Zhongfang He
Ph.D. in Economics

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Summary

• PhD-Level knowledge and research experiences of econometrics and financial/macro economics; Deep understanding of the financial markets and macro economy in general, and of the analytical principles underlying the financial pricing and risk management.

• Expert knowledge of econometric and statistical techniques for practical applications in finance and economics; Experienced in developing quantitative models for banking interest rate and liquidity risk management as well as for central bank macroeconomic analysis;

• Experienced banking professional with extensive experiences in bank treasury functions as well as in central bank financial/macroeconomic analysis; Strong understanding of bank capital and liquidity regulations and regulatory stress-testing frameworks.

Education

- 2005 – 2009, Ph.D. in Economics, Department of Economics, University of Toronto, Canada. Thesis "Structural Breaks and Forecasting in Empirical Finance and Macroeconomics" (https://tspace.library.utoronto.ca/bitstream/1807/19192/1/He_Zhongfang_200911_PhD_thesis.pdf)
- 2004 – 2005, M.A. in Economics (Doctoral stream with entrance scholarship), Department of Economics, University of Toronto, Canada.
- 2000 – 2004, B.A. in Economics (top graduation grade), Department of Economics, Nankai University, China.

Professional Experiences

• **Royal Bank of Canada, Toronto, Canada**

Director, Asset Liability Management Quantitative Analytics, February 2018 – Present

Senior Manager, Asset Liability Management & Portfolio Analytics, October 2011 – February 2018

Responsibilities include:

 • Develop models and frameworks for managing structural interest rate risk, including non-maturity retail and wholesale deposits, early-redeemable and non-redeemable term deposits, prepayments of loans and mortgages, and retail and builders mortgage commitments.
 • Develop models and frameworks for measuring liquidity risk under both business-as-usual and stress scenarios, including the runoff behaviour of deposits in retail, commercial, wealth management and custodian businesses, the draw-down behaviour of revolving loan products such as credit lines and credit cards.
 • Develop models for the bank's banking book balance sheet under Enterprise-Wise, OSFI-Bank of Canada Macro, and US Fed CCAR stress tests.
 • Conduct quantitative analysis of the core-noncore split and the empirical retention profile of non-maturity deposits/loans for determining their funds transfer prices (FTP).
 • Conduct test of hedge effectiveness and analyze impact of promotions of deposit product.
 • Build and maintain framework for backtesting behaviour models in structural interest rate risk measurement.

• Manulife Financial, Toronto, Canada

Senior Analyst, Risk Analytics, January 2011 – September 2011

Responsibilities include:

  • Estimate the long-run government bond yields, corporate spreads and equity returns for different

 countries and regions.
    • Calibrate regime-switching models for bond and equity indices.
    • Provide recommendations to the development of structural break models for equity returns.
    • Participate in the insurance industry working group of developing capital requirement models.
    • Estimate yield curve model.

• Bank of Canada, Ottawa, Canada

Senior Analyst, Financial Market Policy Analysis, July 2009 – January 2011

Responsibilities include:

  • Design latent factor models to estimate the credit and liquidity risks of corporate bond spreads.
  • Build econometric models to estimate of the effect of unconventional monetary policy on Canadian market interest rates.
  • Develop econometric models of the impact of macroeconomic factors on the Canadian overnight index swap (OIS) rates.
  • Model and measure the credit, funding liquidity and contagion risks of Canadian financial institutions.
  • Evaluate the predictive power of the yield curve for subsequent macroeconomic performance.

Professional Certificate

FRM, since 2010

Computer Skills

C, Matlab/Octave, R, Python, Julia, SQL

Publications and Research/Analytical Studies

• "Integrating Macroeconomic Variables with Interest Rate Scenarios for Interest Rate Risk Measurement in the Banking Book", May 2019

    Abstract: Recent Basel standards on interest rate risk (IRR) in the banking book requires the consideration of macroeconomic variables for modeling client behaviors. Since macroeconomic variables and interest rates are correlated, projecting macroeconomic variables for IRR measurement poses a challenge of keeping consistency with interest rate projections from regulator-prescribed interest rate scenarios. This paper proposes an approach to integrate macroeconomic variables with interest rate scenarios. The conditional expectation of macroeconomic variables on interest rate variables is used to capture the dependence between macroeconomic and interest rate variables. Based on the mathematical properties of conditional expectation we derive its non-parametric estimator. The resulting projections of macroeconomic variables are fully consistent with given interest rate scenarios and are convenient for implementation in practice. An empirical application to Canadian fixed-term deposits is conducted to illustrate the proposed approach.

• "A Class of Generalized Dynamic Correlation Models", (under major revisions) February 2018

    Abstract: This paper proposes a class of correlation models that apply a two-layer autoregressive-moving-average structure to the dynamics of correlation matrices. The proposed model contains the Dynamic Conditional Correlation model of Engle (2002) and the Varying Correlation model of Tse and Tsui (2002) as special cases and offers greater flexibility in a parsimonious way. Performance of the proposed model is illustrated in a simulation exercise and an application to the U.S. stock indices.

• "Bayesian Automated Variable Selection for Linear Regression Models" (education note), April 2016

    Abstract: This education note explains the Bayesian variable selection algorithm for the Matlab function "*Bayesian_ARX_variable_selection*" that estimates jointly the probability of each combination of the regressors and their coefficients in a linear regression model. The Matlab function is written by the author and is publicly available under the MIT free software license. The estimated probabilities of the regressor

combinations can be used to rank and select the model specifications in an automated fashion. Applications to a simulated example and the U.S. demand deposits illustrate the use of the algorithm.

• "Efficient Estimation of Extreme Value-at-Risks for Standalone Structural Exchange Rate Risk"
(educational note), August 2014

Abstract: The standalone structural exchange rate risk depends on the product of the future foreign currency earning and the change in the exchange rate. Its Value-at-Risk (VaR) implying an extremely high survival probability, usually exceeding 99.9%, is used in practice to determine its economic capital. This paper proposes a new conditional method to calculate such extreme VaRs that is shown to be more efficient than the conventional method of directly simulating from the joint distribution of the future foreign currency earning and the change in the exchange rate. The intuition of the proposed method is that, conditional on either the future foreign currency earning or the change in the exchange rate, the distribution of the structural exchange rate risk is usually analytically tractable. The proposed method can be implemented by solving a nonlinear equation via a simple one-dimensional numerical integration and is generally applicable under the distributional assumptions commonly employed in practice.

• A Factor Model of Credit Valuation Adjustment with Multiple Counterparties, May 2012

Abstract: This paper proposes a factor model of credit valuation adjustment to price the counterparty credit risk of bilateral over-the-counter derivatives. The proposed model accounts for the interaction between the counterparty credit risk and the market risk and naturally incorporates the right/wrong-way risk. The default correlations of multiple counterparties are modeled based on the idea that there is a small set of common factors that drive the asset prices as well as the default probabilities of the counterparties. Hence the correlations between the counterpart credit risk and the market risk and between multiple counterparty defaults could be studied in a single arbitrage-free framework. This factor approach is consistent with the large literature on reduced-form models of corporate bonds.

• Real Time Detection of Structural Breaks in GARCH Models, with John Maheu, November 2010 ,
published in Computational Statistics and Data Analysis, vol 54, issue 11, pages 2628 - 2640

Abstract: A sequential Monte Carlo method for estimating GARCH models subject to an unknown number of structural breaks is proposed. Particle filtering techniques allow for fast and efficient updates of posterior quantities and forecasts in real time. The method conveniently deals with the path dependence problem that arises in these types of models. The performance of the method is shown to work well using simulated data. Applied to daily NASDAQ returns, the evidence favors a partial structural break specification in which only the intercept of the conditional variance equation has breaks compared to the full structural break specification in which all parameters are subject to change. The empirical application underscores the importance of model assumptions when investigating breaks. A model with normal return innovations result in strong evidence of breaks; while more flexible return distributions such as t-innovations or a GARCH-jump mixture model still favor breaks but indicate much more uncertainty regarding the time and impact of them.

• Understanding Systemic Risk: The Trade-Offs between Capital, Short-Term Funding and Liquid Asset Holdings, with Céline Gauthier and Moez Souissi, November 2010, Bank of Canada working paper 2010-29

Abstract: We offer a multi-period systemic risk assessment framework with which to assess recent liquidity and capital regulatory requirement proposals in a holistic way. Following Morris and Shin (2009), we introduce funding liquidity risk as an endogenous outcome of the interaction between market liquidity risk, solvency risk, and the funding structure of banks. To assess the overall impact of different mix of capital and liquidity, we simulate the framework under a severe but plausible macro scenario for different balance-sheet structures. Of particular interest, we find that (1) capital has a decreasing marginal effect on systemic risk, (2) increasing capital alone is much less effective in reducing liquidity risk than solvency risk, (3) high liquid asset holdings reduce the marginal effect of increasing short term liability on systemic risk, and (4) changing liquid asset holdings has little effect on systemic risk when short term liability is sufficiently low.

• Evaluating the Effect of the Bank of Canada's Conditional Commitment Policy, August 2010, Bank of Canada discussion paper 2010-11

Abstract: The author evaluates the effect of the Bank of Canada's conditional commitment regarding the target overnight rate on longer-term market interest rates by taking into account the relationship between interest rates, inflation, and unemployment rates. By using vector autoregressive models of monthly interest

rates, month-over-month inflation, and unemployment rates for Canada and the United States, the author finds that the Canadian 1-year treasury bill rates and 1-year forward 3-month rates have generally been lower than their model-implied values since April 2009, while the difference between the U.S. realized rates and their model-implied values has been much smaller. The author also studies the effect of the conditional commitment on longer-term government bond yields with maturities of 2, 5, and 10 years, and finds lower actual Canadian longer-term interest rates than their model-implied values, though their difference diminishes as the maturities become longer. The evidence appears to suggest that the Bank of Canada's conditional commitment likely has produced a persistent effect in lowering Canadian interest rates relative to what their historical relationship with inflation and unemployment rates would imply. However, this finding is not statistically strong and is subject to caveats such as possible in-sample model instability and the dependence of the results on the choice of inflation variable.

• Forecasting Output Growth by the Yield Curve: The Role of Structural Breaks, April 2009

Abstract: This paper proposes a new structural-break vector autoregressive (VAR) model for predicting real output growth by the nominal yield curve information. We allow for the possibility of both in-sample and out-of-sample breaks in parameter values and use information in historical regimes to make inference on out-of-sample breaks. A Bayesian estimation and forecasting procedure is proposed which accounts for the uncertainty of structural breaks and model parameters. We discuss dynamic consistency when forecasting recursively with structural break models, which has been ignored in the existing literature, and provide a solution. Applied to monthly US data from 1964 to 2006, we find strong evidence of structural breaks in the predictive relation between the yield curve and output growth in late 1979 and early 1983. The short rate has more predictive power for output growth than the term spread before 1979 while the term spread becomes more significant since the break of 1983. Incorporating the possibility of structural breaks improves out-of-sample forecasts of output growth from 1 to 12 months ahead.