

BIRTHS AND HOUSING NEEDS IN SPAIN. AN ANALYSIS OF CAUSALITY

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ABSTRACT

OBJETIVE.- The study analyzes the relationship between the housing market and births in Spain (January 1986-December 2009).
METHOD.- The process of analysis follows traditional patterns in time series studies. A Vector Error Correction (VEC) is specified. VEC will allow consider the adjustment dynamics of the variables in both the short and long term.
RESULTS.- The domain of the effect of short on the long term effect is evaluated. The resulting series is a linear combination of both series and displays a short memory.
CONCLUSIONS.- The demographic variable contributes to achieving the long-run equilibrium when there are changes in the socioeconomic sphere.

INTRODUCTION



RESULTS

VECTOR ERROR CORRECTION

DATA FILE: C:\Users\mario\Documents\BIRTHS HOUSING (1).dta
 SAMPLE: 1986:1-2009:4
 MODEL: VAR(1)

Variable	Constant
NACIMIENTOS (1)	1.000000
VIVIENDAS (1)	0.000000

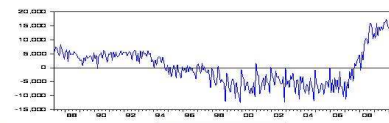
Best Constant: NACIMIENTOS(1) BIRTHS(1)

Variable	NACIMIENTOS(1)	BIRTHS(1)
NACIMIENTOS(1) (1)	-0.000000 (0.000000)	0.000000 (0.000000)
NACIMIENTOS(1) (2)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (3)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (4)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (5)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (6)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (7)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (8)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (9)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (10)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (11)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (12)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (13)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (14)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (15)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (16)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (17)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (18)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (19)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (20)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (21)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (22)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (23)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (24)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (26)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (27)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (28)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (29)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (30)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (31)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (32)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (33)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (34)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (35)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (36)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (37)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (38)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (39)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (40)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (41)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (42)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (43)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (44)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (45)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (46)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (50)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (52)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (54)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (65)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (67)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (70)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (74)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (75)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (76)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (77)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (80)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (81)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (82)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (83)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (84)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (86)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (89)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (90)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (91)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (92)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (93)	-0.000000 (0.000000)	-0.000000 (0.000000)
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NACIMIENTOS(1) (97)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (98)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (99)	-0.000000 (0.000000)	-0.000000 (0.000000)
NACIMIENTOS(1) (100)	-0.000000 (0.000000)	-0.000000 (0.000000)

LONG-TERM → Cointegrating Equation
 $BIRTHS(-1) = 0.403103 \cdot HOUSING(-1) + 21301.48$
 $t^* = (-6.95394)$

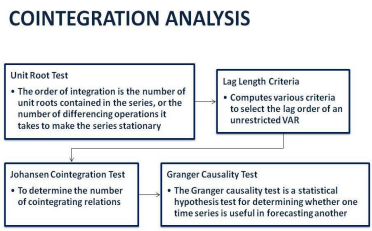
SHORT-TERM → Rate adjustment

Error Correction	$\Delta(BIRTHS)$	$\Delta(HOUSING)$
<i>CointEq1</i>	-0,082233	-0,055796
t^*	-5,32485	-0,63186



NACIMIENTOS: BIRTHS / VIVIENDA: HOUSING

METHODOLOGY



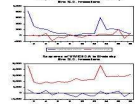
COINTEGRATION ANALYSIS

Engle, Granger (1987)

The variables x and y are non-stationary and $I(1)$ are cointegrated when you care perform regression

$$y_t = a + bx_t + u_t \quad / \quad u_t \rightarrow I(0)$$

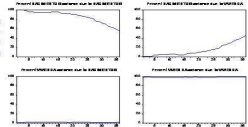
IMPULSE – RESPONSE FUNCTION



A shock to the i -th variable not only directly affects the i -th variable but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables.

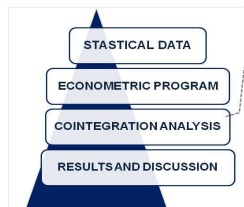
VARIANCE DESCOMPOSITION

Variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR.



NACIMIENTOS: BIRTHS / VIVIENDA: HOUSING

EMPIRICAL EXERCISE



- Unit Root Test
- Lag Length Criteria
- Johansen Cointegration Test
- Granger Causality Test
- VECTOR ERROR CORRECTION
- Impulse-Response Function
- Variance Decomposition
- VEC Forecast

STATISTICAL DATA

Source	Variables	Description
Ministry of Housing	BIRTHS	Monthly number of births
Ministry of Statistics Institute	HOUSING	Number of housing units
Ministry of Statistics Institute	HOUSING	Number of housing units
Ministry of Statistics Institute	HOUSING	Number of housing units
Ministry of Statistics Institute	HOUSING	Number of housing units

ECONOMETRIC PROGRAM: Eviews 7

CONCLUSIONS

- 1.- Association between BIRTHS and HOUSING is linearly proportional, $r_{BH} = 0,3553$ in the short term.
- 2.- Both series are cointegrated, $I(1)$. A long and short term relationship can be differentiated.
- 3.- The estimation of the VEC describes a long-term equilibrium relationship.
- 4.- The cointegration equation shows a crowding-in effect in the long term. A revitalization of the housing activity stimulates the demographic trajectory. Two series of long memory are transformed by a linear combination in a new short term memory series.
- 5.- Population dynamics responds to short-term imbalances to restore long-term equilibrium [speed of adjustment ($t^* = -5,32385$)]. Housing activity is shown as a weakly exogenous variable in the system [speed of adjustment ($t^* = -0,63186$)].
- 6.- The demographic variable is explained by its own dynamics. There is a crowding-out in the short term. The births of prior time units negatively impact on the contemporary time unit. The effect on contemporary references is positive from lag 12 (positive sign and statistical significance). Housing activity contributes negatively to population dynamics (in the short term there is a crowding-out). The statistical significance varies depending on the unit and reflects different considerations of the variable in the short term. The independent term positive and statistically significant confirms the independence of the demographic variable.
- 7.- The present results show the existence of a causal Granger sense relationship from 3 to 24 lags in a two-ways sense. The births do not explain the Granger sense housing series from lag 24 but housing activity explains the births.
- 8.- The domain of demographic dynamics can be checked by estimating a VEC models, impulse-response functions and variance decomposition. Deviations from the trend of the cointegrated variables in the long term are best described as transient variations of the demographic factor in the long term.

REFERENCES

- ENGLE, R.; GRANGER, W. (1987): Cointegration and error correction representation, estimation and testing. *Econometrica*, 55, pp 251-276.
- ENDERS, W. (1995): *Applied econometric time series*. New York: John Wiley & Sons, pp 433
- INE (2012): <http://ine.es>
- JOHANSEN, S. (1988): Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12, pp. 231-254
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COINTEGRATION ANALYSIS

UNIT ROOT TEST

Variable	Levels	t-value	First differences	p-value
Births	-2.001341	0.5978	-6.596335	0.0000
Housing	-1.392542	0.8810	-4.401761	0.0001

Test critical values

H ₀ : Unit root	Test critical values
1%	-3.581760
5%	-3.426251
10%	-3.193285

NONSTATIONARY (I(1))

OPTIMAL LAG

VAR Lag Order Selection

Criteria: Akaike information criterion (AIC)

Exogenous variables: C

Interpolate: Interpolate (1000000)

Interpolate: Interpolate (1000000)

Lag	LR	FPE	AIC	BIC	HQ
14	-2217.408	7.970288E-000	-16.52661	-16.73473	-16.51168
17	-2212.193	3.614832E-000	-16.82714	-16.76793	-16.82247

*Indicates lag order selected by the criterion

LR: Likelihood ratio test (LR test) (best of 10)

FPE: Final prediction error

AIC: Akaike information criterion

BIC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

COINTEGRATION RANK

Trace test results: No deterministic trend (restricted constant)

Series: BIRTHS and HOUSING

Lag length: 14 (see above)

Unrestricted Cointegration Rank Test (Trace)

Trace test	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.10706	35.42382	20.26184	0.0002
At most 1	0.01777	4.686973	9.16486	0.2484

Trace test indicates 1 cointegrating eq(s) at the 0.05 level

*Asymptotic p-values based on: Asymptotic normal distribution

**MacKinnon-Haug-McLeod (99%) p-values

GRANGER CAUSALITY

