *Introduction to Dynamic Macroeconomic General Equilibrium Models*. Vernon Press. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/ download?doi=10.1.1.829.4028rep=rep1type=pdf

Chen, Y., He, M. & Rudkin, S. (2017). Understanding Chinese provincial real estate investment: A Global VAR perspective. *Economic Modelling, 67*, 248–260. doi:10.1016/J. ECONMOD.2016.12.019

Christiano, L. J., Eichenbaum, M. S. & Trabandt, M. (2017). On DSGE Models. *Journal of Economic Perspectives*, 1–29.

Chudik, A. & Fratzscher, M. (2011). Identifying the global transmission of the 2007–2009 financial crisis in a GVAR model. *European Economic Review, 55* (3), 325–339. doi:10.1016/J.EUROECOREV.2010.12.003

Chudik, A. & Pesaran, M. H. (2016). Theory and Practice of GVAR Modelling. *Journal of Economic Surveys, 30* (1), 165–197. doi:10.1111/joes.12095

Coase, R. & Wang, N. (2016). *How China became capitalist*. doi:10.1057/9781137019370

Cooley, T. F. & Leroy, S. F. (1985). Atheoretical macroeconometrics: A critique. *Journal of Monetary Economics, 16* (3), 283–308. doi:10.1016/0304-3932(85)90038-8

Cowles, A. (1944). Stock Market Forecasting. *Econometrica*. doi:10.2307/1905433

Crowder, W. J., Hoffman, D. L. & Rasche, R. H. (1999). Identification, Long-Run Relations, and Fundamental Innovations in a Simple Cointegrated System. *Review of Economics and Statistics, 81* (1), 109–121. doi:10.1162/003465399767923863

De Jong, D. N. & Dave, C. (2011). Structural Macroeconometrics.pdf. Princeton University Press; 2nd edition.

Dees, S., di Mauro, F., Pesaran, M. H. & Smith, L. V. (2007). Exploring the international linkages of the euro area: a global VAR analysis. *Journal of Applied Econometrics, 22* (1), 1–38. doi:10.1002/jae.932

Dees, S., Hashem Pesaran, M., Vanessa Smith, L. & Smith, R. P. (2014). Constructing MultiCountry Rational Expectations Models. *Oxford Bulletin of Economics and Statistics, 76* (6), 812–840. doi:10.1111/obes.12046

Demsetz, H. (1968). The Cost of Transacting. *The Quarterly Journal of Economics*. doi:10.2307/1882244

di Mauro, F. & Pesaran, M. (2013b). *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis*. OUP Oxford.

di Mauro, F. & Pesaran, M. H. (2013a). Introduction: An Overview of the GVAR Approach and the Handbook. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (Chap. 1, pp. 1–11). doi:10.1093/acprof. arXiv: arXiv:1011.1669v3

di Mauro, F. & Smith, L. V. (2013). The basic GVAR DdPS model. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 12–32). doi:10.1093/acprof. arXiv: arXiv:1011.1669v3

Doan, T., Litterman, R. & Sims, C. (1984). Forecasting and conditional projection using realistic prior distributions. *Econometric Reviews, 3* (1), 1–100. doi:10.1080/07474938408800053

Dragomirescu-Gaina, C. & Philippas, D. (2015). Strategic interactions of fiscal policies in Europe: A global VAR perspective. *Journal of International Money and Finance*, *59*, 49–76. doi:10.1016/J.JIMONFIN.2015.06.001

Dreger, C & Zhang, Y. (2014). Does the economic integration of China affect growth and inflation in industrial countries? *Economic Modelling*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0264999313005671

Edge, R. M. & Gurkaynak, R. S. (2011). How Useful are Estimated DSGE Model Forecasts? *SSRN Electronic Journal*, (100). doi:10.2139/ssrn.1810075

Edge, R. M., Kiley, M. T. & Laforte, J. P. (2010). A comparison of forecast performance between Federal Reserve staff forecasts, simple reduced-form models, and a DSGE model. *Journal of Applied Econometrics*, *25* (4), 720–754. doi:10.1002/jae.1175.arXiv:1099-1255

Eickmeier, S. & Ng, T. (2015). How do US credit supply shocks propagate internationally? A GVAR approach. *European Economic Review*, *74*, 128–145. doi:10.1016/J. EUROECOREV.2014.11.011

Elliott, G & Timmermann, A. (2013). *Handbook of economic forecasting*.

Engle, R. F. & Patton, A. J. (2001). What good is a volatility model? *Quantitative Finance*. doi:10.1088/1469-7688/1/2/305

Engle, R. F. (1982). Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica*, *50* (4), 987. doi:10.2307/1912773

Engle, R. F. (2000). The econometrics of ultra-high-frequency data. *Econometrica*. doi:10.1111/1468-0262.00091

Engle, R. F., Hendry, D. F. & Richard, J.-F. (1983). Exogeneity. *Econometrica*, *51* (2), 277–304.

Engle, R. F., Lilien, D. M. & Robins, R. P. (1987). Estimating Time-Varying Risk Premia in the Term Structure: The Arch-M Model. *Econometrica*. doi:10.2307/1913242

Fama, E. F. & French, K. R. (2004). The Capital Asset Pricing Model: Theory and evidence. In *Journal of economic perspectives*. doi:10.1257/0895330042162430

Fama, E. F. & French, K. R. (2007). Disagreement, tastes, and asset prices. *Journal of Financial Economics*. doi:10.1016/j.jfineco.2006.01.003

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*. doi:10.2307/2325486

Fama, E. F., Fisher, L., Jensen, M. C. & Roll, R. (1969). The Adjustment of Stock Prices to New Information. *International Economic Review*. doi:10.2307/2525569

Favero, C. A. (2001). *Applied Macroeconometrics*. doi:10.1017/S1365100502020084

Favero, C. A. (2013). Modelling sovereign bond spreads in the euro area: a nonlinear global VAR model. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 166–181). doi:10.1093/acprof.arXiv:arXiv:1011.1669v3

Favero, C., Giavazzi, F. & Perego, J. (2011). Country Heterogeneity and the International Evidence on the Effects of Fiscal Policy. *IMF Economic Review*, *59* (4), 652–682. doi:10.1057/imfer.2011.25

Feldkircher, M. & Huber, F. (2016). The international transmission of US shocks—Evidence from Bayesian global vector autoregressions. *European Economic Review*, *81*, 167–188. doi:10.1016/J.EUROECOREV.2015.01.009

Feldkircher, M. & Korhonen, I. (2012). The Rise of China and Its Implications for Emerging Markets- Evidence from a GVAR Model. *SSRN Electronic Journal*. doi:10.2139/ssrn.2151223

Feldkircher, M. (2015). A global macro model for emerging Europe. *Journal of Comparative Economics*, *43* (3), 706–726. doi:10.1016/J.JCE.2014.09.002

Friedman, M. (1968). The Role of Monetary Policy. *The American Economic Review*, *58* (1), 1–17.doi:10.1126/science.151.3712.867-a.arXiv:00368075

Galesi, A. & Lombardi, M. J. (2013). External shocks and international inflation linkages University. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 70–82). doi:10.1093/acprof.arXiv:arXiv:1011.1669v3

Galesi, A. & Sgherri, S. (2013). Regional financial spillovers across Europe. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 255–266). doi:10.1093/acprof.arXiv:arXiv:1011.1669v3

Gali, J. (1992). How well does the IS-LM model fit postwar US data? *The Quarterly Journal of Economics*, *107* (2), 709–738. Retrieved from https://academic.oup.com/qje/article-abstract/107/2/709/1838344

Ganelli, G. & Tawk, N. (2017). Spillovers from Japan's Unconventional Monetary Policy: A global VAR Approach. *Economic Modelling*. doi:10.1016/J.ECONMOD.2017.10.020

Garratt, A., Lee, K. & Shields, K. (2016). Forecasting global recessions in a GVAR model of actual and expected output. *International Journal of Forecasting*, *32* (2), 374–390. doi:10.1016/J.IJFORECAST.2015.08.004

Garratt, A., Lee, K., Pesaran, M. H. & Shin, Y. (2006a). Introduction. In *Global and National Macroeconometric Modelling: A Long-Run Structural Approach* (June 2016, pp. 1–400). doi:10.1093/0199296855.001.0001

Garratt, A., Lee, K., Pesaran, M. H. & Shin, Y. (2006b). Macroeconometric modelling: Alternative approaches. *Global and National Macroeconometric Modelling: A Long-Run Structural Approach*, (June 2016), 1–400. doi:10.1093/0199296855.001.0001

Garratt, A., Lee, K., Pesaran, M. H. & Shin, Y. (2006c). *National and global structural macroeconometric modelling*. doi:10.1093/0199296855.001.0001

Georgiadis, G. (2015). Examining asymmetries in the transmission of monetary policy in the euro area: Evidence from a mixed cross-section global VAR model. *European Economic Review*, *75*, 195–215. doi:10.1016/J.EUROECOREV.2014.12.007

Georgiadis, G. (2016). Determinants of global spillovers from US monetary policy. *Journal of International Money and Finance*, *67*, 41–61. doi:10.1016/J.JIMONFIN.2015.06.010

Giot, P. & Laurent, S. (2004). Modelling daily Value-at-Risk using realized volatility and ARCHtype models. *Journal of Empirical Finance*. doi:10.1016/j.jempfin.2003.04.003

Glosten, L. R., Jagannathan, R. & Runkle, D. E. (1993). On the Relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks. *The Journal of Finance*, *48* (5), 1779–1801.

Graham, J. R. & Harvey, C. R. (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics*. doi:10.1016/S0304-405X(01)00044-7

Granger, C. & Newbold, P. (2014). *Forecasting economic time series*. Academic Press.

Granger, C. (1999). *Empirical modeling in economics: Specification and evaluation*. Cambridge University Press.

Granger, C. W. & Jeon, Y. (2004). Thick modeling. *Economic Modelling, 21* (2), 323–343. doi:10.1016/S0264-9993(03)00017-8

Granger, C. W. & Jeon, Y. (2007). Evaluation of global models. *Economic Modelling, 24* (6), 980–989. doi:10.1016/J.ECONMOD.2007.03.008

Greenwood, R. & Shleifer, A. (2014). Expectations of returns and expected returns. *Review of Financial Studies*. doi:10.1093/rfs/hht082

Greenwood-Nimmo, M., Nguyen, V. H. & Shin, Y. (2013). Using global VAR models for scenario-based forecasting and policy analysis. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 97–113). doi:10.1093/acprof.arXiv:arXiv:1011.1669v3

Gross, M. & Kok, C. (2013). Measuring Contagion Potential Among Sovereigns and Banks Using a Mixed-Cross-Section GVAR. *Working Paper Series*, (15), 1 –49.

Gross, M. & Kok, C. (2016). *Working Paper Series The impact of bank capital on economic activity - Evidence from a Mixed-Cross-Section GVAR model*.

Grossman, S. J. & Stiglitz, J. E. (1977). On Value Maximization and Alternative Objectives of the Firm. *The Journal of Finance*. doi:10.2307/2326771

Gürkaynak, R. S., Kısacıkoğlu, B. & Rossi, B. (2013). Do DSGE Models Forecast More Accurately Out-Of-Sample than VAR Models? *VAR Models in Macroeconomics–New Developments and Applications: Essays in Honor of Christopher A. Sims*, 27–79. doi:10.1108/S0731-9053(2013) 0000031002

Haavelmo, T. (1944). The Probability Approach in Econometrics. *Econometrica1*, *12* (Supplement), 1–115.

Hájek, J. & Horváth, R. (2016). The Spillover Effect of Euro Area on Central and Southeastern European Economies: A Global VAR Approach. *Open Economies Review, 27* (2), 359–385 doi:10.1007/s11079-015-9378-4

Hamilton, J. D. (1989). A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle. *Econometrica, 57* (2), 357. doi:10.2307/1912559

Hamilton, J. D. (1994). *Time Series Analysis*. Princeton: Princeton University Press.

Han, L., Qi, M. & Yin, L. (2016). Macroeconomic policy uncertainty shocks on the Chinese economy: a GVAR analysis. *Applied Economics, 48* (51), 4907–4921. doi:10.1080/00036846.2016.1167828

Hansen, B. E. (1992). The likelihood ratio test under nonstandard conditions: Testing the Markov switching model of gnp. *Journal of Applied Econometrics, 7* (S1), S61–S82. doi:10.1002/jae.3950070506

Hansen, P. R. & Lunde, A. (2005). A forecast comparison of volatility models: Does anything beat a GARCH(1,1)? *Journal of Applied Econometrics*. doi:10.1002/jae.800

Harbo, I., Johansen, S., Nielsen, B. & Rahbek, A. (1998). Asymptotic inference on cointegrating rank in partial systems. *Journal of Business and Economic Statistics, 16* (4), 388–399. doi:10.1080/07350015.1998.10524779

Harris, L., 2003. *Trading and exchanges: Market microstructure for practitioners*. OUP USA.

Harvey, C. R. (1989). Time-varying conditional covariances in tests of asset pricing models. *Journal of Financial Economics*. doi:10.1016/0304-405X(89)90049-4

Herbst, E. & Schorfheide, F. (2015). *Bayesian estimation of DSGE models*.

Hill, R. C., Griffiths, W. E. & Lim, G. C. (2011). *Principles of Econometrics (Fourth Edition)*.

Hoover, K. D., Johansen, S. & Juselius, K. (2008). Allowing the Data to Speak Freely: The Macroeconometrics of the Cointegrated Vector Autoregression. *American Economic Association*, *98* (2), 251–255.

Hylleberg, S. & Paldam, M. (1991). New Approaches to Empirical Macroeconomics: Editors' Introduction. *The Scandinavian Journal of Economics*, *93* (2), 121–128.

Iacoviello, M. & Neri, S. (2010). Housing Market Spillovers: Evidence from an Estimated DSGE Model. *American Economic Journal: Macroeconomics*, *2* (2).

Iacoviello, M. (2005). House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle. *American Economic Review*, *95* (3), 739–764. doi:10.1257/000 2828054 201477

Ireland, P. N. (2004). A method for taking models to the data. *Journal of Economic Dynamics and Control*, *28* (6), 1205–1226. doi:10.1016/S0165-1889(03)00080-0

Issing, O. (2005). Communication, transparency, accountability: Monetary policy in the twenty-first century. *Federal Reserve Bank of St. Louis Review*, *87* (2 I), 65–83. Retrieved from https://core.ac.uk/download/pdf/6958869.pdf

Jensen, M. C. (1968). The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance*. doi:10.2307/2325404

Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. *Journal of Financial Economics*. doi:10.1016/0304-405X(78)90025-9

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12* (2-3), 231–254. doi:10.1016/0165-1889(88)90041-3

Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, *59* (6), 1551. doi:10.2307/ 2938278

Katrin, A. (2013). Forecasting the Swiss economy with a small GVAR model. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 97–113). doi:10.1093/acprof.arXiv:arXiv:1011.1669v3

Kendall, M. G. & Hill, A. B. (1953). The Analysis of Economic Time-Series-Part I: Prices. *Journal of the Royal Statistical Society. Series A (General)*. doi:10.2307/2980947

Khrapko, V. (2013). Testing The Weak-Form Efficiency Hypothesis in the Ukrainian Stock Market Versus Those of the USA, Russia, And Poland. *Ekonomika*. doi:10.15388/ekon.2013.0.1411

Kilian, L & Lütkepohl, H. (2017). *Structural vector autoregressive analysis*. Cambridge University Press.

Klein, L. R. (1947). The Use of Econometric Models as a Guide to Economic Policy Author (s): Lawrence R. Klein Published by The Econometric Society Stable URL: http://www.jstor.org/stable/1907067 Accessed: 09-06-2016 *Econometrica*, *15* (2), 111–151.

Klein, L. R., Welfe, A. & Welfe, W. (1999). *Principles of macroeconometric modeling*. North Holland; Revised edition.

Klein, P. (2002). Using the generalized Schur form to solve a multivariate linear rational expectations model. *Journal of Economic Dynamics and Control*, *24* (10), 1405–1423. doi:10.1016/s0165-1889(99)00045-7

Kocherlakota, N. (2010). Creating business cycles through credit constraints. *Quarterly Review-Federal Reserve Bank*. Retrieved from http://search.proquest.com/openview/1bb53d992fdd57a7bdc2836f3033284f/1?pqorigsite=gscholarcbl=47763

Koop, G., Pesaran, M. & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. *Journal of Econometrics*, *74* (1), 119–147. doi:10.1016/0304-4076(95)01753-4

Koopmans, T. C. (1949). Identification Problems in Economic Model Construction. *Econometrica*, *17* (2), 125–144.

Koopmans, T. C. (1950). When is an equation system complete for statistical purposes? In *Cowles commission monograph no. 10* (Chap. In Statist). New York: John Wiley. Retrieved from https://dialnet.unirioja.es/servlet/articulo?codigo=4563201

Korinek, A. (2017). Thoughts on DSGE Macroeconomics: Matching the Moment, But Missing the Point? *2015 Conference "A Just Society"*, (July), 1–13.

Kydland, F. & Prescott, E. (1991). Hours and employment variation in business-cycle theory. *Business Cycles*, 107–134. Retrieved from https://link.springer.com/chapter/10.1007/978-1-349-11570-95

Kydland, F. E. & Prescott, E. C. (1982). Time to build and aggregate fluctuations. *Econometrica*, *50* (6), 1345–1370.

Levin, B. A., Wieland, V. & Williams, J. C. (2003). The Performance of Forecast-Based Monetary Policy Rules under Model Uncertainty. *American Economic Review*, *93* (3), 622–645.

Levy, R. A. (1967). The Theory of Random Walks: A Survey of Findings. *The American Economist*.doi:10.1177/056943456701100205

Lintner, J. (1965). Security Prices, Risk, and Maximal Gains From Diversification. *The Journal of Finance*. doi:10.2307/2977249

Litterman, R. B. (1986). Forecasting With Bayesian Vector Autoregressions—Five Years of Experience. *Journal of Business & Economic Statistics*, *4* (1), 25–38. doi:10.1080/07350015.1986.10509491

Litzenberger, R. H. & Ramaswamy, K. (1982). The Effects of Dividends on Common Stock Prices Tax Effects or Information Effects? *The Journal of Finance*. doi:10.2307/2327346

Liu, T.-C. (1960). Underidentification, Structural Estimation, and Forecasting. *Econometrica*, *28* (4), 855–865.

Liu, Z., Wang, P. & Zha, T. (2013). Land-Price Dynamics and Macroeconomic Fluctuations. *Econometrica*, *81* (3), 1147–1184. doi:10.3982/ECTA8994

Ljung, G. M. & Box, G. E. (1978). On a measure of lack of fit in time series models. *Biometrika*. doi:10.1093/biomet/65.2.297

Lo, A. W. & MacKinlay, A. C. (2014). 2. Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test. In *A non-random walk down wall street*. doi:10.1515/9781400829095.17

Long, J. B. & Plosser, C. I. (1983). Real Business Cycles. *Journal of Political Economy*, *91* (1), 39–69. doi:10.1086/261128

Lubik, T. A. & Schorfheide, F. (2007). Do central banks respond to exchange rate movements? A structural investigation. *Journal of Monetary Economics*, *54* (4), 1069–1087. doi:10.1016/j.jmoneco.2006.01.009

Lucas, R. (1976). Economic Policy Evaluation: A Critique. *Carnegie-Rochester Conference Series on Public Policy*, 19–46. doi:http://dx.doi.org /10.1016/S0167-2231(76) 80003-6.arXiv: 9809069v1

Lucas, R. E. (1978). Asset Prices in an Exchange Economy. *Econometrica*. doi:10.23 07/1913837

Ma, S., Zhou, X. & Feng, H. (2012). Exploring the Endogenous Links and Exogenous Shocks Based on Efficiency Improvement A Case Study of Zhejiang Province. *Journal of Zhejiang University Humanities and Social Sciences*, *42* (6), 126–141. Retrieved from http://www.zjujournals.com/soc/CN/abstract/abstract10635. shtml

Malkiel, B. G. (2003). Passive Investment Strategies and Efficient Markets. *European Financial Management*. doi:10.1111/1468-036X.00205

Malkiel, B. G. (2005). Reflections on the efficient market hypothesis: 30 years later. *Financial Review*. doi:10.1111/j.0732-8516.2005.00090.x

Malkiel, B. G. (2013). *A random walk down Wall Street*. doi:10.1017/CBO97811074 15324.004.arXiv:arXiv:1011.1669v3

Mandelbrot, B. (1963). The Variation of Certain Speculative Prices. *The Journal of Business*. doi:10.1086/294632

Melecky, M. & Podpiera, A. M. (2012). Macroprudential Stress-Testing Practices of Central Banks in Central and Southeastern Europe: Comparison and Challenges Ahead.*Emerging Markets Finance and Trade*, *48* (4), 118–134. doi:10.2753/REE15 40-496X480407

Mensi, W. (2017). Global Financial Crisis and Co-movements between Oil Prices and Sector Stock Markets in Saudi Arabia: A VaR based Wavelet. *Borsa Istanbul Review*. doi:10.1016/J.BIR.2017.11.005

Merton, R. C. (1973). An Intertemporal Capital Asset Pricing Model. *Econometrica*. doi:10.2307/1913811

Michailova, S. & Worm, V. (2003). Personal networking in Russia and China: Blat and guanxi. *European Management Journal*. doi:10.1016/S0263-2373(03)00077-X. Milgate & P. Newman, Eds.). WW Norton & Company.

Mobarek, A. & Keasey, K. (2000). Weak-form market efficiency of an Emerging Market: Evidence from Dhaka Stock Market of Bangladesh. *ENBS Conference held in Oslo*.

Morana, C. (2002). IGARCH effects: An interpretation. *Applied Economics Letters*. doi:10.1080/13504850210127254

Murphy, C. (1988). An Overview of the Murphy Model. *Australian Economic Papers*, *27* (s1), 175–199. doi:10.1111/j.1467-8454.1988.tb00703.x

Musgrave, R., Musgrave, P. & Bird, R. (1989). *Public finance in theory and practice*. New York: McGraw-Hill.

Muth, J. F. (1961). Rational Expectations and the Theory of Price Movements. *Econometrica*, *29* (3), 315–335.

Ng, T. & Eickmeier, S. (2013). International business cycles and the role of financial markets. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 83–96). doi:10.1093/acprof. arXiv:arXiv:1011.1669v3

Nyblom, J. (1989). Testing for the Constancy of Parameters over Time. *Journal of the American Statistical Association*, *84* (405), 223–230. doi:10.1080/01621459.1989.10478759

Oral, E. & Oral, E. (2012). Analyzing high frequency financial data and modeling volatility using GARCH models with normal and stable paretian distributions: An example from an emerging market. *International Research Journal of Finance and Economics*.

Ortiz-Molina, H. & Phillips, G. M. (2014). Real asset illiquidity and the cost of capital. *Journal of Financial and Quantitative Analysis*. doi:10.1017/S0022109014000210

Osborne, M. F. M. (1959). Brownian Motion in the Stock Market. *Operations Research*. doi:10.1287/opre.7.2.145

Osorio, C. & Unsal, D. F. (2013). Inflation dynamics in Asia: Causes, changes, and spillovers from China. *Journal of Asian Economics*, *24*, 26–40. doi:10.1016/J.ASIECO.2012.10.007

Oyelami, L. O. & Olomola, P. (2016). External shocks and macroeconomic responses in Nigeria: A global VAR approach. *Cogent Economics & Finance*, *4* (1). doi:10.1080/23322039.2016.1239317

Pesaran, H. & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics Letters*, *58* (1), 17–29. doi:10.1016/S0165-1765(97)00214-0

Pesaran, M. & Timmermann, A. (2004). How costly is it to ignore breaks when forecasting the direction of a time series? *International Journal of Forecasting*, *20* (3), 411–425. doi:10.1016/S0169-2070(03)00068-2

Pesaran, M. (1990). *Econometrics: The New Palgrave A Dictionary of Economics* (J. Eatwell, M. Pesaran, M. H. & Smith, R. (1995). The role of theory in econometrics. *Journal of Econometrics*, *67* (1), 61–79. doi:10.1016/0304-4076(94)01627-C

Pesaran, M. H. (2015). Theory and Practice of GVAR Modelling. In *Time series and panel data econometrics* (Chap. 33, pp. 900–935). doi:10.1093/acprof.arXiv:arXiv:1011.1669v3

Pesaran, M. H., Schuermann, T. & Smith, L. V. (2009). Forecasting economic and financial variables with global VARs. *International Journal of Forecasting*, *25* (4), 642–675. doi:10.1016/J.IJFORECAST.2009.08.007

Pesaran, M. H., Schuermann, T. & Weiner, S. M. (2004). Modeling Regional Interdependencies Using a Global Error-Correcting Macroeconometric Model. *Journal of Business & Economic Statistics*, *22* (2), 129–162. doi:10.1198/073500104000000019

Pesaran, M. H., Schuermann, T., Treutler, B.-J. & Weiner, S. M. (2006). Macroeconomic Dynamics and Credit Risk: A Global Perspective. doi:10.2307/3839005

Pesaran, M. H., Shin, Y. & Smith, R. J. (2001a). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16* (3), 289–326. doi:10.1002/jae.616

Pesaran, M. H., Shin, Y. & Smith, R. J. (2001b). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16* (3), 289–326. doi:10.1002/jae.616. arXiv: CAM.5093 [10.17863]

Ploberger, W & Krämer, W. (1992). The CUSUM test with OLS residuals. *Journal of Econometrics*. Retrieved from http://www.jstor.org/stable/2951597

Popper, K. (2005). *The logic of scientific discovery*. doi:10.4324/9780203994627

Qin, D. (2013). A History of Econometrics: The Reformation from the 1970s. doi:10.1017/CBO9781107415324.004.arXiv:arXiv:1011.1669v3

Quandt, R. E. (1958). The Estimation of the Parameters of a Linear Regression System Obeying Two Separate Regimes. *Journal of the American Statistical Association*, *53* (284), 873–880.doi:10.1080/01621459.1958.10501484

Quandt, R. E. (1960). Tests of the Hypothesis That a Linear Regression System Obeys Two Separate Regimes. *Journal of the American Statistical Association*, *55* (290), 324–330. doi:10.1080/01621459.1960.10482067

Rabemananjara, R. & Zakoian, J. M. (1993). Threshold arch models and asymmetries in volatility. *Journal of Applied Econometrics*. doi:10.1002/jae.3950080104

Ramey, V. A. (2016). Macroeconomic shocks and their propagation. In J. B. Taylor & H. Uhlig (Eds.), *Handbook of macroeconomics* (V.2, pp. 71–162). Elsevier. Retrieved from https://www.sciencedirect.com/science/article/pii/S1574004816000045

Ramsey, F. P. (1927). A Contribution to the Theory of Taxation. *The Economic Journal*, *37* (145), 47–61. Retrieved from http://www.jstor.org/stable/2222721

Ramsey, F. P. (1928). A mathematical theory of saving. *The Economic Journal*, *38* (152), 543–559. Retrieved from http://www.jstor.org/stable/2224098

Rey, H. (2015). Dilemma not trilemma: the global financial cycle and monetary policy independence. *National Bureau of Economic Research*. Retrieved from http://www.nber.org/papers/w21162

Roberts, H. V. (1959). Stock-Market "Patterns" and Financial Analysis: Methodological Suggestions. *The Journal of Finance*. doi:10.2307/2976094

Roll, R. (1977). A Critique of the Asset Pricing Theory's Tests. *Journal of Financial Economics*.

Rosenberg, A., 2011. *Philosophy of social science*. Routledge.

Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*.doi:10.1016/0022-0531(76)90046-6

Rotemberg, J. J. & Woodford, M. (1997). *An Optimization-Based Framework for the Evaluation*. Retrieved from http://www.nber.org/chapters/c11041

Sargent, T. & Sims, C. (1977). Business Cycle Modeling Without Pretending to Have Too Much a Priori Economic Theory. Federal Reserve Bank of Minneapolis. Retrieved from https://nyuscholars.nyu.edu/en/publications/business-cycle-modeling-without-pretending-to-have-too-much-a-pri

Sewell, M. (2011). History of the efficient market hypothesis. *RN*.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance*. doi:10.2307/2977928

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*, *48* (1), 1–48.

Sims, C. A. (1986). Are forecasting models usable for policy analysis? *Federal Reserve Bank of Minneapolis Quarterly Review*, *10* (1). Retrieved from https://ideas.repec.org/a/fip/ fedmqr/y1986iwinp2-16nv.10no.1.html

Sims, C. A. (1992). Interpreting the macroeconomic time series facts. The effects of monetary policy. *European Economic Review*, *36* (5), 975–1000. doi:10.1016/0014-2921(92)90041-T

Sims, C. A. (2002). Solving Linear Rational Expectations Models. *Computational Economics*, *20* (1-2), 1–20. doi:10.1023/A:1020517101123

Slutzky, E. (1937). The Summation of Random Causes as the Source of Cyclic Processes. *Econometrica*. doi:10.2307/1907241

Smets, F. & Wouters, R. (2007). Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach. *American Economic Review*, *97* (3), 586–606. doi:10.1257/aer.97.3.586

Smith, R. P. (2013). The GVAR approach to structural modelling. In F. di Mauro & M. H. Pesaran (Eds.), *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis* (pp. 56–69). doi:10.1093/acprof. arXiv:arXiv:1011.1669v3

Šonje, V., Alajbeg, D. and Bubaš, Z., 2011. Efficient market hypothesis: is the Croatian stock market as (in) efficient as the US market. Financial theory and practice, 35(3), pp.301-326.

Stiglitz, J. E. (2018). Where modern macroeconomics went wrong. *Oxford Review of Economic Policy*, *34* (1), 70–106. Retrieved from https://academic.oup.com/oxrep/article-abstract/34/1-2/70/4781816

Stock, J. H. & Watson, M. W. (2002). Macroeconomic Forecasting Diffusion indexes. *Journal of Business & Economic Statistics*, *20* (2), 147–162. doi: 10.1198/073500102317351921

Stuart, A. & Markowitz, H. M. (1959). Portfolio Selection: Efficient Diversification of Investments. *OR*. doi:10.2307/3006625

Subrahmanyam, A. (2016). American Finance Association Investor Psychology and Security Market under- and Overreactions Author (s): Kent Daniel, David Hirshleifer and Avanidhar Subrahmanyam Source: The Journal of Finance, Vol. 53, No. 6 (Dec., 1998), pp .1839-1885 Publ. *The Journal of Finance*, *53* (6), 1839–1885.

Tan, M. S.-L. (2016). Policy coordination among the ASEAN-5: A global VAR analysis. *Journal of Asian Economics*, *44*, 20–40. doi:10.1016/J.ASIECO.2016.05.002

Taylor, J. (1993). *Macroeconomic policy in a world economy: from econometric design to practical operation*. New York: W.W. Norton. Retrieved from http://www.stanford.edu /johntayl/MacroPolicyWorld.htm

Tobin, J. (1958). Liquidity Preference as Behavior Towards Risk. *The Review of Economic Studies*. doi:10.2307/2296205

Tsay, R. S. (2002). *Analysis of Financial Time Series*. doi:10.1002/0471264105

Valadkhani, A. (2004). History of macroeconometric modelling: Lessons from past experience. *Journal of Policy Modeling*, *26* (2), 265–281. doi:10.1016/j.jpolmod.2004. 01.004

Vanessa Smith, L. & Galesi, A. (2017). *GVAR Toolbox 2.0 User Guide*.

Vayanos, D. (1998). Transaction costs and asset prices: A dynamic equilibrium model. *Review of Financial Studies*. doi:10.1093/rfs/11.1.1

Wald, A. & Wolfowitz, J. (1940). On a Test Whether Two Samples are from the Same Population. *The Annals of Mathematical Statistics*. doi:10.1214/aoms/1177731909

Wang, M., Keller, C. & Siegrist, M. (2011). The less you know, the more you are afraid of-A survey on risk perceptions of investment products. *Journal of Behavioral Finance*. doi:10.1080/15427560.2011.548760

Welfe, W. (2013). *Macroeconometric Models* (Advanced S). Springer-Verlag Berlin Heidelberg.

Wieland, V., Cwik, T., Müller, G. J., Schmidt, S. & Wolters, M. (2012). A new comparative approach to macroeconomic modeling and policy analysis. *Journal of Economic Behavior and Organization, 83* (3), 523–541. doi:10.1016/j.jebo.2012.01.006

Wilmott, Paul. (2006). *Paul Wilmott on Quantitative Finance*. doi:10.1002/1521-3773(20010316)40: 6<9823::AID-ANIE9823>3.3.CO;2-C.arXiv:arXiv:1011.1669v3

Working, H. (1949). The investigation of economic expectations. *The American Economic Review*.

Working, H. (1958). A Theory of Anticipatory Prices. *American Economic Review*. doi:10.2307/1816908.arXiv:00368075

Zakoian, J. M. (1994). Threshold heteroskedastic models. *Journal of Economic Dynamics and Control*. doi:10.1016/0165-1889(94)90039-6

Index

L

M

O

P

R

S