

# Applying a Macroprudential Risk Assessment to Irish Commercial Real Estate Prices

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The views expressed are those of the authors and do not necessarily represent those of the Central Bank of Ireland

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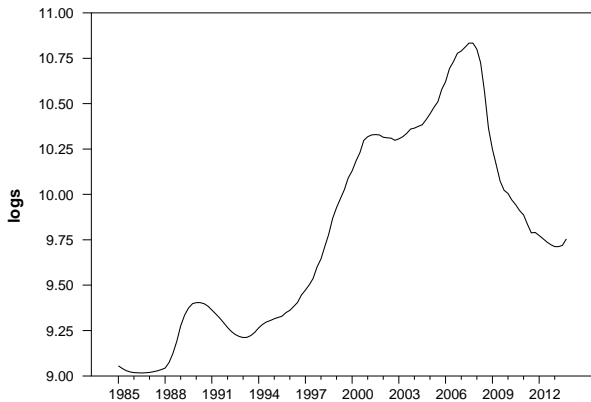
- Global Financial Crisis renewed focus on mitigating systemic risk
  - New macroprudential mandate for many national authorities
  - Range of new measures added to the toolkit (e.g., CRR/CRD IV)
- Need to enhance analytical framework and bridge data gaps to support macroprudential policy discussions
  - For time-varying systemic risk, analysis of real estate cycles important
  - Boom/bust cycles can have material real effects
- This paper looks at commercial real estate (CRE) prices and examines their dynamic behaviour up to, and during the Irish crisis
- Develop tools to support macroprudential risk assessments of this sector

# Why Commercial Real Estate?

- Housing market focus of much research but CRE market also merits attention
- Developments in this market key role in many banking crises
  - Primarily an investment asset
  - High leverage and limited liability
  - Bank loans are large and heterogeneous
- The Irish crisis clear example of risks posed by this market

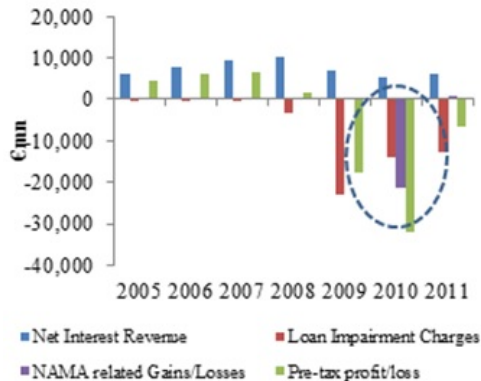
# The Irish Experience

Figure: Irish CRE Prices: 1985Q1- 2013Q4



# The Irish Banking Crisis and CRE

Figure: Irish Banks' Income Statements and NAMA related gains and losses - 2005 to 2011 (Banks' published annual accounts)



# Macroprudential Policy and CRE

- Range of measures available to policy makers
  - Sectoral capital requirements (risk weights and loss-given-default floors)
  - Broad capital buffers and other microprudential instruments
  - Credit-based measures (Loan-to-value, loan-to-cost, and interest coverage ratios)
- Recent role of non-bank finance poses challenges
- Data and analytical gaps in this sector widely recognised
  - A number of initiatives on data both domestically and internationally
  - Some markets (e.g., US, Australia and UK) widely researched - Chervachidze & Wheaton (2013), Hendershott (2000) and Ball & Grilli (1997)
  - Limited research on CRE prices in Ireland - McCartney (2010) on rents in Dublin office market. Roche and McQuinn (2000) on land prices

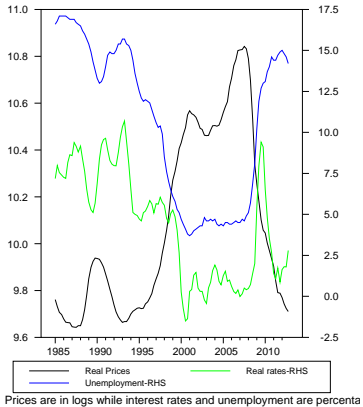
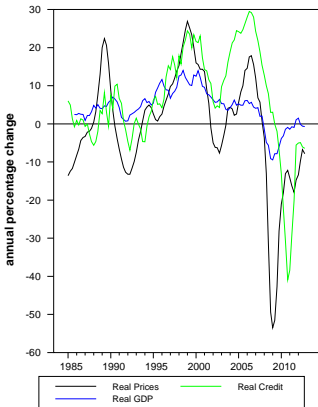
- 1 Examine the dynamic behaviour of Irish real commercial property prices over period 1985Q1 to 2013Q4
  - Identify and investigate role of fundamental and non-fundamental influences
  - Are there periods of misalignment (i.e., actual prices deviate from fundamental prices) over the sample?
- 2 Test if commercial prices conform to certain models of misalignment
  - Borrow from finance literature on asset pricing
  - Evidence of Fads (Schiller, 1984) or rational bubbles (Blanchard & Watson, 1982)?

# Estimating Misalignments in CRE Prices

- ① Reduced form approach drawing on Davis & Zhu (2011)
  - Price cycles driven by macroeconomic factors and market-specific features
  - Valuation-based index and/or investor myopia creates persistence in prices
  - Income (GDP, unemployment), interest rates, credit, lagged prices
  - Lack of supply data
- ② Two models and one statistical indicator to estimate misalignment
  - Model A: Fundamental price proxied by long-run relationship between prices, income and interest rates
  - Model B: Fundamental price changes proxied by relationship with changes in lagged prices, lagged credit and lagged unemployment
  - Statistical: Deviation of price-to-rent ratio from historical average approximate non-fundamental price component



# CRE Prices and Explanatory Variables: 1985Q1 - 2012Q4



# Empirical Approach for Model A

- Error Correction Model using Engle-Granger (1987) Two-Step Approach
- Long-run specification

$$cp_t = \alpha_0 + \alpha_1 gdp_t + \alpha_2 i_t + \mu_t$$

where  $cp_t$  is the log of real commercial property prices,  $gdp_t$  is the log of real Gross Domestic Product and  $i_t$  is real interest rates

- Short-run model

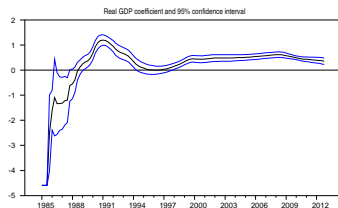
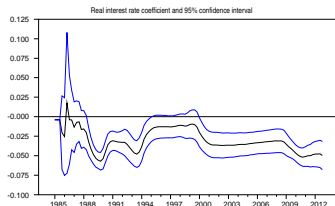
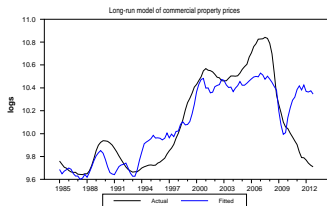
$$\Delta cp_t = \mu_{t-1} + \sum_{i=1}^p \delta_i \Delta cp_{t-i} + \sum_{i=1}^q \omega_i \Delta gdp_{t-i} + \sum_{i=1}^q \vartheta_i \Delta i_{t-i} + \epsilon_t$$

Table: Long- and short-run model of Irish CRE prices: 1985Q1 to 2012Q4

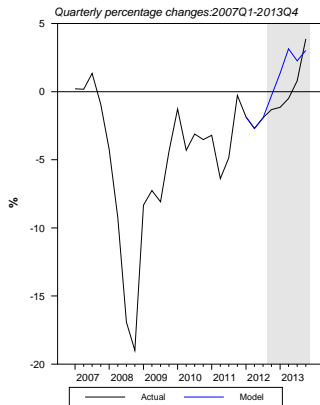
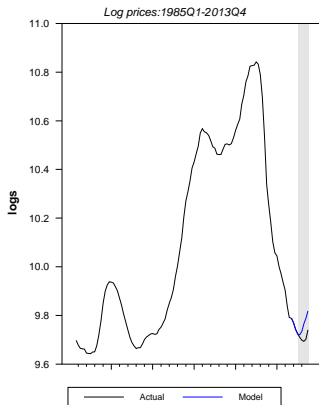
<i>Dependent variable: <math>cp_t</math></i>	
<i>constant</i>	6.71 (8.04)
<i>gdp<sub>t</sub></i>	0.35 (4.52)
<i>i<sub>t</sub></i>	-0.05 (-4.53)
<i>Dependent variable: <math>\Delta cp_t</math></i>	
<i>ecm<sub>t-1</sub></i>	-0.02 (-1.78)
$\Delta cp_{t-1}$	0.85 (8.63)
$\Delta gdp_{t-2}$	0.16 (2.39)
$\overline{R^2}$	0.78

Note: Absolute t-statistics in brackets. Heteroscedasticity-Consistent Standard Errors used in short-run model.

# Long-run model of Irish CRE prices: 1985Q1 to 2012Q4



# Out-of-sample performance: 1985Q1 to 2013Q4



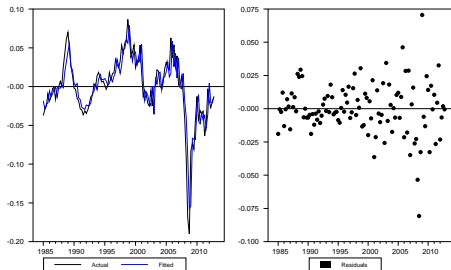
# Model B: Autoregressive Distributed Lag Model of Real CRE Prices

- Quarterly changes in Irish CRE Prices

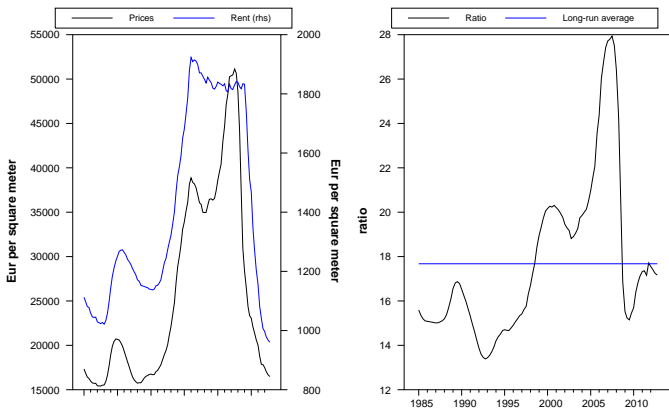
$$\Delta cp_t = \gamma_0 + \gamma_1 \Delta cp_{t-1} + \gamma_2 \Delta cp_{t-2} + \eta \Delta ue_{t-1} + \nu \Delta cred_{t-2} + \epsilon_t$$

- where  $ue$  is the unemployment rate and  $cred$  is corporate credit

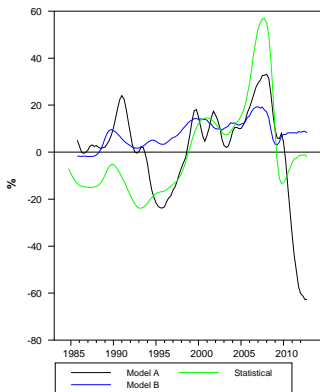
Figure: Short-run model of Irish real CRE prices



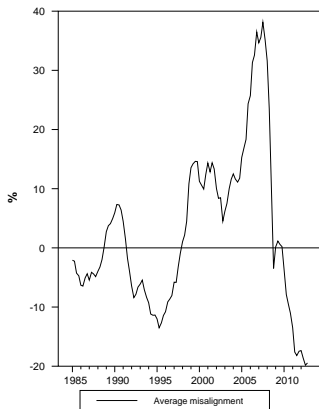
# Statistical Indicator: CRE Prices and Rents: 1985Q1 to 2012Q4



# Estimates of Deviation between Actual and Fundamental Commercial Property Prices: 1985Q1 to 2012Q4



Data are a four-quarter moving average in this figure





# Testing between Fads and Rational Bubbles

- Using regime switching techniques (Schaller & van Norden, 2002)

- ① Rational bubble specification

$$R_{i,t+1} = \beta_{i,0} + \beta_{i,b}b_t + e_{i,t+1}$$

$$e_{i,t+1} \sim N(0, \sigma_i^2), i = S, C$$

- where  $R_{i,t+1}$  refers to price returns  $(p_{t+1} - p_t)$ , and  $b_t$  is the estimated bubble term  $(p_t - p_t^f)$
- $S$  is the low volatility survival regime,  $C$  is high volatility crash regime

- ② Impose restrictions and assume heteroscedasticity to nest the fads model

$$R_{t+1} = \beta_0 + \beta_b b_t + e_{i,t+1}$$

$$e_{i,t+1} \sim N(0, \sigma_i^2), i = S, C$$

- Assume  $\beta_{s,0} = \beta_{c,0}$  and  $\beta_{s,b} = \beta_{c,b}$
- The validity of these restrictions can be tested.

# Regime Switching Results

Table: Testing the restrictions imposed by the fads models

	<i>Model A</i>	<i>Model B</i>	<i>Statistical</i>
	<i>p-values for Wald Test</i>		
$H_0 : \beta_{s,0} = \beta_{c,0}$	0.00	0.00	0.00
$H_0 : \beta_{s,b} = \beta_{c,b}$	0.37	0.00	0.06
	<i>p-values for Likelihood Ratio Test</i>		
$H_0$ : Restrictions are valid	0.00	0.00	0.00

- Understanding CRE price dynamics important for macroprudential risk analysis
- Estimated two reduced form models for Irish real CRE prices using long-run sample
  - Demand-side variables: Income, interest rates and credit
  - Supply-side data gaps area of on-going work
- Useful to complement traditional metrics of price-to-rent ratios
- Over the sample periods of misalignment and some evidence of bubble-like behaviour and non-linearity
- Further work using recursive unit root tests (Philips, Shi & Yu, 2015) and investigating non-linear methods

Thank You