What are the Main Features of the Portuguese Business Cycle?

Monetary and Financial Economics

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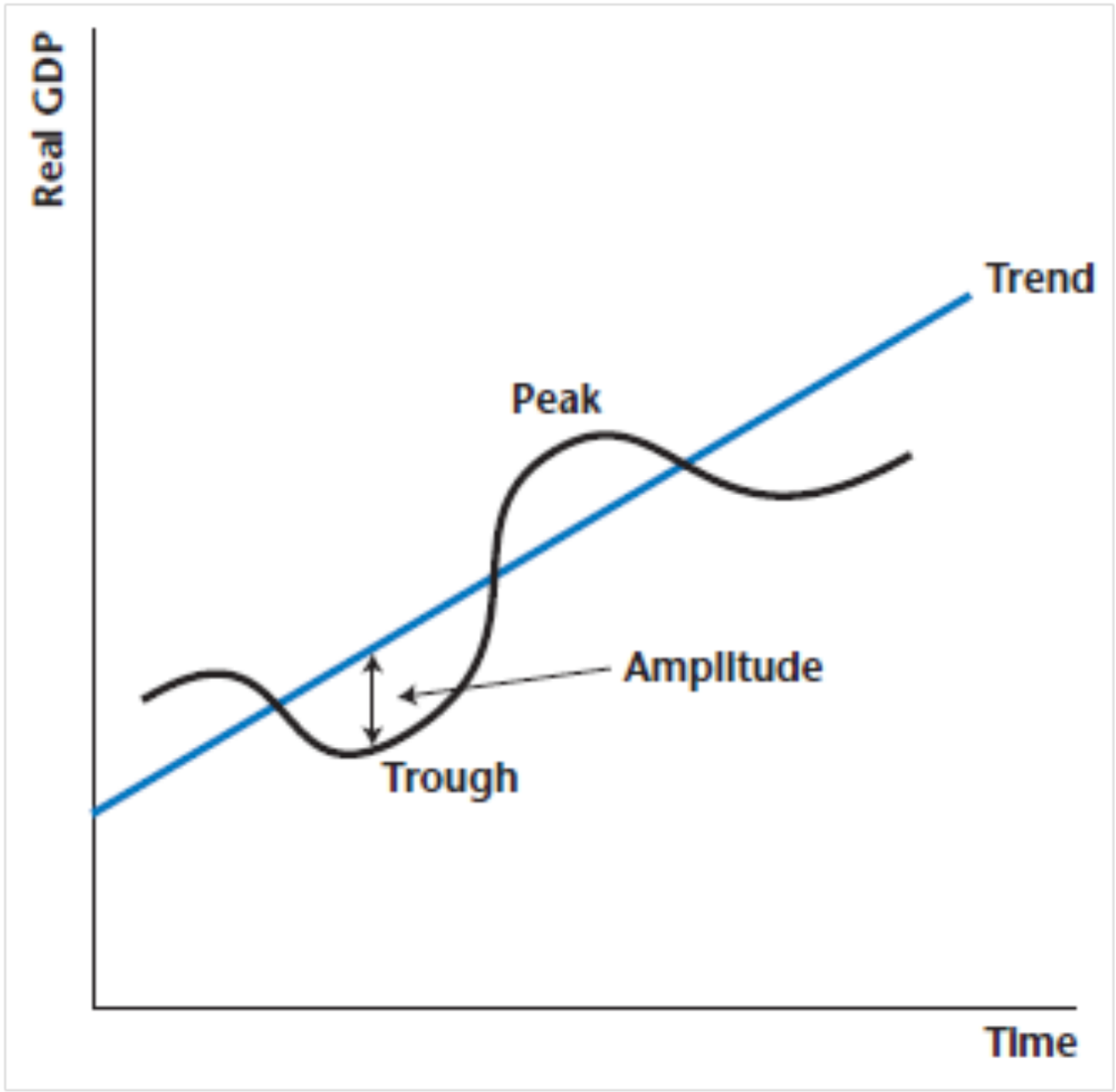
I - Basic Concepts of Business Cycle Theory

Business cycles are a type of fluctuation in the aggregate economic activity of nations (...) a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals (...) this sequence of changes is recurrent but not periodic (...).

In Burns & Mitchell (1946), p. 3.

Stages of Business Cycles



SOURCE: Williamson (2014), p. 88.

II - Measurement Issues

The Variables

Y	Gross Demand Product
C	Private Consumption
I	Investment
G	Government Expenditure
Ex	Exports
Im	Imports
NX	Net Exports
w	Real Wage *per worker*
Y/L	Average Labour Productivity
u	Unemployment Rate

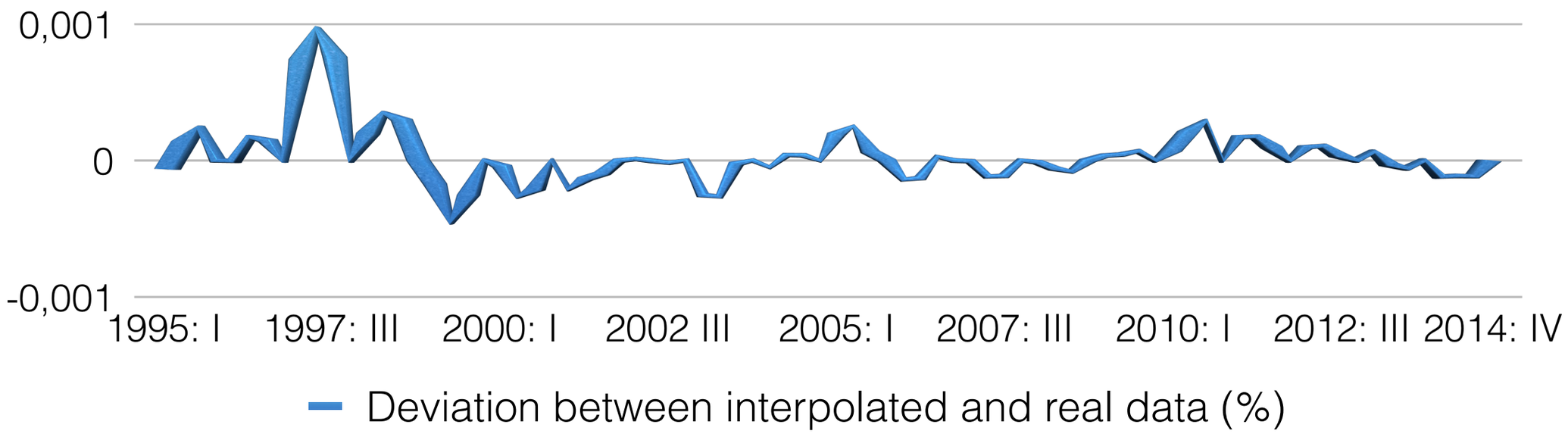
$$y_t = \log \frac{Y_t}{Pop_t}$$

- Quarterly Data (Banco de Portugal, 2015; OECD, 2016; INE - Instituto Nacional de Estatística, 2015);
- Per Capita Values (Smoothes the comparison between countries);
- Logarithm of the variables (Makes scaling more easily manageable).

Cubic Spline

A cubic spline is an algorithm used to fit a curve to a series of points with a piecewise series of third-order polynomials (…).

Jenkins, D., 2009



Detrending Procedures

- Linear Filter

$$\bar{x}_t = \tilde{a}_0 + \tilde{a}_1 t$$

$$\tilde{x}_t = a_0 + a_1 t + u_t$$

- Hodrick-Prescott

$$\underset{\{\bar{x}_t\}_{t=1}^{T}}{\text{Min}} \; (x_t - \bar{x}_t)^2 + \lambda \sum_{t=2}^{T-1} [(\bar{x}_{t+1} - \bar{x}_t) - (\bar{x}_t - \bar{x}_{t-1})]^2 =$$

$$= (x_t - \bar{x}_t)^2 + \lambda \sum_{t=2}^{T-1} (\Delta_{\bar{x}_{t+1}} - \Delta_{\bar{x}_t})^2$$

for all $t = 1, \cdots, T$

Detrending Procedures

- Baxter-King

$$\bar{x}_t = \sum_{j=-K}^{K} a_j L^j x_t$$

- Christiano-Fitzgerald

$$\hat{x}_t = B_0 x_t + B_1 x_{t+1} + \cdots + B_{T-1-t} x_{T-1} + \tilde{B}_{T-t} x_T +$$

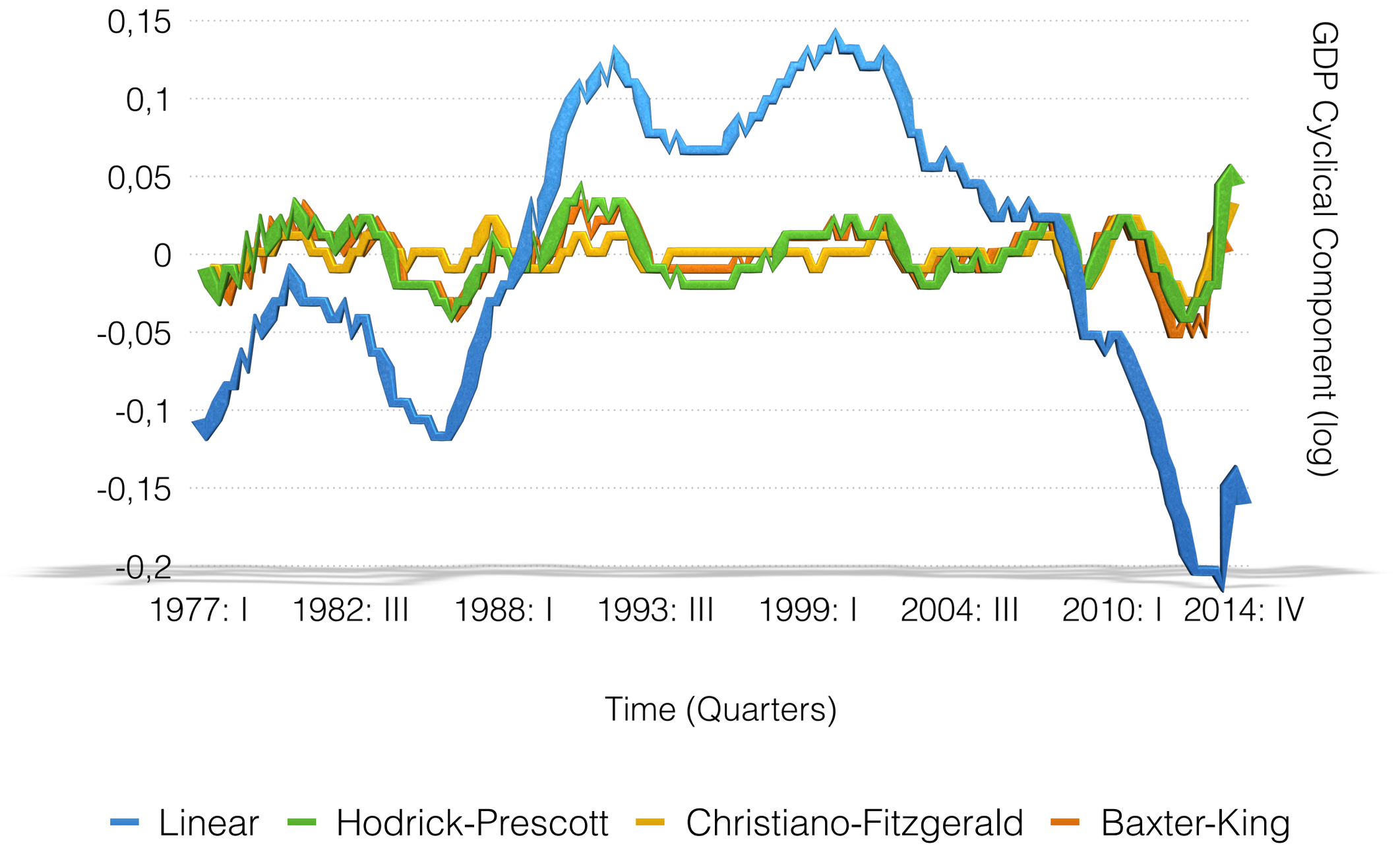
$$+ B_1 x_{t-1} + \cdots + B_{t-2} x_2 + \tilde{B}_{t-2} x_1 \,, \text{for} \, t = 3, 4, \cdots, T-2.$$

$$B_j = \frac{\sin(jb) - \sin(ja)}{\pi j} \,, \; j \geq 1$$

$$B_0 = \frac{b-a}{\pi} \,, \; a = \frac{2\pi}{p_u} \,, \; b = \frac{2\pi}{p_l}$$

$$\tilde{B}_k = -\tfrac{1}{2} B_0 - \textstyle\sum_{j=1}^{k-1} B_j$$

GDP *per capita* Cyclical Component



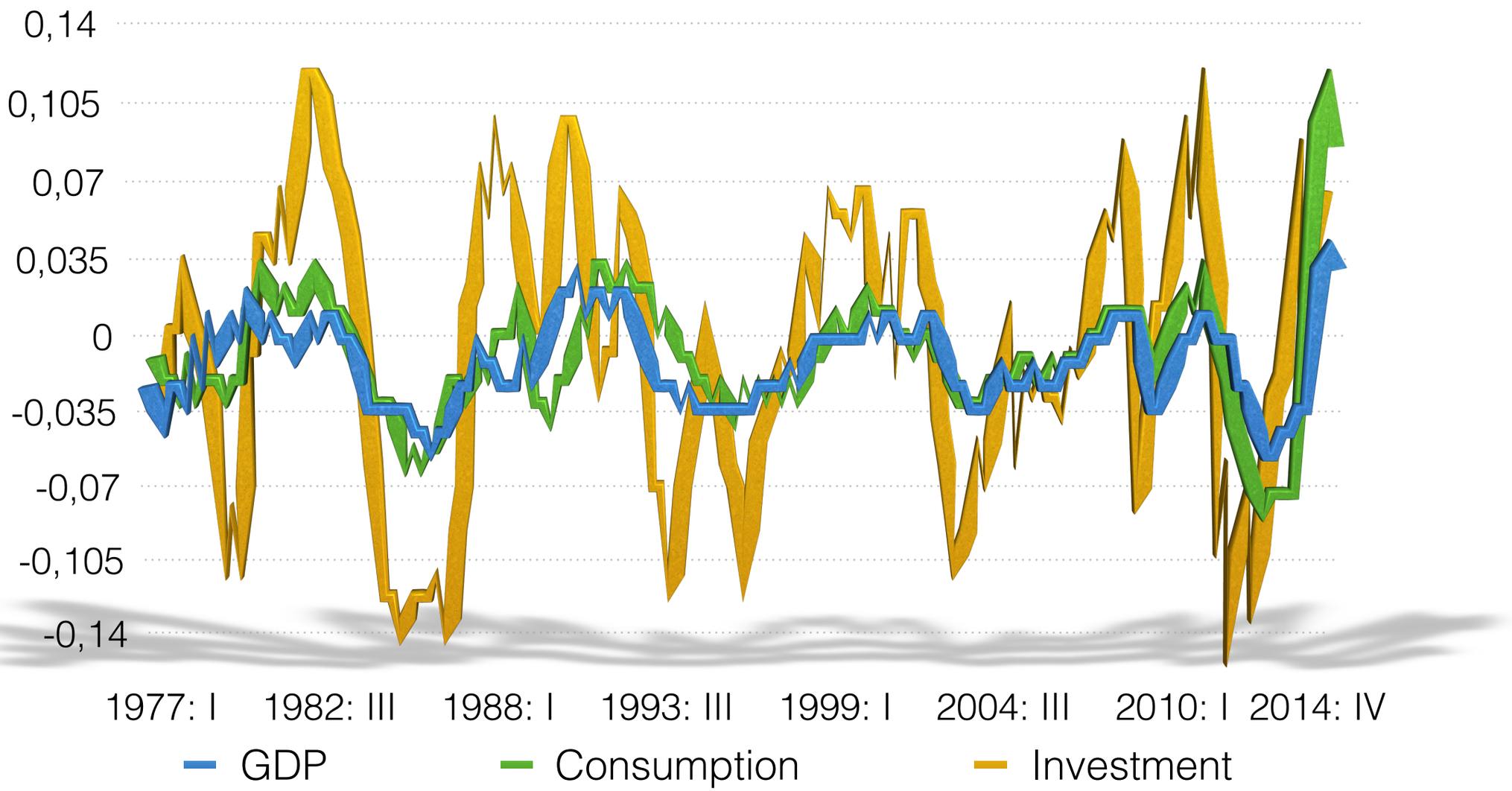
III - Characterizing the Portuguese Business Cycles

Volatility Analysis

	Linear	BK	HP	CF
$\sigma_{\hat{Y}}$	0.09	0.02	0.02	0.01
$\sigma_{\hat{C}}/\sigma_{\hat{Y}}$	1.22	1.57	1.49	2.01
$\sigma_{\hat{I}}/\sigma_{\hat{Y}}$	2.51	3.45	3.59	4.91
$\sigma_{\hat{G}}/\sigma_{\hat{Y}}$	1.28	0.87	0.86	1.12
$\sigma_{\hat{NX}}/\sigma_{\hat{Y}}$	0.39	0.69	0.68	1.12
$\sigma_{\hat{w}}/\sigma_{\hat{Y}}$	1.01	1.82	1.77	2.98
$\sigma_{(\hat{Y/L})}/\sigma_{\hat{Y}}$	4.82	6.41	6.37	8.18
$\sigma_{\hat{u}}/\sigma_{\hat{Y}}$	0.25	0.36	0.38	0.52

TABLE I: Volatilities, Portugal, 1977 to 2014.
SOURCE: Excel Dataset, own calculations.

Graphical Analysis*



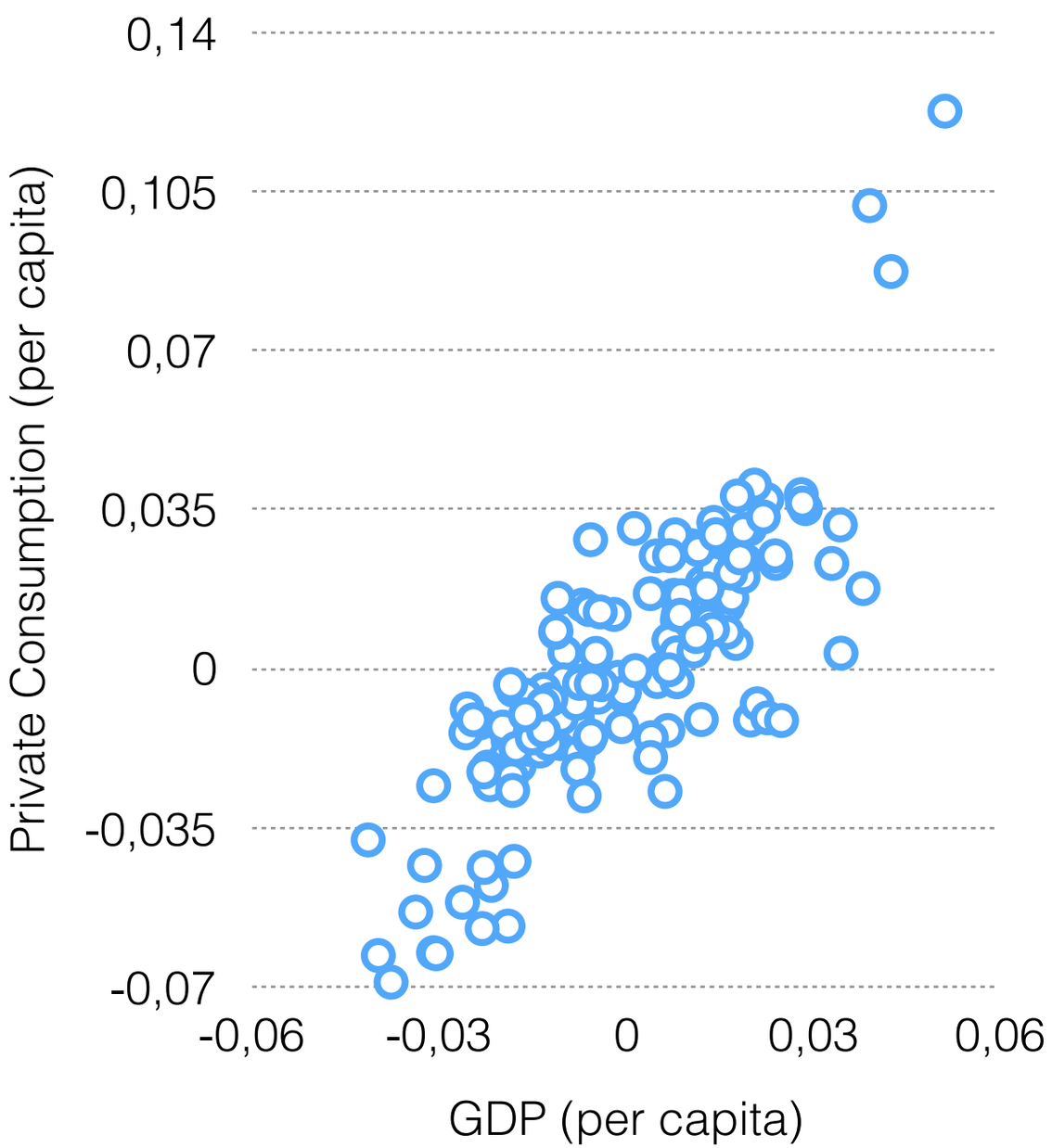
*NOTES: Results concern the application of the HP filter only.

Correlation Analysis

	$Correlation(\hat{X}_t, \hat{Y}_t)$			
Variable X	Linear	BK	HP	CF
C	0.97	0.81	0.81	0.70
I	0.93	0.62	0.68	0.47
G	0.95	0.40	0.53	0.03
NX	-0.75	-0.33	-0.40	-0.24
w	0.77	0.46	0.52	0.35
Y/L	0.98	0.91	0.92	0.90
u	-0.95	-0.69	-0.73	-0.58

TABLE II: Contemporaneous Correlation Coefficients, Portugal, 1977 to 2014.
SOURCE: Excel Dataset, own calculations.

Graphical Analysis*



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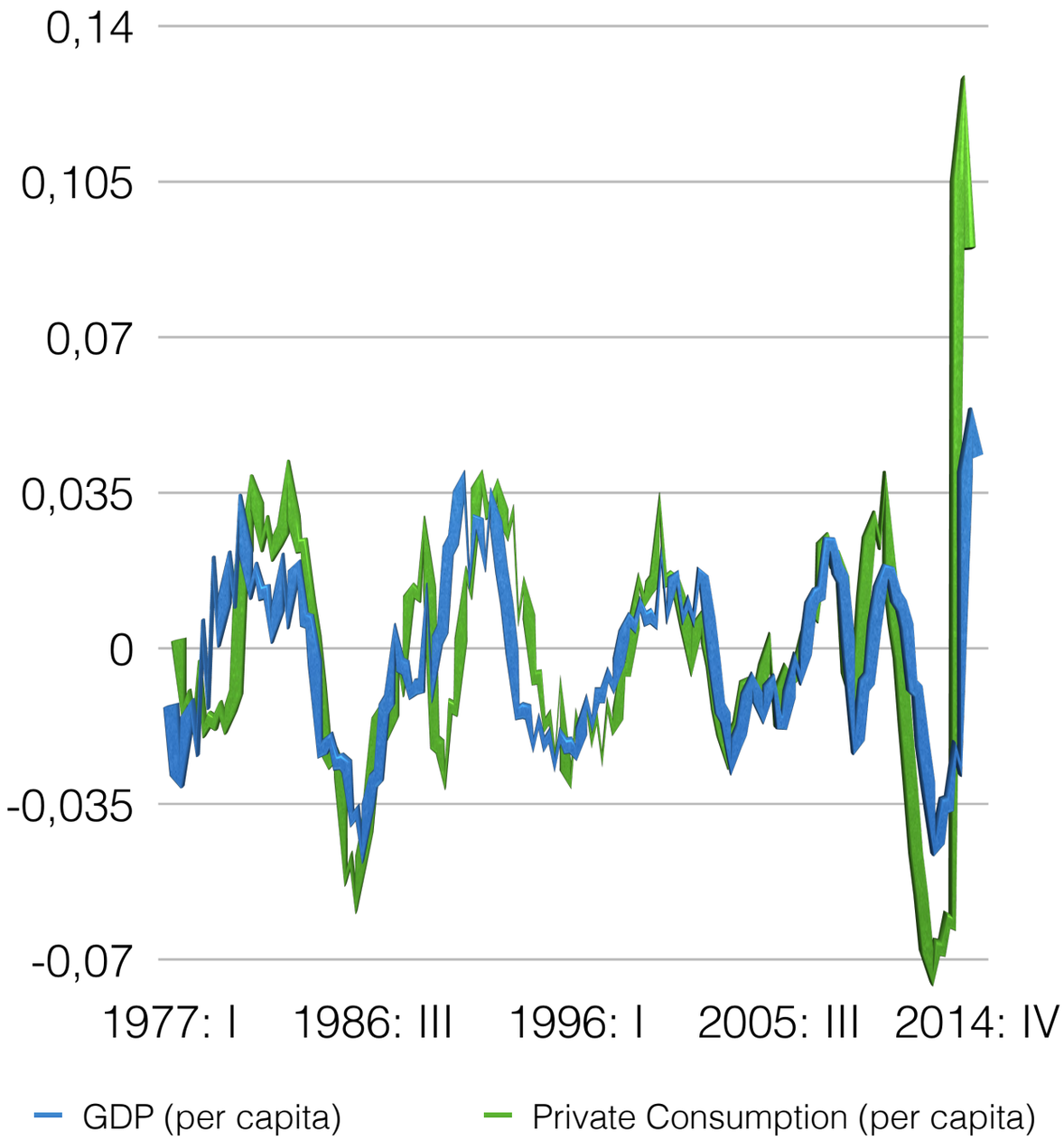
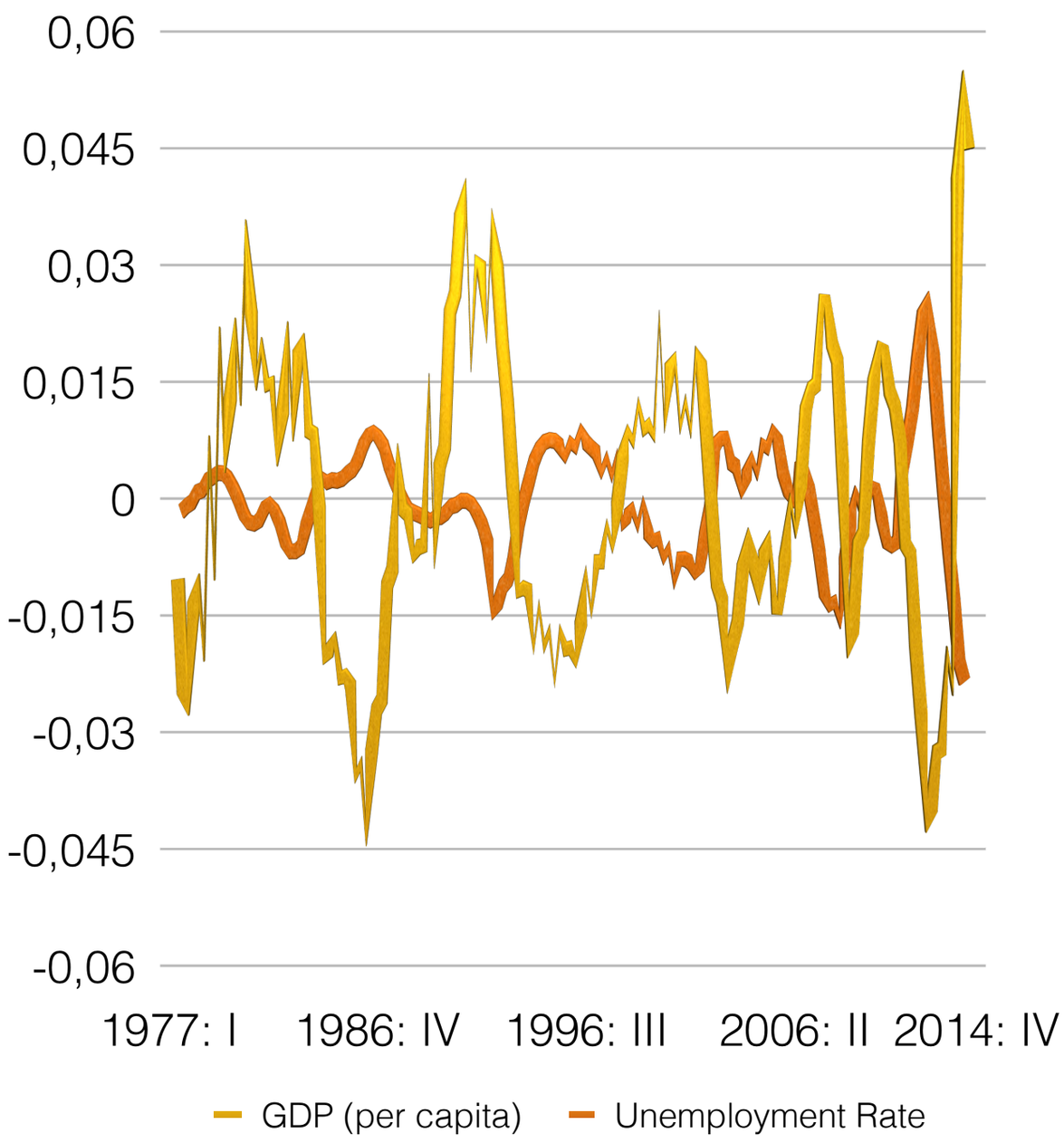
Graphical Analysis*





*NOTES: Results concern the application of the HP filter only.

IV - An International Perspective

Volatility Analysis

	Portugal	Spain	Germany	USA
$\sigma_{\hat{Y}}$	0.01	0.01	0.02	0.01
$\sigma_{\hat{C}}/\sigma_{\hat{Y}}$	1.30	1.21	0.40	0.84
$\sigma_{\hat{I}}/\sigma_{\hat{Y}}$	4.70	3.65	3.34	4.09
$\sigma_{\hat{G}}/\sigma_{\hat{Y}}$	0.88	1.07	0.53	0.92
$\sigma_{\hat{NX}}/\sigma_{\hat{Y}}$	0.94	0.79	0.51	0.37

TABLE III: Relative Volatilities for Portugal, Spain, Germany and the USA, 1995 to 2014.
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Correlation Analysis

	Portugal			Spain		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.07	0.89	0.19	0.06	0.90	0.36
I	-0.04	0.82	0.24	0.05	0.87	0.44
G	0.02	0.26	0.29	0.23	0.26	-0.17
NX	0.09	-0.51	-0.30	0.12	-0.73	-0.33
	Germany			USA		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.19	0.46	0.25	0.45	0.90	0.29
I	-0.07	0.85	0.24	0.20	0.95	0.44
G	0.16	-0.27	-0.19	-0.44	-0.68	-0.33
NX	0.17	0.61	-0.15	-0.15	-0.74	-0.18

TABLE IV: Correlation Coefficients for Portugal, Spain, Germany and the USA, 1995 to 2014
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Correlation Analysis

	Spain			Germany			USA		
	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
$Corr(Y_t^{PT}; Y_{t+k}^{j})$	0.03	0.77	0.23	-0.15	0.57	0.22	0.20	0.40	-0.23
$Corr(Y_t^{PT}; NX_{t+k}^{j})$	-0.06	-0.63	0.05	-0.31	0.17	-0.06	0.22	-0.25	0.07

TABLE V: Cross correlation coefficients between Portuguese GDP and other economies' GDP and net exports, 1995 to 2014.
SOURCE: Excel Dataset, own calculations.
NOTE: Y_t^{PT} denotes Portuguese GDP; Yj_{t+k} and NXj_{t+k} denote other economies' GDP and net exports respectively, where j = (Spain, Germany, USA).
Values of k represent lagging or leading correlation coefficients.
Results concern the application of the HP filter only.

V - Macroeconomic Analysis

Consumption

	Portugal	Spain	Germany	USA
$\sigma_{\hat{Y}}$	0.01	0.01	0.02	0.01
$\sigma_{\hat{C}}/\sigma_{\hat{Y}}$	1.30	1.21	0.40	0.84
$\sigma_{\hat{I}}/\sigma_{\hat{Y}}$	4.70	3.65	3.34	4.09
$\sigma_{\hat{G}}/\sigma_{\hat{Y}}$	0.88	1.07	0.53	0.92
$\sigma_{\hat{NX}}/\sigma_{\hat{Y}}$	0.94	0.79	0.51	0.37

TABLE VI: Relative Volatilities for Portugal, Spain, Germany and the USA, 1995 to 2014.
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Consumption

	Portugal			Spain		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.07	0.89	0.19	0.06	0.90	0.36
I	-0.04	0.82	0.24	0.05	0.87	0.44
G	0.02	0.26	0.29	0.23	0.26	-0.17
NX	0.09	-0.51	-0.30	0.12	-0.73	-0.33

	Germany			USA		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.19	0.46	0.25	0.45	0.90	0.29
I	-0.07	0.85	0.24	0.20	0.95	0.44
G	0.16	-0.27	-0.19	-0.44	-0.68	-0.33
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TABLE VII: Correlation Coefficients for Portugal, Spain, Germany and the USA, 1995 to 2014
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Consumption

	Portugal			Spain		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.07	**0.68**	**0.56**	0.06	0.90	0.36
I	-0.04	0.82	0.24	0.05	0.87	0.44
G	0.02	0.26	0.29	0.23	0.26	-0.17
NX	0.09	-0.51	-0.30	0.12	-0.73	-0.33

	Germany			USA		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.19	0.46	0.25	0.45	**0.78**	**0.04**
I	-0.07	0.85	0.24	0.20	0.95	0.44
G	0.16	-0.27	-0.19	-0.44	-0.68	-0.33
NX	0.17	0.61	-0.15	-0.15	-0.74	-0.18

TABLE VII: Correlation Coefficients for Portugal, Spain, Germany and the USA, 1995 to 2014
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Investment

	Portugal	Spain	Germany	USA
$\sigma_{\hat{Y}}$	0.01	0.01	0.02	0.01
$\sigma_{\hat{C}}/\sigma_{\hat{Y}}$	1.30	1.21	0.40	0.84
$\sigma_{\hat{I}}/\sigma_{\hat{Y}}$	4.70	3.65	3.34	4.09
$\sigma_{\hat{G}}/\sigma_{\hat{Y}}$	0.88	1.07	0.53	0.92
$\sigma_{\hat{NX}}/\sigma_{\hat{Y}}$	0.94	0.79	0.51	0.37

TABLE VI: Relative Volatilities for Portugal, Spain, Germany and the USA, 1995 to 2014.
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Investment

	Portugal			Spain		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.07	0.89	0.19	0.06	0.90	0.36
I	-0.04	0.82	0.24	0.05	0.87	0.44
G	0.02	0.26	0.29	0.23	0.26	-0.17
NX	0.09	-0.51	-0.30	0.12	-0.73	-0.33

	Germany			USA		
Variable X	$k=-4$	$k=0$	$k=4$	$k=-4$	$k=0$	$k=4$
C	0.19	0.46	0.25	0.45	0.90	0.29
I	-0.07	0.85	0.24	0.20	0.95	0.44
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TABLE IV: Correlation Coefficients for Portugal, Spain, Germany and the USA, 1995 to 2014
SOURCE: Excel Dataset, own calculations.
NOTES: Results concern the application of the HP filter only.

Investment

- Animal Spirits

  Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than mathematical expectations, whether moral or hedonistic or economic.

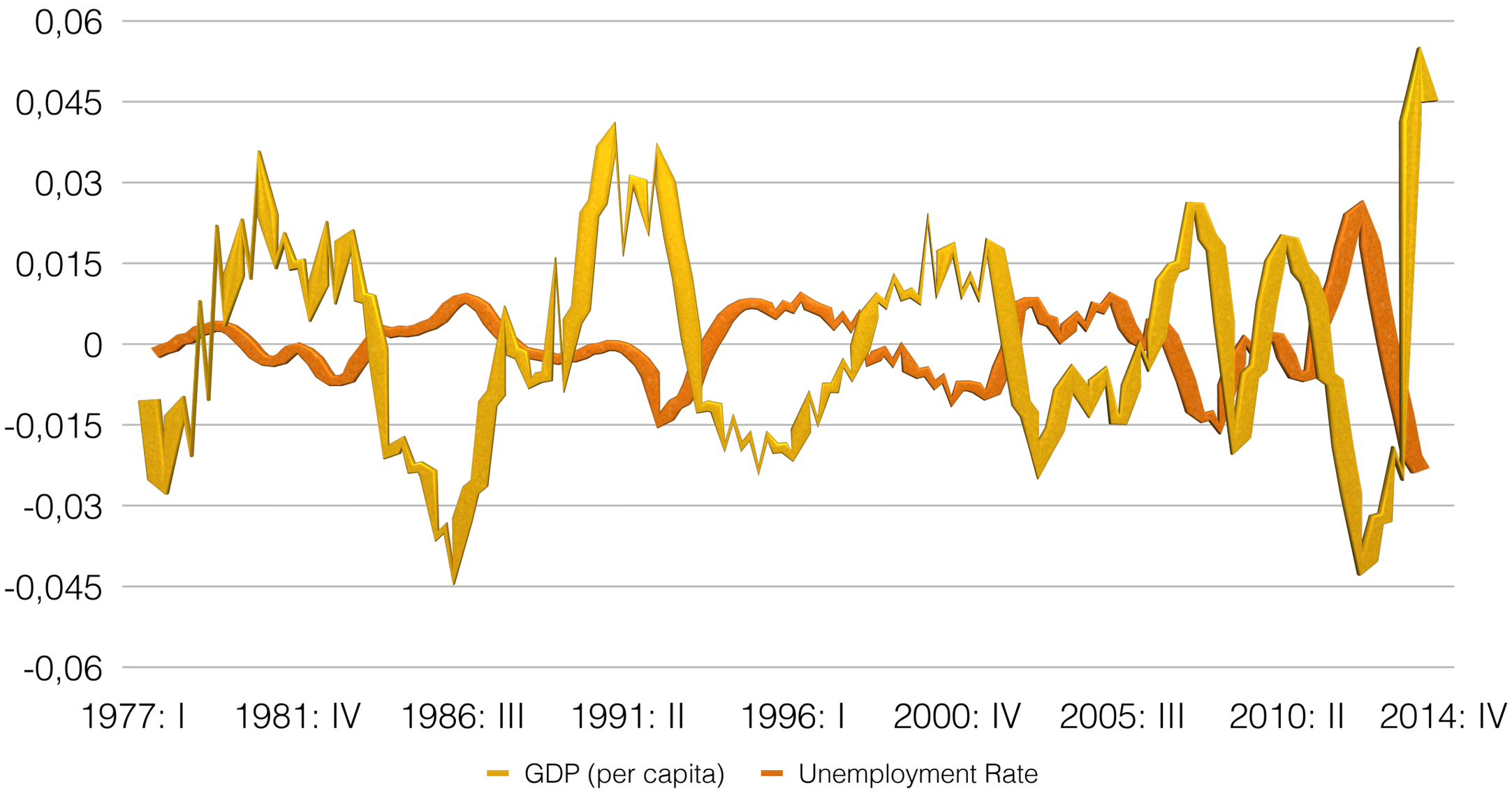
  In Keynes (1936), p. 91.

- Flexible Accelerator Theory

The Labour Market

The Labour Market

- Okun's Law



The Labour Market

- Walrasian Labour Market Model
  (General Equilibrium Theory)

- Non-Walrsian Labour Market Theories
  - Efficiency-Wage Theories
    - Single Generic Efficiency-Wage Model
  - Contracting Model
  - Search and Matching Models

VI - Conclusion

What are the Main Features of the Portuguese Business Cycle?

What are the Main Features of the Portuguese Business Cycle?

- Economic fluctuations are noticeable among all the variables in study.

- Consumption does not show a smoothing behavior over the business cycle;
    - Consistent with the Keynesian theory of consumption.

What are the Main Features of the Portuguese Business Cycle?

- Investment is highly volatile variable in comparison with GDP;
    - Consistent with the Flexible Accelerator Model.

- The Portuguese Labour Market can not be explained by any of the theories analyzed;
    - In between the assumptions of the models.

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Thank You.

What are the Main Features of the Portuguese Business Cycle?

Monetary and Financial Economics

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