Table of Contents: DIW Lecture Series on Oil Markets and the Macro Economy May 29-30, 2012

Lutz Kilian © 2012

Lecture 1:

Alternative Specifications of the Price of Oil

Key Oil Price Series

One Price?

No Oil Price Series is Perfect for all Purposes

A Statistically Significant Break in 1973

Traditional Interpretations of Oil Price Shocks

What is an Oil Price Shock?

Oil Price Shocks Driven by Oil Supply Shocks

The Crude Oil Market Becomes a Global Market

What about the Post-1973 Oil Market?

Hypothesis 1: Wars Cause Oil Price Shocks

Hypothesis 2: The Case for Endogenous Oil Prices

Hypothesis 3: The OPEC Cartel Controls Oil Prices

Synthesis

A Structural Model of the Global Market for Crude Oil

Competing Views of the Global Market for Crude Oil

Limitations of Traditional Oil Market Models

Examples of Forward-Looking Elements in Expectations of Oil Demand and Oil Supply

Key Insights

A Structural Model of the Oil Market

Why Do We Not Include the Oil Futures Spread?

Historical Decompositions for 1978.6-2010.6

What Explains the 2003-08 Oil Price Surge

Three Policy Conclusions

Speculation without a Change in Oil Inventories?

Digression: The Short-Run Price Elasticity of Oil Demand

Financial Speculation

The Masters Hypothesis

Why Do Policymakers Pay So Much Attention?

What is the Evidence on this Hypothesis?

What is Speculation?

The Role of Speculation in Oil Markets

Speculation versus Excessive Speculation

What is Excessive Speculation?

Conclusion

Increased Financialization of Oil Futures Markets

Do Index Funds Cause Oil Price Increases?

Do Oil Futures Prices Predict Oil Spot Prices

Is there a Theoretical Link from Inflows into Index Funds to Higher Spot Prices?

Did Index Funds Cause the Oil Price-Inventory Relationship to Collapse?

What Do Structural Oil Markets Tell Us?

The Role of Time-Varying Risk Premia

Index Funds and Oil Price Volatility

What is the Consensus?

Lecture 2:

Forecasting the Real Price of Oil and Quantifying Oil Price Risks

Background

Why Real-Time Data Matter

The Baumeister-Kilian Real-Time Data Set

Key Parameters for the Forecasting Horserace

Candidate Models

Results

Limitations of Standard Oil Price Forecasts

Forecast Scenarios

Examples of Scenarios

Probability Weighted Real-Time Density Forecasts

Real-Time Risk Analysis

Case Study: December 2010.

Lecture 3:

A Review of the Channels of Transmission of Exogenous Oil Price Shocks

Production Channels

Direct Effects

Indirect Effects

Consumption Channels

Direct Effects

Indirect Effects

Summary of the Demand-Side Channels of Transmission

Summary of the Supply-Side Channels of Transmission

Are Macroeconomic Responses Asymmetric in Oil Price Increases and Decreases?

The Literature on Oil Prices and the Economy

Asymmetric Models of the Transmission of Oil Price Shocks

Two Types of Studies in the Literature

Censored Oil Price VAR Models

Problems with Estimates of Asymmetric Responses from Censored VAR Models

A Stylized Static Model

What if the DGP is a Linear Symmetric VAR?

What if the DGP Is an Asymmetric Dynamic Model?

A General Model of the Oil Price-Economy Link

Computing Asymmetric Responses Properly

The Standard Approach to Constructing Asymmetric Responses

How Different is the Traditional Response from the Correctly Computed Response?

Summary

Testing for Symmetry in the Responses

Testing Models of Net Energy Price Increases

Testing Symmetry in Models of Net Energy Price Increases

Implications for the Literature on the Transmission of Oil Price Shocks

Evidence from (Pseudo) Linear VAR Models

Two Seeming Puzzles

Summary

Why Structural Oil Market Models Are Important

Do Oil Prices Forecast Real GDP?

Using Oil Prices to Forecast Real GDP Growth

Possible Explanations of the Limited Success of Linear Forecasting Models

Nonlinear Forecasting Models

Lecture 4:

Monetary Policy Responses to Oil Price Fluctuations

The Central Message

This Insight is Not New

Policy Makers Have Been Slow to Accept This Point

Oil Prices and Monetary Policy: A Review

The Monetary Policy Regime Shifts Hypothesis

The Monetary Policy Reaction Hypothesis

The Bernanke, Gertler, and Watson (1997) Model

Towards a New Class of Structural Models

An Open Economy DSGE Analysis of Policy Responses with Endogenous Oil Prices

Empirical Results

Welfare Analysis

Conclusions

Extensions

Bibliography:

- Almoguera, P.A., Douglas, C., and A.M. Herrera (2011), "Testing for the Cartel in OPEC: Noncooperative Collusion or Just Noncooperative?" *Oxford Review of Economic Policy*, 27, 144-168.
- Alquist, R., and L. Kilian (2010), "What Do We Learn from the Price of Crude Oil Futures?" *Journal of Applied Econometrics*, 25, 539-573.
- Alquist, R., L. Kilian, and T.J. Vigfusson (2012), "Forecasting the Price of Oil." Prepared for: G. Elliott and A. Timmermann, eds., *Handbook of Economic Forecasting* 2. Amsterdam: North Holland.
- Atkeson, A., and P.J. Kehoe (1999), "Models of Energy Use: Putty-Putty versus Putty-Clay," *American Economic Review*, 89, 1028-1043.

- Backus, D., and M. Crucini (1998), "Oil Prices and the Terms of Trade," *Journal of International Economics*, 50, 185-213.
- Balke, N.S., Brown, S.P.A., and M.K. Yücel (2002), "Oil Price Shocks and the U.S. Economy: Where Does the Asymmetry Originate?" *Energy Journal*, 23, 27-52.
- Balke, N.S., S.P.A. Brown, and M.K. Yücel (2010), "Oil Price Shocks and U.S. Economic Activity: An International Perspective," Discussion Paper No. 1037, Resources for the Future.
- Barsky, R.B., and L. Kilian (2002), "Do We Really Know that Oil Caused the Great Stagflation? A Monetary Alternative," in: *NBER Macroeconomics Annual 2001*, B.S. Bernanke and K. Rogoff (eds.), MIT Press: Cambridge, MA, 137-183.
- Baumeister, C., and L. Kilian (2011a), "Real-Time Forecasts of the Real Price of Oil," forthcoming: *Journal of Business and Economic Statistics*.
- Baumeister, C., and L. Kilian (2011b), "Real-Time Analysis of Oil Price Risks using Forecast Scenarios," mimeo, Department of Economics, University of Michigan.
- Baumeister, C., and G. Peersman (2012), "The Role of Time-Varying Price Elasticities in Accounting for Volatility Changes in the Crude Oil Market," forthcoming: *Journal of Applied Econometrics*.
- Bernanke, B.S. (1983), "Irreversibility, Uncertainty, and Cyclical Investment," *Quarterly Journal of Economics*, 98, 85-106.
- Bernanke B.S., M. Gertler and M.W. Watson (1997), "Systematic Monetary Policy and the Effects of Oil Price Shocks," *Brookings Papers on Economic Activity*, 1, 91-142.
- Blanchard, O.J. and J. Galí (2010), "The Macroeconomic Effects of Oil Price Shocks: Why Are the 2000s So Different from the 1970s?" in J. Galí and M. Gertler (eds), *International Dimensions of Monetary Policy*, University of Chicago Press, Chicago, 373-421.
- Bodenstein, M., C.J. Erceg, and L. Guerrieri (2011), "Oil shocks and External Adjustment," *Journal of International Economics*, 83, 168-184.
- Bodenstein, M., and L. Guerrieri (2011), "Oil Effciency, Demand and Prices: A Tale of Ups and Downs," International Finance Discussion Papers No. 1031, Board of Governors of the Federal Reserve System.
- Bodenstein, M., L. Guerrieri, and L. Kilian (2012), "Monetary Policy Responses to Oil Price Fluctuations," mimeo, University of Michigan.
- Bresnahan, T., and V. Ramey (1993), "Segment Shifts and Capacity Utilization in the U.S.

- Automobile Industry," *American Economic Review Papers and Proceedings*, 83, 213-218.
- Bruno, M., and J. Sachs (1985), *Economics of World-Wide Stagflation*, Cambridge, MA: Harvard University Press.
- Büyükşahin, B., and J.H. Harris (2011), "Do Speculators Drive Crude Oil Futures?" *Energy Journal*, 32, 167-202.
- Carlstrom, C.T., and T.S. Fuerst (2006), "Oil Prices, Monetary Policy, and Counterfactual Experiments," *Journal of Money, Credit and Banking*, 38, 1945-1958.
- Davis, S.J. (1987), "Allocative Disturbances and Specific Capital in Real Business Cycle Theories," *American Economic Review Papers and Proceedings*, 77, 326-332.
- Davis, S.J., and J. Haltiwanger (2001), "Sectoral Job Creation and Destruction Responses to Oil Price Changes," *Journal of Monetary Economics*, 48, 465-512.
- Dvir, E., and K. Rogoff (2010), "Three Epochs of Oil," mimeo, Harvard University.
- Edelstein, P., and L. Kilian (2007), "The Response of Business Fixed Investment to Energy Price Changes: A Test of Some Hypotheses about the Transmission of Energy Price Shocks," *B.E. Journal of Macroeconomics*, 7(1) (Contributions).
- Edelstein, P., and L. Kilian (2009), "How Sensitive Are Consumer Expenditures to Retail Energy Prices?" *Journal of Monetary Economics*, 56, 766-779.
- Erceg, C., L. Guerrieri, and S.B. Kamin (2011), "Did Easy Money in the Dollar Bloc Fuel the Oil Price Run-Up?" *International Journal of Central Banking*, 7, 131-160.
- Fattouh, B., L. Kilian, and L. Mahadeva (2012), "The Role of Speculation in Oil Markets: What Have We Learned So Far?" mimeo, University of Michigan.
- Finn, M.G. (2000), "Perfect Competition and the Effects of Energy Price Increases on Economic Activity," *Journal of Money, Credit and Banking*, 32, 400-416.
- Giannone, D., and L. Reichlin (2006), "Does Information Help Recover Structural Shocks from Past Observations," *Journal of the European Economic Association*, 4, 455-465.
- Green, E.J., and R.H. Porter (1984), "Noncooperative Collusion under Imperfect Price Information," *Econometrica*, 52, 87-100.
- Hamilton, J.D. (1983), "Oil and the Macroeconomy Since World War II," *Journal of Political Economy*, 91, 228-248.
- Hamilton, J.D. (1985), "Historical Causes of Postwar Oil Shocks and Recessions," *Energy Journal*, 6, 97–116.

- Hamilton, J. D. (1996). "This is What Happened to the Oil Price–Macroeconomy Relationship," *Journal of Monetary Economics*, 38, 215–220.
- Hamilton, J. D. (2003) "What is an Oil Shock?" Journal of Econometrics, 113, 363–398.
- Hamilton, J.D. (2009), "Causes and Consequences of the Oil Shock of 2007-08," *Brookings Papers on Economic Activity*, 1, Spring, 215-261.
- Hamilton, J.D. (2011), "Nonlinearities and the Macroeconomic Effects of Oil Prices," *Macroeconomic Dynamics*, 15, 364-378.
- Hamilton, J.D., and A.M. Herrera (2004), "Oil Shocks and Aggregate Economic Behavior: The Role of Monetary Policy," *Journal of Money, Credit and Banking*, 36, 265-286.
- Herrera, A.M., Lagalo, L.G., and T. Wada (2011), "Oil Price Shocks and Industrial Production: Is the Relationship Linear?" *Macroeconomic Dynamics*, 15, 472-497.
- Herrera, A.M., Lagalo, L.G., and T. Wada (2012), "Nonlinearities in the Oil Price-Industrial Production Relationship: Evidence from 18 OECD Countries" mimeo, Wayne State University.
- Herrera, A.M., and E. Pesavento (2009), "Oil Price Shocks, Systematic Monetary Policy, and the 'Great Moderation'," *Macroeconomic Dynamics*, 13, 107-137.
- Hooker, M.A. (1996), "What Happened to the Oil Price-Macroeconomy Relationship?" *Journal of Monetary Economics*, 38, 195-213.
- Hoover, K.D., and S.J. Perez (1994), "Post Hoc Ergo Propter Hoc Once More: An Evaluation of 'Does Monetary Policy Matter?' in the Spirit of James Tobin," *Journal of Monetary Economics*, 34, 89-99.
- Irwin, S.H., and D.R. Sanders (2012), "Testing the Masters Hypothesis in Commodity Futures Markets," *Energy Economics*, 34, 256-269.
- Juvenal, L., and I. Petrella (2011), "Speculation in the Oil Market," Working Paper, Federal Reserve Bank of St. Louis.
- Kellogg, R. (2010), "The Effect of Uncertainty on Investment: Evidence from Texas Oil Drilling," mimeo, Department of Economics, University of Michigan.
- Kilian, L. (2008a), "The Economic Effects of Energy Price Shocks," *Journal of Economic Literature*, 46(4), 871-909.
- Kilian, L. (2008b), "Exogenous Oil Supply Shocks: How Big Are They and How Much Do They Matter for the U.S. Economy?" *Review of Economics and Statistics*, 90, 216-240.

- Kilian, L. (2008c), "A Comparison of the Effects of Exogenous Oil Supply Shocks on Output and Inflation in the G7 Countries," *Journal of the European Economic Association*, 6, 78-121.
- Kilian, L. (2009a), "Not all Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," *American Economic Review*, 99, 1053-1069.
- Kilian, L. (2009b), "Comment on 'Causes and Consequences of the Oil Shock of 2007-08' by James D. Hamilton," *Brookings Papers on Economic Activity*, 1, Spring 2009, 267-278.
- Kilian, L. (2010a), "Explaining Fluctuations in U.S. Gasoline Prices: A Joint Model of the Global Crude Oil Market and the U.S. Retail Gasoline Market," *Energy Journal*, 31, 87-104.
- Kilian, L. (2010), "Oil Price Shocks, Monetary Policy and Stagflation," in Fry, R., Jones, C., and C. Kent (eds), *Inflation in an Era of Relative Price Shocks*, Sydney, 60-84.
- Kilian, L., and B. Hicks (2012), "Did Unexpectedly Strong Economic Growth Cause the Oil Price Shock of 2003-2008?" forthcoming: *Journal of Forecasting*.
- Kilian, L., and L.T. Lewis (2011), "Does the Fed Respond to Oil Price Shocks?" *Economic Journal*, 121, 1047-1072.
- Kilian, L., and Manganelli, S. (2007), "Quantifying the Risk of Deflation," *Journal of Money, Credit, and Banking*, 39, 561-590.
- Kilian, L., and Manganelli, S. (2008), "The Central Banker as a Risk Manager: Estimating the Federal Reserve's Preferences under Greenspan," *Journal of Money, Credit and Banking*, 40, 1103-1129.
- Kilian, L., and D. Murphy (2010), "The Role of Inventories and Speculative Trading in the Global Market for Crude Oil," mimeo, University of Michigan.
- Kilian, L., and D.P. Murphy (2012). "Why Agnostic Sign Restrictions Are Not Enough: Understanding the Dynamics of Oil Market VAR Models," forthcoming: *Journal of the European Economic Association*.
- Kilian, L., and C. Park (2009), "The Impact of Oil Price Shocks on the U.S. Stock Market," *International Economic Review*, 50, 1267-1287.
- Kilian, L., Rebucci, A., and N. Spatafora (2009), "Oil Shocks and External Balances," *Journal of International Economics*, 77, 181-194.
- Kilian, L., and C. Vega (2010), "Do Energy Prices Respond to U.S. Macroeconomic News? A Test of the Hypothesis of Predetermined Energy Prices," *Review of Economics and*

- Statistics, 93, 660-671.
- Kilian, L., and R.J. Vigfusson (2011a), "Are the Responses of the U.S. Economy Asymmetric in Energy Price Increases and Decreases?" *Quantitative Economics*, 2, 419-453.
- Kilian, L., and R.J. Vigfusson (2011b), "Nonlinearities in the Oil Price-Output Relationship," *Macroeconomic Dynamics*, 15, 337-363.
- Kormilitsina, A. (2011), "Oil Price Shocks and the Optimality of Monetary Policy," *Review of Economic Dynamics*, 14, 199-223.
- Kozicki, S., and P.A. Tinsley (2009), "Perhaps the 1970s' FOMC Did What It Said It Did," *Journal of Monetary Economics*, 56, 842-855.
- Leduc, S., and K. Sill (2004), "A Quantitative Analysis of Oil-Price Shocks, Systematic Monetary Policy, and Economic Downturns" *Journal of Monetary Economics*, 51, 781-808.
- Lee, K., and S. Ni (2002), "On the Dynamic Effects of Oil Price Shocks: A Study Using Industry Level Data," *Journal of Monetary Economics*, 49, 823-852.
- Lombardi, M.J., and I. Van Robays (2011), "Do Financial Investors Destabilize the Oil Price?" Working Paper. European Central Bank.
- Lütkepohl, H. (2005), New Introduction to Multiple Time Series Analysis, Springer: New York.
- Mork, K.A. (1989), "Oil and the Macroeconomy. When Prices Go Up and Down: An Extension of Hamilton's Results," *Journal of Political Econ*omy, 97, 740-744.
- Nakov, A., and G. Nuño (2011), "Saudi Aramco and the Oil Market," Working Paper No. 1354, European Central Bank.
- Nakov, A., and A. Pescatori (2010a), "Monetary Policy Trade-Offs with a Dominant Oil Producer," *Journal of Money, Credit, and Banking*, 42, 1-32.
- Nakov, A., and A. Pescatori (2010b), "Oil and the Great Moderation," *Economic Journal*, 120, 131-156.
- Natal, J.-M., (2012), "Monetary Policy Response to Oil Price Shocks," *Journal of Money, Credit, and Banking*, 44, 53-101.
- Obstfeld, M., and K. Rogoff (2002), "Global Implications of Self-Oriented National Monetary Policy Rules," *Quarterly Journal of Economics*, 117, 503-535.
- Pindyck, R.S. (1991), "Irreversibility, Uncertainty and Investment," *Journal of Economic Literature*, 29, 1110-1148.

- Ramey, V.A., and D.J. Vine (2010), "Oil, Automobiles, and the U.S. Economy: How Much Have Things Really Changed," *NBER Macroeconomics Annual*, 333-368.
- Ravazzolo, F., and P. Rothman (2012), "Oil and U.S. GDP: A Real Time Out-of-Sample Examination," forthcoming: *Journal of Money, Credit and Banking*.
- Rotemberg, J., and M. Woodford (1996), "Imperfect Competition and the Effects of Energy Price Increases on Economic Activity," *Journal of Money, Credit and Banking*, 28, 549-577.
- Serletis, A., G. Timilsina, and O. Vasetsky (2010). "International Evidence on Sectoral Interfuel Substitution," *Energy Journal*, 31, 1-29.
- Singleton, K.J. (2011), "Investor Flows and the 2008 Boom/Bust in Oil Prices," Working Paper, Stanford University.
- Skeet, I. (1988), *OPEC: Twenty-five Years of Prices and Politics*, Cambridge University Press: Cambridge.
- Smets, F., and R. Wouters (2007), "Shocks and Frictions in U.S. Business Cycles: A Bayesian DSGE Approach," *American Economic Review*, 97, 586-606.
- Smith, J.L. (2005), "Inscrutable OPEC? Behavioral Tests of the Cartel Hypothesis," *Energy Journal*, 26, 51-82.
- Waggoner, D.F., and Zha, T. (1999), "Conditional Forecasts in Dynamic Multivariate Models," *Review of Economics and Statistics*, 81, 639-651.
- Working, H. (1960), "Speculation on Hedging Markets," *Stanford University Food Research Institute Studies*, 1, 185-220.