North American Journal of Economics and Finance 33 (2015) 55–73

Contents lists available at ScienceDirect

North American Journal of Economics and Finance

Temporal causality between house prices and output in the US: A bootstrap rolling-window approach

Wendy Nyakabawo[a], Stephen M. Miller[b], Mehmet Balcilar[a,c], Sonali Das[d,e], Rangan Gupta[a,*]

[a] *Department of Economics, University of Pretoria, Pretoria 0002, South Africa*
[b] *Department of Economics, University of Nevada, Las Vegas, Las Vegas, NV 89154-6005, USA*
[c] *Department of Economics, Eastern Mediterranean University, Famagusta, Northern Cyprus, via Mersin 10, Turkey*
[d] *Advanced Mathematical Modelling, CSIR Modelling and Digital Science, PO Box 395, Pretoria 0001, South Africa*
[e] *Department of Statistics, Nelson Mandela Metropolitan University, PO Box 77000, Port Elizabeth 6031, South Africa*

ARTICLE INFO

Article history:
Received 10 December 2013
Received in revised form 5 March 2015
Accepted 10 March 2015
Available online 22 March 2015

JEL classification:
C32
E32
R31

Keywords:
Real house price

ABSTRACT

This paper examines the causal relationships between the real house price index and real GDP per capita in the US, using the bootstrap Granger (temporal) non-causality test and a fixed-size rolling-window estimation approach. We use quarterly time-series data on the real house price index and real GDP per capita, covering the period 1963:Q1 to 2012:Q2. The full-sample bootstrap non-Granger causality test result suggests the existence of a unidirectional causality running from the real house price index to real GDP per capita. A wide variety of tests of parameter constancy used to examine the stability of the estimated vector autoregressive models indicate short- and long-run instability. This suggests that we cannot rely on the full-sample causality tests and, hence,

Abbreviations: AIC, Akaike information criterion; AR, autoregressive; FM-OLS, fully modified ordinary least squares; GDP, gross domestic product; GMP, Gross metropolitan product; LM, Lagrange multiplier; LR, likelihood ratio; MSA, metropolitan statistical area; OECD, Organisation for Economic Co-operation and Development; OLS, ordinary least squares; PCE, personal consumption expenditure; RBB, Residual-based bootstrap; RHP, real house price; RGDPC, real GDP per capita; SIC, Schwarz information criteria; VAR, Vector autoregressive; VEC, vector error-correction.

* Corresponding author. Tel.: +27 124203460.
E-mail addresses: wvnyakabawo@yahoo.co.uk (W. Nyakabawo), stephen.miller@unlv.edu (S.M. Miller), mehmet@mbalcilar.net (M. Balcilar), sdas@csir.co.za (S. Das), rangan.gupta@up.ac.za (R. Gupta).

http://dx.doi.org/10.1016/j.najef.2015.03.001

Real GDP per capita
Bootstrap
Time-varying causality

this warrants a time-varying (bootstrap) rolling-window approach to examine the causal relationship between these two variables. Using a rolling window size of 28 quarters, we find that while causality from the real house price to real GDP per capita occurs frequently, significant, but less frequent, evidence of real GDP per capita causing the real house price also occurs. These results imply that while the real house price leads real GDP per capita, in general (both during expansions and recessions), significant feedbacks also exist from real GDP per capita to the real house price.

1. Introduction

This paper investigates the temporal (Granger) causal relationship, if any, between the real house price index and real GDP per capita, using bootstrap full- and sub-sample rolling-window estimation for the US economy. Empirical studies that examine the causal relationships between variables may suffer from inaccurate findings from full-sample time-series data, when the data series experience structural changes (Balcilar, Ozdemir, & Arslanturk, 2010). In the presence of structural change, the dynamic links between series can exhibit instability across different sub-samples (Balcilar et al., 2010). As such, this paper analyses whether a temporal (Granger) causal relationship exists between the real house price index and real GDP per capita in the US economy.

We utilize time-varying (28-quarter rolling window) bootstrap causality tests between the real house price and real GDP per capita, over the period 1963:Q1 to 2012:Q2. This sample period covers a series of different economic expansions and recessions in the US, as well as different market booms and busts, creating substantial volatility, that may provide different outcomes from other less-volatile periods (Iacoviello & Neri, 2010). We test the stability of the short- and long-run relationships between the two series to assess the reliability of full-sample causality tests. The US economy provides an interesting case study, because of the important role the housing sector played historically, including during the recent global financial crisis and Great Recession. For example, Leamer (2007) and Bernanke (2008) argue that weaknesses in the housing sector exert a pivotal role in the US business cycle.

This paper contributes to the existing literature by considering the possibility of structural change. That is, we allow the temporal (Granger) causal relationship between the real house price index and real GDP per capita to vary over time, instead of assuming structural stability within the full sample period. We implement bootstrap Granger non-causality tests for a series of rolling-window sub-sample estimations.

The subprime mortgage lending fiasco and the financial crisis sparked a price bubble and collapse in the housing market and the subsequent Great Recession.[1] Many economists argue that these events caused the recent dramatic changes in the behavior of financial and economic markets (Miller, Peng, & Sklarz, 2011), even extending to global financial markets and economies. A growing literature recognizes the importance of the relationship between the housing market and the macroeconomy, showing that the interaction between house prices and economic growth imbeds important policy implications. Economists and policy makers seemingly agree that house prices play an important role in stimulating the growth or decline of an economy. Miller et al. (2011) suggest that the strong housing market during the 2001 stock market crash may have saved the US economy from a severe recession and that, in addition, the recent collapse of the housing market initiated the Great Recession. The housing market, thus, plays an important role in the economy and its performance affects its overall performance.[2]

[1] For a historical survey of crises, refer to Dungey, Jan and Jacobs (2015).

[2] Other views of the causes of the business cycle exist. Hamilton (2003, 2009) argues that oil price shocks proximately causes of post-WWII recessions in the US.