Irish Fiscal Advisory Council

Overheating

Eddie Casey & Niall Conroy

Path for the Public Finances Conference, 2018 (5th March)

Outline

- Overheating as a concept

- Output Gaps and Potential Output

- Additional Indicators ("A Modular Approach")

- Challenges in Real-Time

Overheating as a Concept

- What do we mean by overheating and why does it matter?

Overheating as a Concept

- We think of an economy as displaying cyclical behaviour ("booms and busts")
- Think of a speedometer for the economy
  - Run it below average or "trend" speed for too long and the engine cools
  - Run it above trend speed for too long and it will likely overheat

Overheating as a Concept
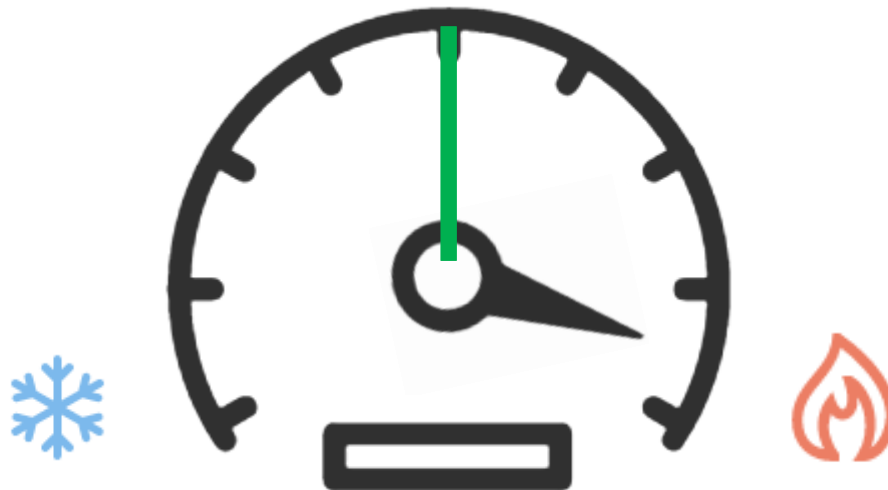
- Overheating is problematic as:

  – Prolonged excess production can lead to unsustainable price pressures (in goods/services, wage costs, commercial and residential property...)

  – Economies that tend to have more volatile boom-bust cycles also tend to have weaker growth in incomes (Kose *et al.,* 2005; Ramey and Ramey, 1995)

Overheating as a Concept

- Departures from trend are inherently unsustainable; the economy will eventually return to its trend (its "potential").

  - Keynesian view that prices and wages are sticky: economy can depart from trend for a long time.

  - Hysteresis; scarring

Overheating as a Concept
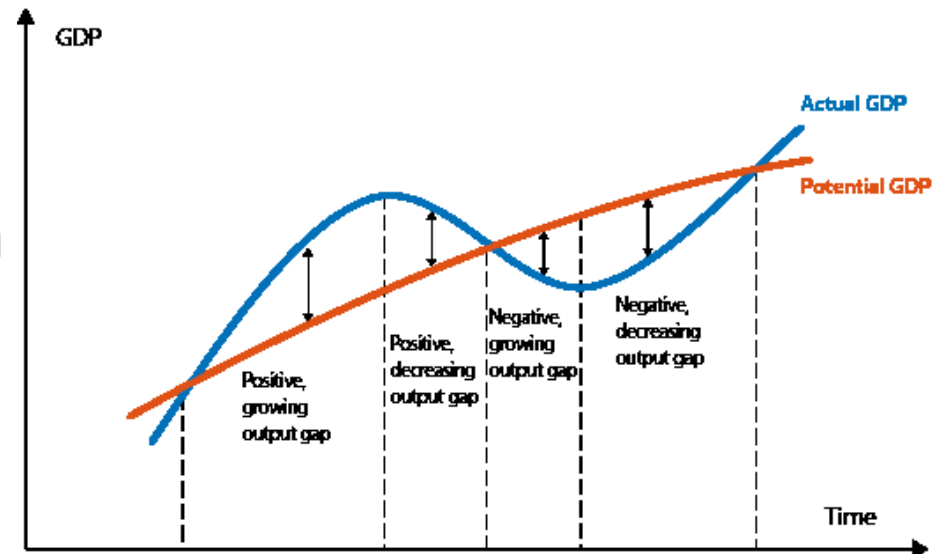
- Other imbalances such as excess credit can augment the cycle
    – "…the catch-up was so fast as to encourage illusory expectations. The inflow of bank borrowing in the 2000s was turbocharged by the momentum of that period."
    – also imported a newly relaxed approach to the prudential supervision of mortgage lending…
    – "Together with another key element of globalization: the absence of any fear of exchange controls, this ensured the fuel for a turbocharged monocultural expansion of the Irish economy (call it Turbocharger 3.0)

See addresses by Governor Patrick Honohan to (a) the Gilman Rutihinda Memorial Lecture, Tanzania and (b) the Royal Irish Academy. Available at: https://www.centralbank.ie/news/article/address-by-governor-patrick-honohan-to-the-gilman-rutihinda-memorial-lecture-tanzania and https://www.centralbank.ie/news/article/address-by-governor-honohan-at-the-royal-irish-academy

What can we do?

Fiscal Policy

- Fiscal Rules
- Strong Institutions

Macro-Prudential Policy

- Credit-based tools
- Bank requirements

What can we do?

- So-called "fine-tuning" may be overly ambitious and could be misguided

- Yet, evidence shows fiscal policy has tended to aggravate booms in a procyclical manner:
    - Ilzetzki and Vegh (2008) for developed economies
    - Lane (1998) for Ireland

- Stresses need for strong fiscal frameworks and robust analysis

Does "Groundhog Day beckon"?

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- "Economic forecasting at any time is uncertain but today, because of problems with the national accounts, we are effectively flying without instruments."

  — J. FitzGerald (2017)

https://www.irishtimes.com/business/economy/groundhog-day-beckons-for-economy-in-danger-of-overheating-1.3112705

When Flying Blind

Economy's Equilibrium?

Lagged release of information

Distortions from MNEs, etc.

Data revisions

Output Gaps and Potential Output

Output Gaps and Potential Output

- Measuring potential output is challenging.
  - Unobservable concept
  - Structural breaks
  - Statistical challenges
  - Data problems

- Important to state that unobserved doesn't mean non-existent

Output Gaps and Potential Output

- Trends and Cycles in US GDP
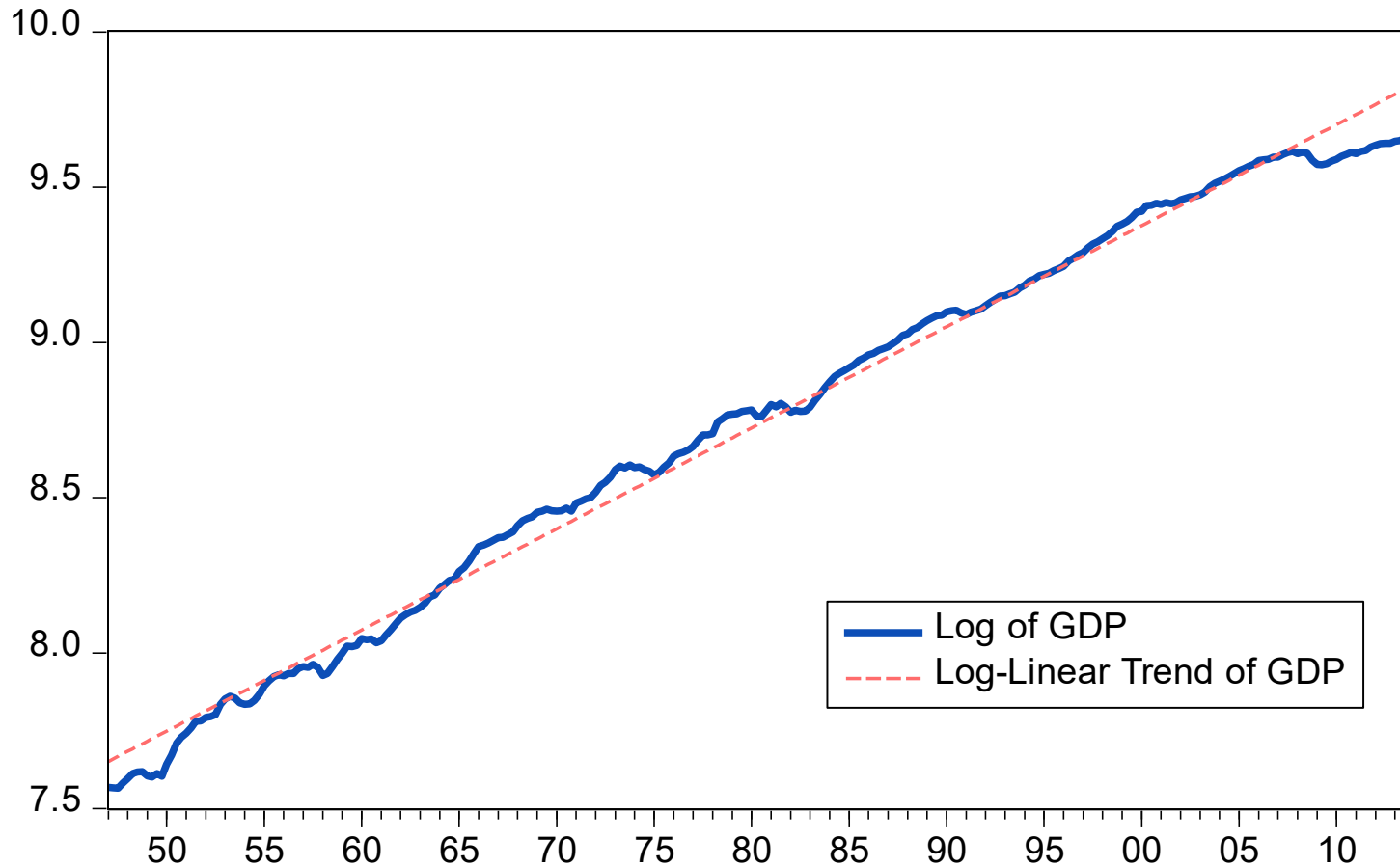
Source: Updated charts based on K. Whelan's Advanced Macro: http://karlwhelan.com/blog/?p=761

Output Gaps and Potential Output

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- Even simple HP-Filtered Cycles Correspond Well to NBER Recessions

Source: Updated charts based on K. Whelan's Advanced Macro: http://karlwhelan.com/blog/?p=761
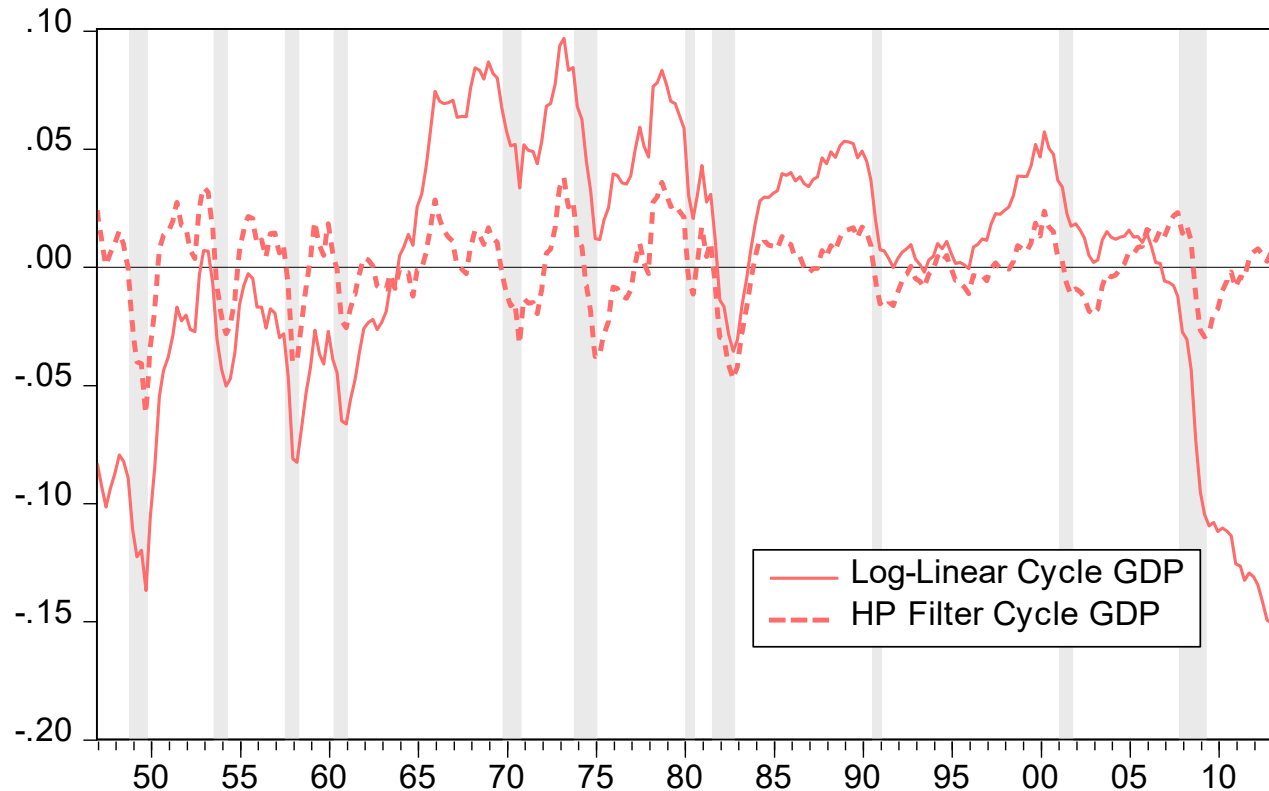
Output Gaps and Potential Output

- Ireland has its own issues:
  - Small, open nature
  - Large foreign-owned multinational enterprises
  - Regional behaviour (self-reinforcing growth periods)

Output Gaps and Potential Output

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Openness Indicators
% GDP unless stated (2014)
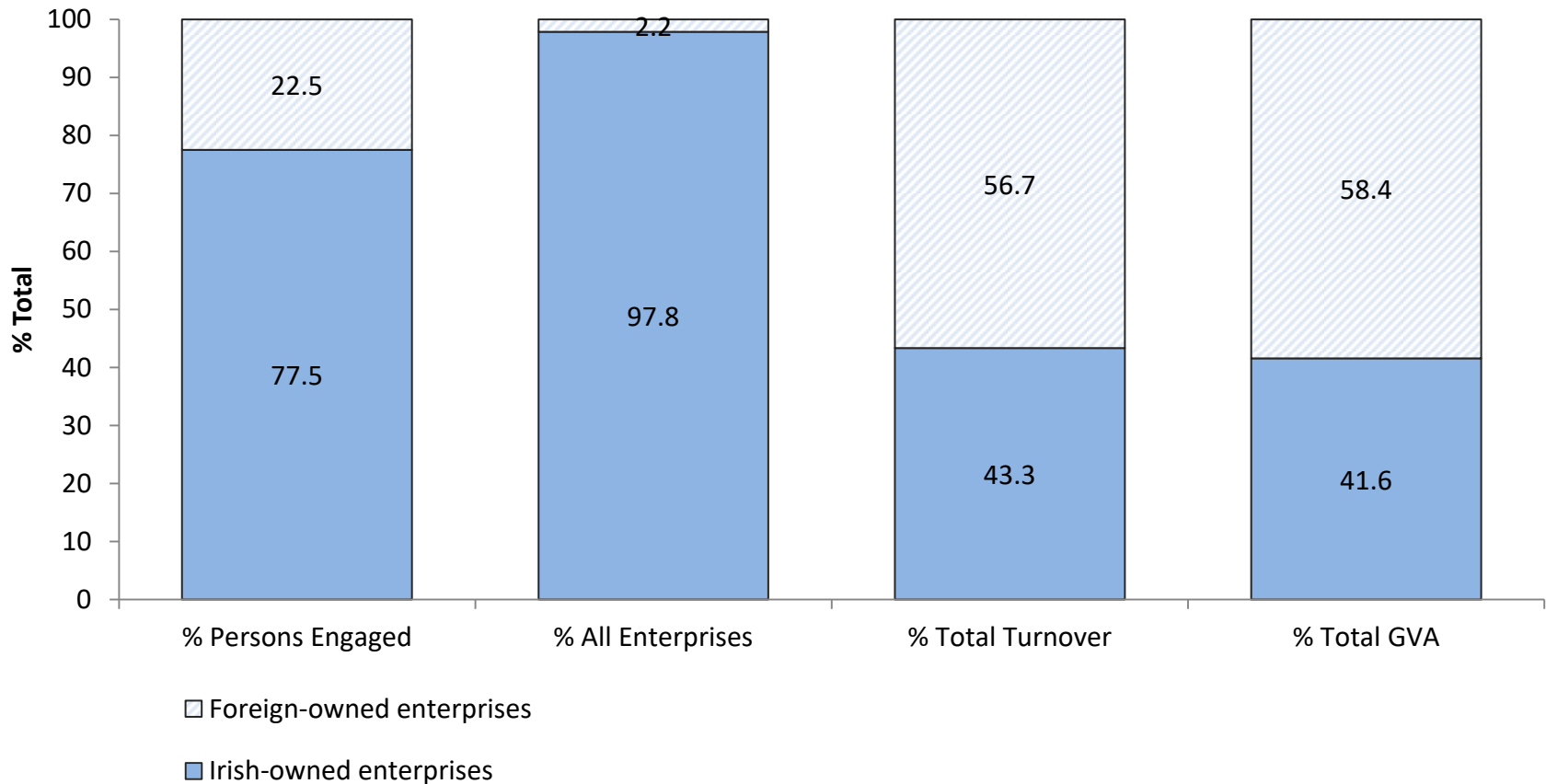

■ Exports (% GDP)

■ Exports + Imports (% GDP)
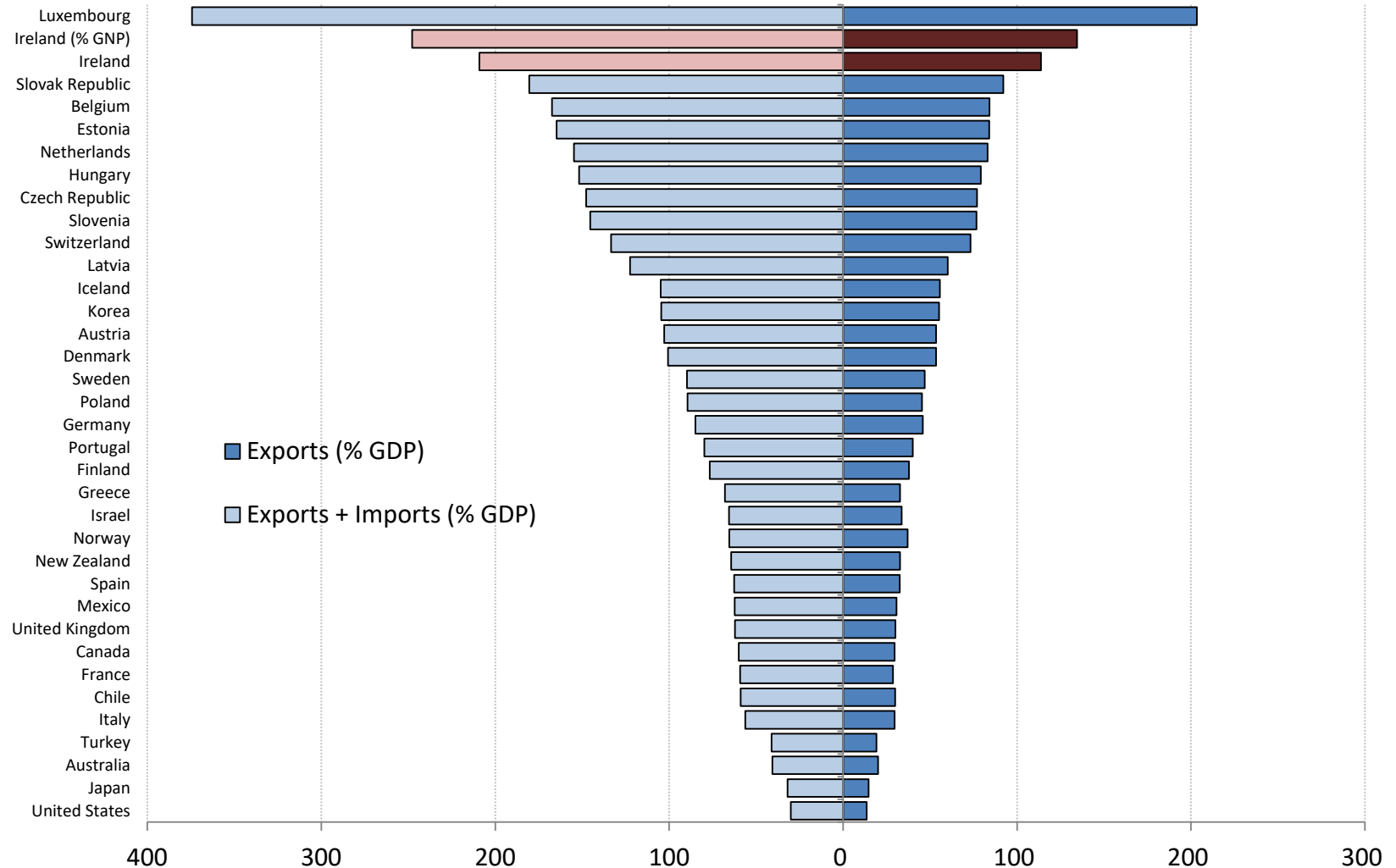
Sources: OECD data and author's workings.
Notes: Openness indicators used are nominal exports as a share of GDP and nominal exports + imports as a share of GDP.

Output Gaps and Potential Output

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Irish Business Economy
% of respective totals (2012)

Bar chart showing % Total for four categories split between Foreign-owned enterprises and Irish-owned enterprises:

- % Persons Engaged: Irish-owned 77.5, Foreign-owned 22.5
- % All Enterprises: Irish-owned 97.8, Foreign-owned 2.2
- % Total Turnover: Irish-owned 43.3, Foreign-owned 56.7
- % Total GVA: Irish-owned 41.6, Foreign-owned 58.4

Legend:
☐ Foreign-owned enterprises
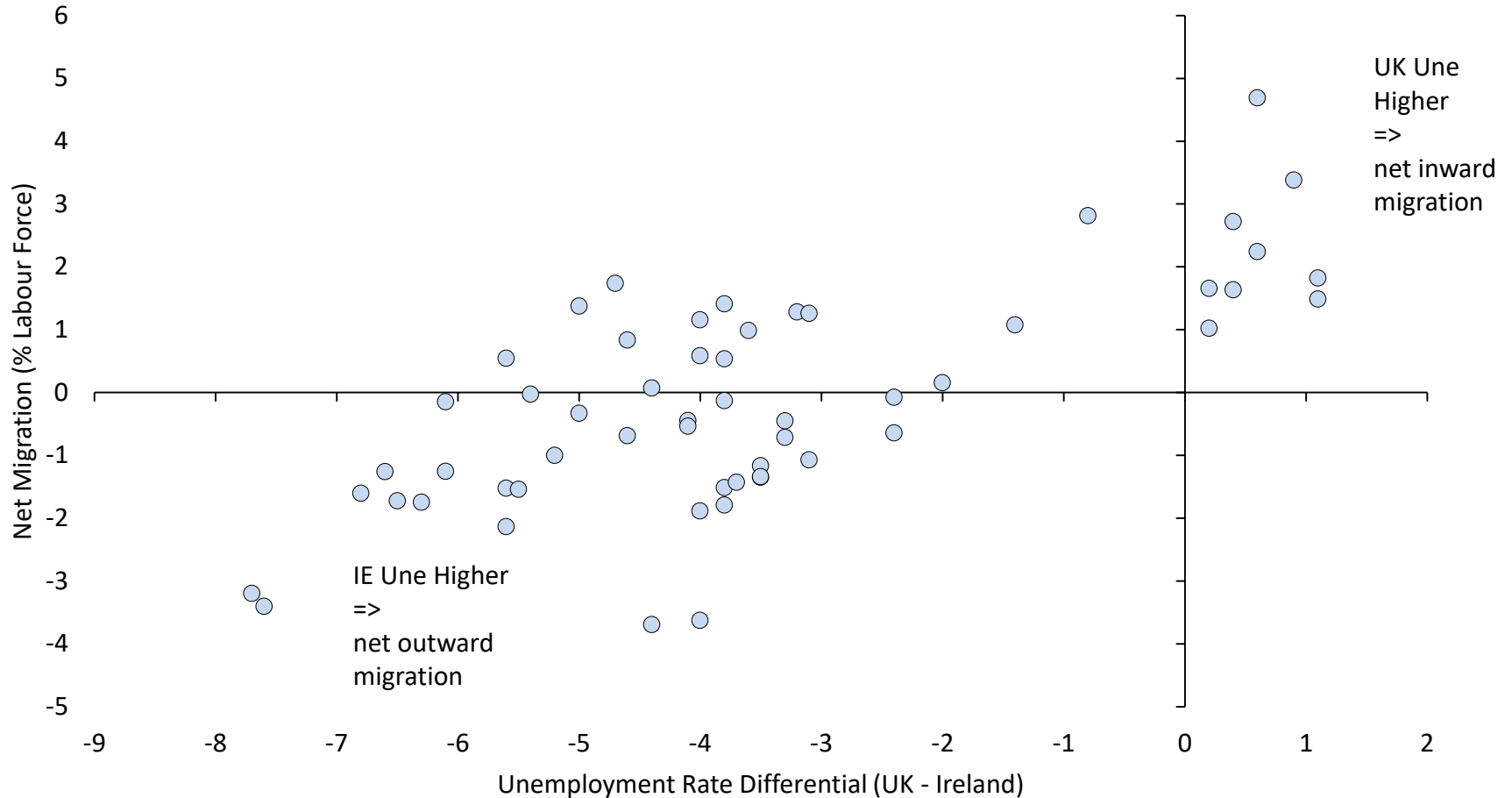■ Irish-owned enterprises

Sources: CSO Business in Ireland 2012 and author's workings.

Output Gaps and Potential Output

Net Irish Migration and Relative Unemployment Rates

Net migration (% labour force); UK – Ireland unemployment differential (%), 1960-2015

Sources: AMECO; own workings.

Output Gaps and Potential Output

- New IFAC Working Paper explores a number of ways to estimate an output gap that is relevant for Irish fiscal policy.

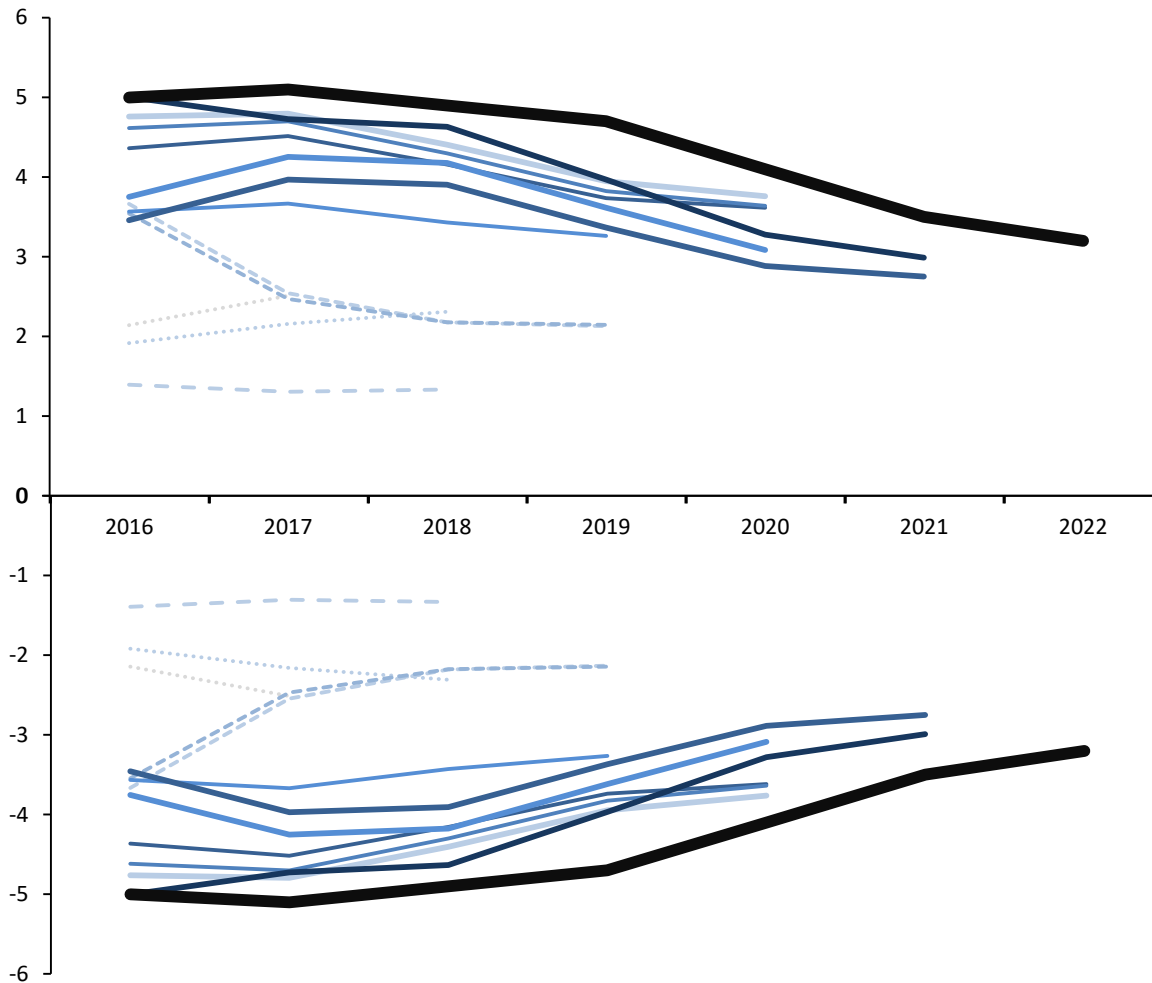Inside the "Upside Down": Estimating Ireland's Output Gap

Eddie Casey

Working Paper No. 5
January 2018

Irish Fiscal Advisory Council

See Casey (2018) available at: http://www.fiscalcouncil.ie/working-papers/estimating-irelands-output-gap/

The "Upside Down"

Recent vintages of European Commission estimates for the period 2016–2022 suggest an already overheating economy gradually cooling…

…though a more plausible path might be for a economy with spare capacity gradually seeing its negative output gap closing (i.e., the actual estimates upside down)

The "Upside Down"

Importance of Domestic Economy

Output and General Government Revenue

Dependent Variable ΔRevenue$_t$/ Δ Revenue$_{t-1}$ (Sample: 1990–2016)

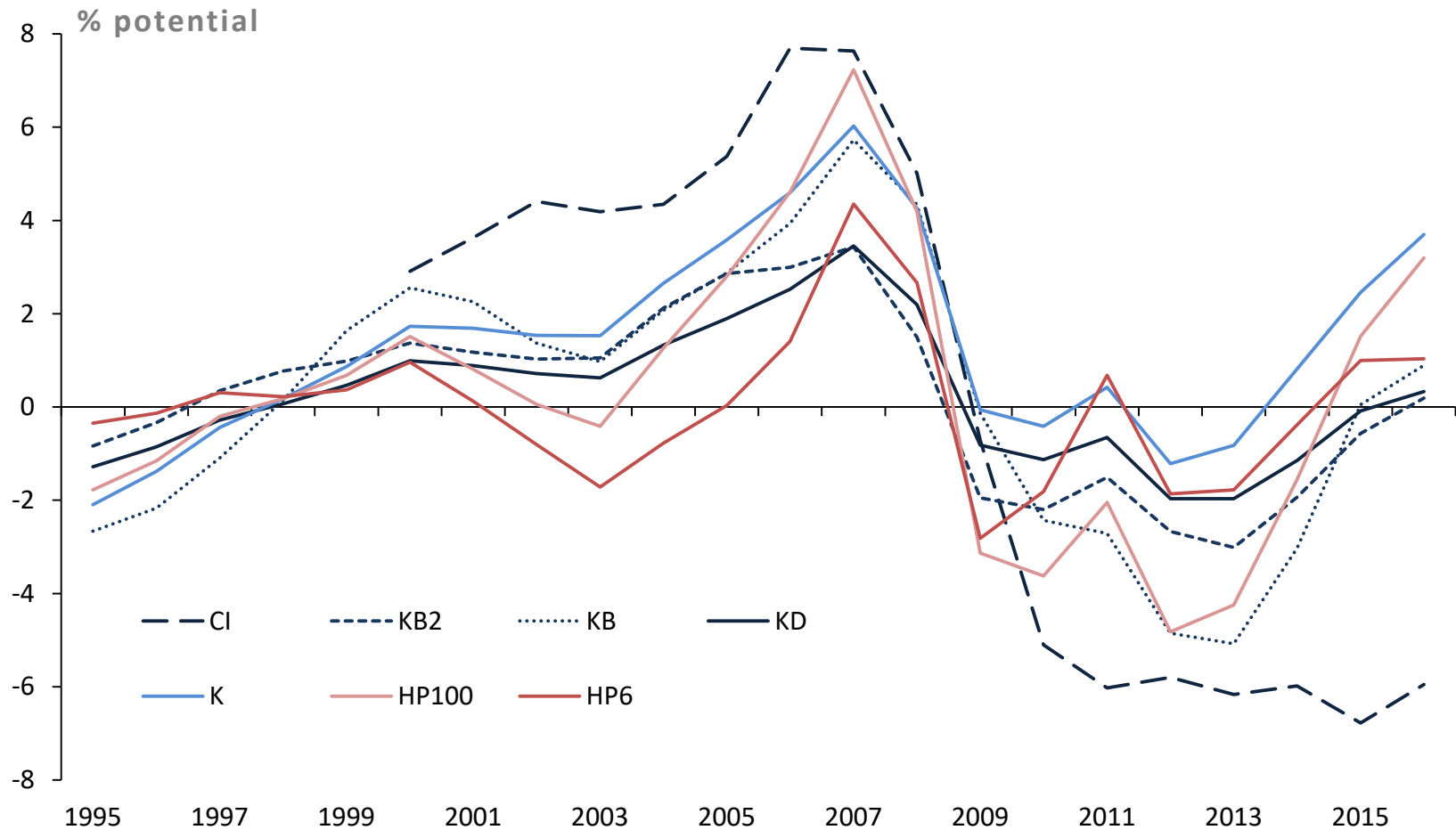|	(1)	(2)	(3)	(4)	(5)
ΔGDP$_t$/GDP$_{t-1}$	0.6888*** (0.1898)				
ΔGNP$_t$/GNP$_{t-1}$		0.9665*** (0.2064)			
ΔGNI*$_t$/GNI*$_{t-1}$			0.8439*** (0.1026)		
ΔDomestic GVA$_t$/Domestic GVA$_{t-1}$				1.6280*** (0.2290)	
ΔGVA of MNEs$_t$/GVA of MNEs$_{t-1}$					0.0244 (0.0327)
Constant	2.4273 (1.4941)	1.4678 (1.3974)	0.4217 (0.9789)	0.0065 (1.1533)	5.8601 (1.4162)
Observations	27	27	27	27	27
R-squared	0.34	0.47	0.73	0.67	0.02
Root Mean Squared Error	5.18	4.67	3.32	3.68	6.33

Sources: CSO; own workings.
Notes: Robust standard errors in parentheses (*** $p<0.01$; **$p<0.05$; *$p<0.1$). Revenue refers to total General Government Revenue. Domestic GVA is total GVA less sectors dominated by foreign-owned multinational enterprises (GVA of MNEs). GNI* is an aggregate that is designed to more accurately capture national income of Irish residents compared to GDP, given that GDP is prone to distortions from foreign-owned multinational enterprises. GNI* differs from actual GNI in that it excludes (i) the depreciation of foreign-owned, but Irish-resident, capital assets (specifically, intellectual property and aircraft leasing assets) and (ii) the undistributed profits of firms that have re-domiciled to Ireland. For years where GNI* data are unavailable (1990-1994), we use extend the GNI* series using the unadjusted GNI series growth rates.

Output Gaps and Potential Output

- Suite of Models Approach:
  - practical limits to information content of any model
  - single model paradigm may also vary over time (e.g., following the recent financial crisis)
  - a number of specific factors that we may be interested in, which individual models may fail to address if relied upon in isolation
  - generally finding that diversification can lead to more robust forecasts/estimates in the face of uncertainty (Bates and Granger, 1969; Stock and Watson, 1999)

Output Gaps and Potential Output

- We examine a number of models beyond the standard EU approach (i.e., the Commonly Agreed Methodology or "CAM"):

  - HP Filter

  - Kalman Filter
    - Univariate
    - Multivariate (controlling for current account, etc.)

  - Cyclical Indicators

Data:

|	Unit	Source
Aggregate Macroeconomic Measure		
Domestic GVA	Log of level in €m (2015 prices)	CSO
Additional Signal Variables for Multivariate Filters		
Adjusted Current Account Balance [1]	% GNI*	CSO
House Prices	% change y/y	BIS
Private Sector Credit growth	% change y/y	CBI
Short-Term Real Interest Rates (1yr; CPI inflation)	%	Thomson Reuters
Real Effective Exchange Rate (CPI-based, 67 trading partners)	% change y/y	Bruegel
Variables for Cyclical Indicators Approach		
Exchange Rate: USD-EUR	$/€	Thomson Reuters
Restaurants & Hotels Inflation	% change y/y	CSO
Recreation and Culture Inflation	% change y/y	CSO
Transport Services Inflation	% change y/y	CSO
Domestic Services and Household Services Inflation	% change y/y	CSO
Private Rent Inflation	% change y/y	CSO
Construction Sector PMI	Index	Markit
Services Sector PMI	Index	Markit
Annualised Housing Completions Minus Long-Run Average	(4-Qtr moving sum) – (LR avg) [2]	CSO
New Vehicle Registrations	% change y/y	CSO
Unemployment Rate	% labour force	CSO

Results

Output Gap Estimates from Different Methods
% potential

Legend: CI, KB2, KB, KD, K, HP100, HP6

Sources: Own workings.

Note: "HP6" refers to the HP-Filter Domestic GVA estimates (λ=6.25); "HP100" refers to same with different smoothing parameter (λ=100); "K" refers to the Kalman Filter Domestic GVA estimates; "KD" refers to the Kalman Filter of Domestic GVA with a drift term; "KB" refers to Kalman Filter of Domestic GVA with drift term and house prices; "KB2" refers to the Kalman Filter of Domestic GVA with a drift term and the adjusted current account balance. "CI" refers to the Cyclical Indicators estimates of the output gap; "Mid-Range" refers to the average of the maxima and minima of each of the preceding methods for each period; while "CAM" refers to the European Commission Commonly Agreed Methodology estimates of the Irish output gap.

Results

Mid-Range of Output Gap Estimates and Range
% potential
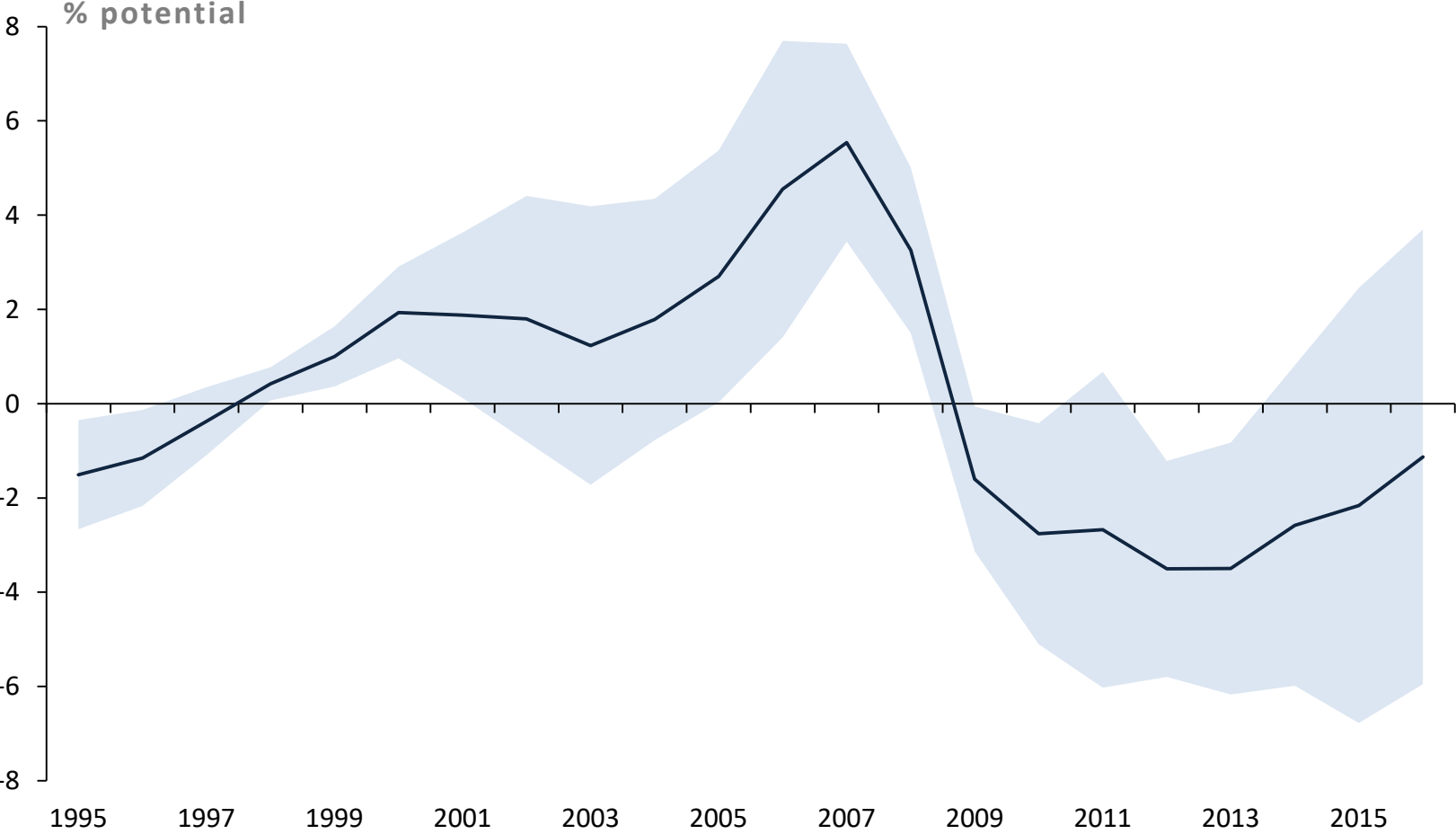
Are these estimates good?

- Knowing whether these estimates are good is a difficult question to answer.

- We ask a number of questions:
  1. Do they fit with intuition/other data ("smell test")?
  2. How stable are the estimates over time?
  3. Are they reliable at key turning points?
  4. Do they explain Inflation?
  5. Are they too complex to be depended on?

How stable are the estimates?

Full Sample (1999-2015)

	HP6	HP100	K	KD	KB	KB2	CI	Mid-Range	CAM
Year-to-Year Revisions									
MAR	0.5	0.8	0.6	0.3	0.4	0.5	1.2	0.5	0.7
Max Revision	5.5	6.9	3.0	1.8	3.2	2.3	7.1	3.4	4.2
Sign Changes	5	9	3	2	2	6	14	1	17
Initial-Final Revision									
MAR	2.7	4.6	2.9	1.1	2.5	1.1	4.4	1.7	2.3
Max Revision	6.5	8.6	6.4	2.1	5.7	2.2	8.9	3.4	5.4
Sign Changes	5	4	4	0	2	0	4	1	5

Recent Sample (2010-2015)

	HP6	HP100	K	KD	KB	KB2	CI	Mid-Range	CAM
Year-to-Year Revisions									
MAR	1.6	2.1	1.0	0.5	0.9	0.7	0.5	0.6	0.7
Max Revision	5.5	6.9	3.0	1.8	2.6	2.3	0.8	3.4	2.0
Sign Changes	3	1	3	0	1	0	0	1	0
Initial-Final Revision									
MAR	4.0	4.9	2.7	1.3	2.6	1.2	1.6	1.9	1.8
Max Revision	6.5	7.6	3.6	2.1	4.0	2.1	3.8	3.4	4.2
Sign Changes	3	1	4	0	1	0	0	1	0

Are they useful at turning points?

Comparison of the 2007 Vintage of Estimates
Vintages of output gap estimates produced on a real-time basis as of 2007 (% potential)
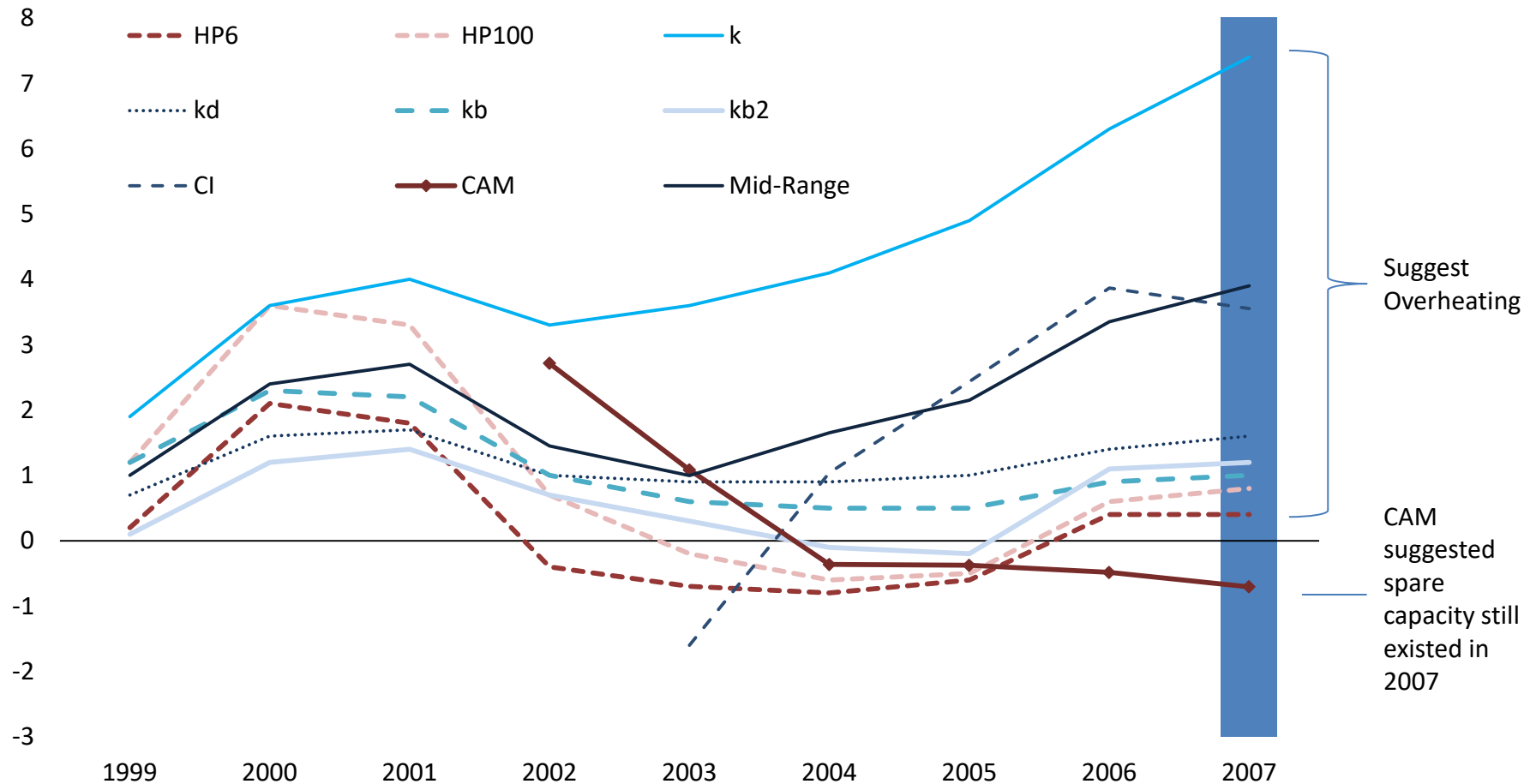
Do they explain inflation?

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Output Gaps and Inflation (Phillips Curve Approach Incorporating Inflation Expectations and Inflation-Targeting)

(Sample: 1990–2016), Dependent Variable: Core CPI inflation

	HP6	HP100	K	KD	KB	KB2	CI	Mid-Range	CAM
π^{exp}_{t+1}	1.20*** (0.07)	1.21*** (0.07)	1.23*** (0.09)	1.22*** (0.08)	1.23*** (0.08)	1.21*** (0.07)	1.22*** (0.12)	1.20*** (0.07)	1.15*** (0.07)
Output Gap	0.38*** (0.11)	0.20*** (0.06)	0.09 (0.08)	0.33** (0.12)	0.17** (0.06)	0.32*** (0.09)	0.13** (0.05)	0.25*** (0.07)	0.25*** (0.07)
Observations	26	26	26	26	26	26	16	26	26
R-squared	0.85	0.84	0.78	0.83	0.83	0.85	0.85	0.86	0.86

Sources: CSO; own workings.
Notes: Robust standard errors in parentheses (*** p<0.01; **p<0.05; *p<0.1). "HP6" refers to the HP-Filter Domestic GVA estimates (λ=6.25); "HP100" refers to same with different smoothing parameter (λ=100); "K" refers to the Kalman Filter Domestic GVA estimates; "KD" refers to the Kalman Filter of Domestic GVA with a drift term; "KB" refers to Kalman Filter of Domestic GVA with drift term and house prices; "KB2" refers to the Kalman Filter of Domestic GVA with a drift term and the adjusted current account balance. "CI" refers to the Cyclical Indicators estimates of the output gap; "Mid-Range" refers to the average of the maxima and minima of each of the preceding methods for each period; while "CAM" refers to the European Commission estimates of the Irish output gap using the Commonly Agreed Methodology.

Are they overly complex?

Output Gaps and Inflation (Phillips Curve Approach Incorporating Inflation Expectations and Inflation-Targeting)

(Sample: 1990–2016), Dependent Variable: Core CPI inflation

Method	Number of Input Series	Number of Statistical Operations Involved
HP Filter	2	10
Kalman Filter (KF)	2	28
KF with drift	2	31
KF with House Prices	3	34
KF with Current Account	3	34
Cyclical Indicators	11	24
CAM *	14	160+

Sources: CSO; own workings.
Notes: Robust standard errors in parentheses (*** $p<0.01$; **$p<0.05$; *$p<0.1$). "HP6" refers to the HP-Filter Domestic GVA estimates ($\lambda=6.25$); "HP100" refers to same with different smoothing parameter ($\lambda=100$); "K" refers to the Kalman Filter Domestic GVA estimates; "KD" refers to the Kalman Filter of Domestic GVA with a drift term; "KB" refers to Kalman Filter of Domestic GVA with drift term and house prices; "KB2" refers to the Kalman Filter of Domestic GVA with a drift term and the adjusted current account balance. "CI" refers to the Cyclical Indicators estimates of the output gap; "Mid-Range" refers to the average of the maxima and minima of each of the preceding methods for each period; while "CAM" refers to the European Commission estimates of the Irish output gap using the Commonly Agreed Methodology.

Conclusions

- We have managed to operationalise some different approaches that compare well against the standard:
  - reasonably intuitive
  - broadly as stable; fewer sign changes
  - better guidance pre-turning point (for 2007 at least)
  - similar ability to explain inflation
  - far less complex to estimate

- There may still be a Holy Grail (or not). Every cycle is different. A "least bad" solution among a host of mediocre choices might be the only realistic goal (Blagrave *et al.*, 2015). Opportunity to develop estimates in a full (semi-) structural model approach.

- Output gaps are just summary indicators. We need to supplement them with good analysis of the economy and imbalances – Rationale for IFAC's **"Modular Approach"**

Additional Indicators
("A Modular Approach")

Modular approach to imbalances

- A modular approach involves looking at several indicators for evidence of imbalances in the economy.

- These indicators can be split into different modules.

- Four modules are shown in each fiscal assessment report:

1) Labour market
2) External Sector
3) Investment/Housing
4) Credit

1. Labour market

- Measures of slack in the labour market: Vacancy rates, unemployment rate, employment rate. Are inflationary pressures building?

- Sectoral composition of employment: is any sector disproportionately represented. Evidence of this in the build up to the last crisis.

- Net migration: has been a key labour supply channel in the past. Significant inward net migration could lead to overheating.
  - O' Grada, C. and B. Walsh, (1994);
  - Barrett, (2005);
  - FitzGerald and Kearney, (1999);
  - Krugman, (1997).

2. External balance

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- Lendvai *et al.* (2011) highlights how unsustainable booms in domestic demand across EU Member States were coupled with widening current account deficits in the pre-crisis period.

- May reflect:
  - lack of savings accompanied by strong borrowing => adverse competitiveness developments
  - overexuberant return expectations => overinvestment
  - aging populations
  - growth or income differentials

- Gaps between actual and fitted current account balances have strong predictive power for future current account changes (Darvas, 2015)

3. Investment/housing

- Recent experience internationally has shown the dangers of overreliance on investment in housing, as well as the spillovers to the rest of the economy.

    - Runstler and Vlekke (2016): house price cycles are often longer than GDP cycles. Real time estimates of credit/house price cycles of similar precision to output gaps.

    - Claessens et al (2012): house price booms/busts coincide with larger swings in activity.

    - Leamer (2007): residential investment is the best component of output as an early warning indicator of recessions.

4. Credit

- Related to the investment/housing cycle. Excessive credit levels and/or growth can augment the cycle.

- Credit to GDP gaps often used. This measures how the credit to GDP ratio has deviated from some equilibrium level.

  - Alessi and Detken (2014): credit to GDP gaps as a useful early warning indicator of financial crises.

  - Giese et al (2014): credit to GDP gaps to inform countercyclical capital buffers.

  - Edge and Meisenzahl (2011): credit to GDP gaps not a useful warning signal in real time. This is because estimates of the trend are prone to heavy revision. Many false positives are triggered.

Challenges in Real-Time

Challenges in Real-Time

- Looking at the last crisis, many believe that the current account was a warning signal and showed significant imbalances in the Irish economy.

- However it is worth considering the warning signals given by the current account when using:

  1. The real time data
  2. The revised data (latest vintage)

- Real time data used here for the current account and GNP comes from the National Income and Expenditure accounts of that year.

Current Account Distortions

- Before examining the various vintages of data, it is worth remembering that there are various distortions impacting on the current account. Attempts have been made at correcting for these to arrive at an "underlying" current account.

Current account (% of GNI*)
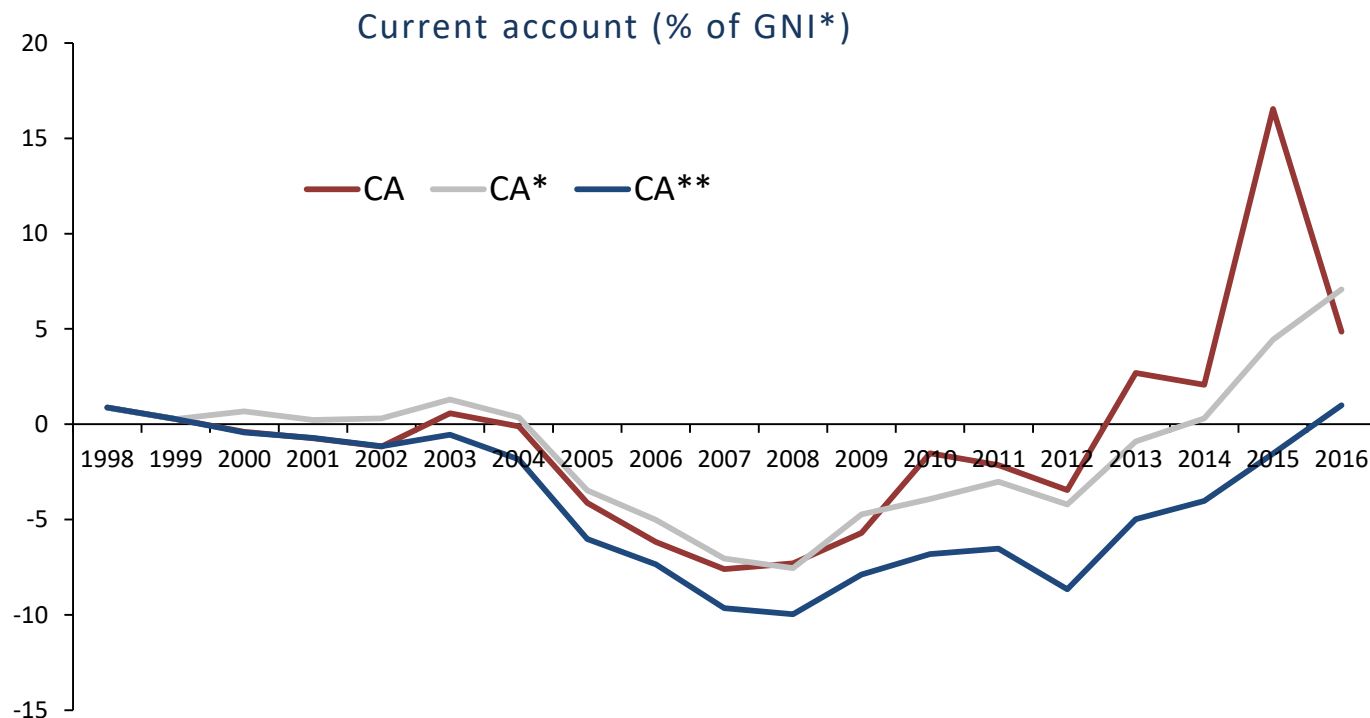
Current Account

- Looking at the current account of the Balance of payments, it appears there was a significant deterioration from 2004 onward, moving into significant deficit.

Current Account (% of GNP)
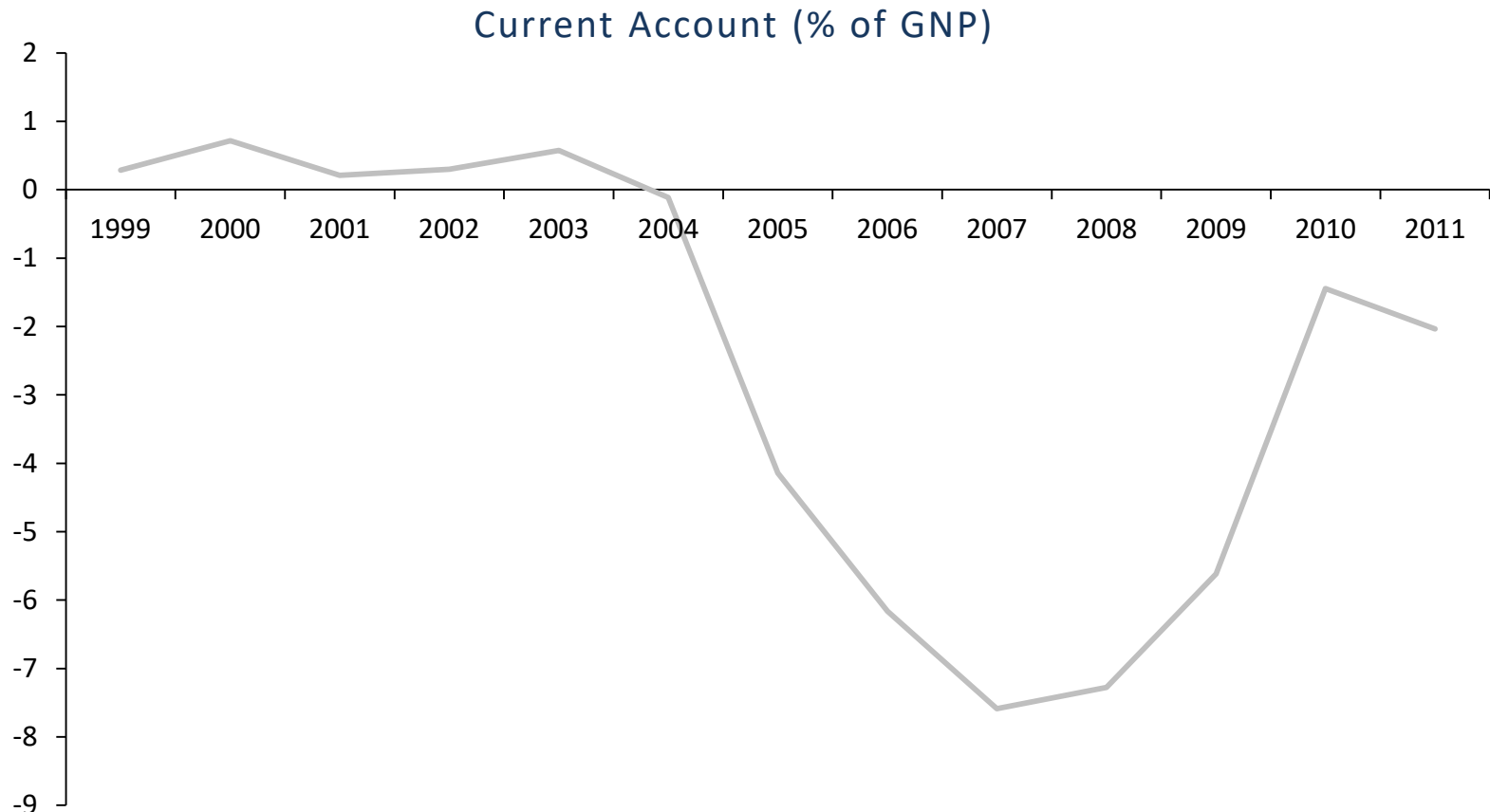
Current Account

- Using the real time data the deterioration is less severe.

Current Account (% of GNP)
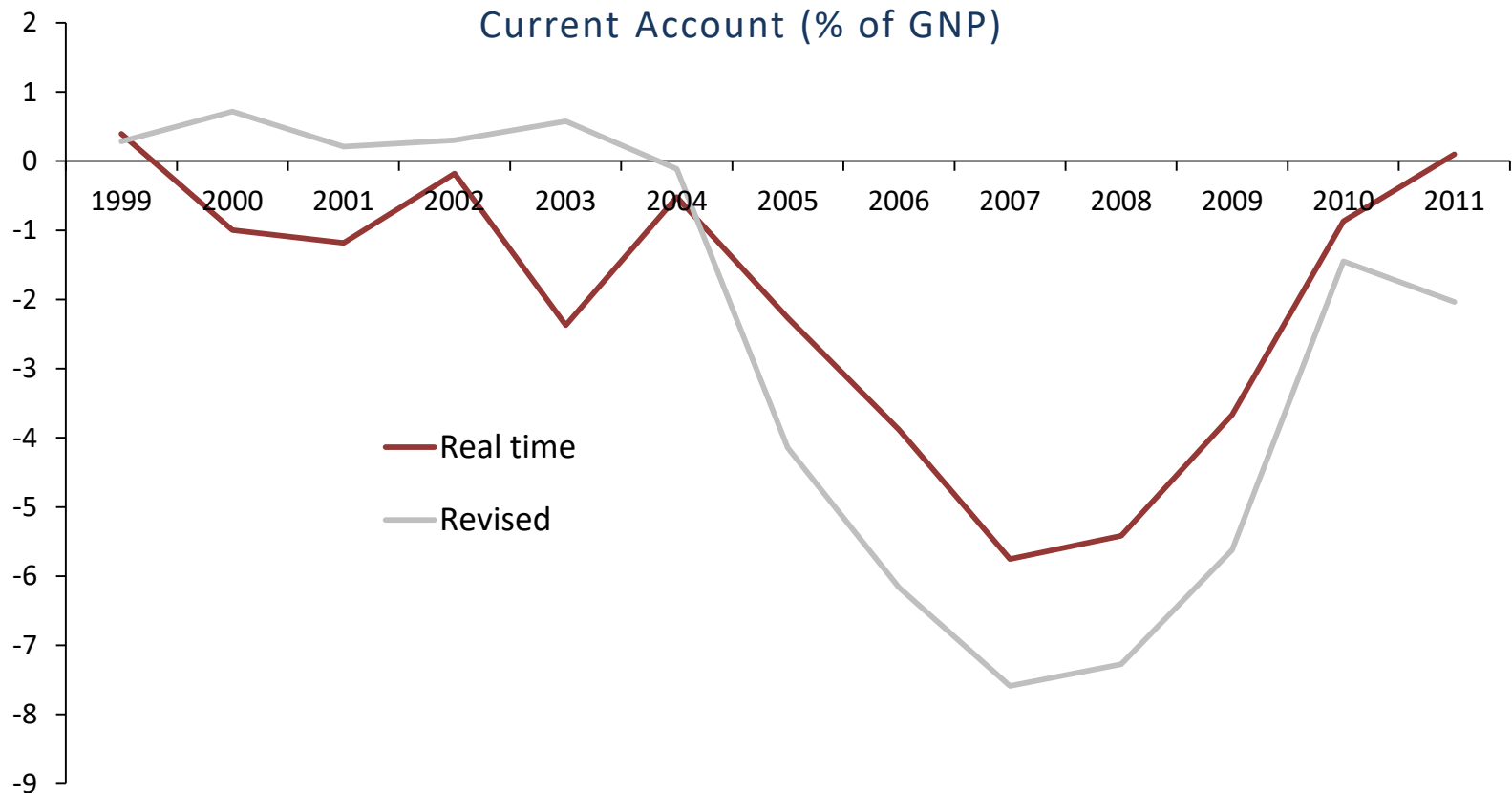
Real time

Revised

Current Account - Levels

- Looking at the years immediately pre crisis the revised data gives a much stronger warning signal.

	Current account balance (% GNP)	
	Real time	Revised
2004	-0.5	-0.1
2005	-2.3	-4.1
2006	-3.9	-6.2
2007	-5.8	-7.6
2008	-5.4	-7.3

Current Account - Levels

- Breaches of the macroeconomic imbalance procedure in red.

	Current account balance (% GNP)	
	Real time	Revised
2004	-0.5	-0.1
2005	-2.3	-4.1
2006	-3.9	-6.2
2007	-5.8	-7.6
2008	-5.4	-7.3

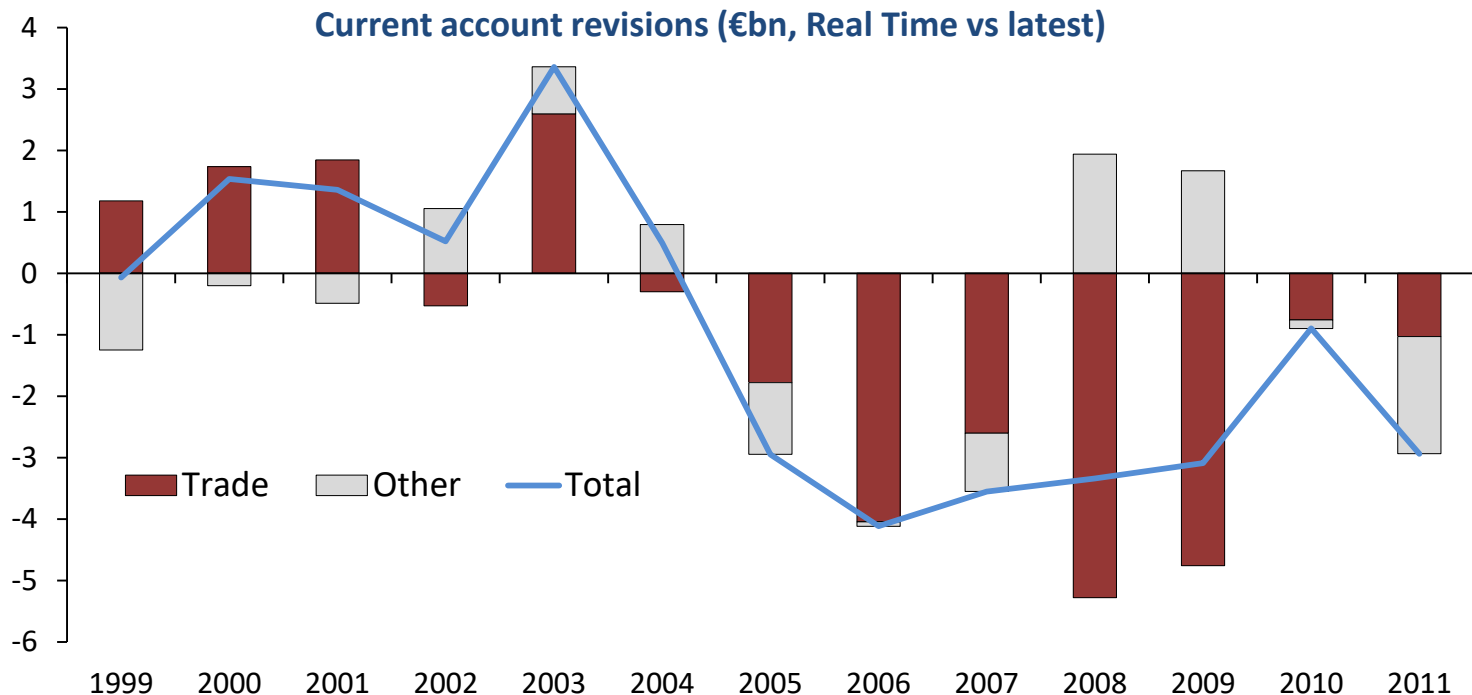# Current Account - Changes

- Looking at the years immediately pre crisis the revised data gives a much stronger warning signal. Negative values indicate a deterioration in the balance.

	Annual Change in Current account balance (% GNP)	
	Real time	Revised
2004	1.8	-0.7
2005	-1.7	-4.0
2006	-1.6	-2.0
2007	-1.9	-1.4
2008	0.3	0.3

Current Account- Levels & Changes

- Looking at the years immediately pre crisis the revised data gives a much stronger warning signal, both in levels and in changes.

	Current account balance (% GNP)		Annual Change in Current account balance (% GNP)	
	Real time	Revised	Real time	Revised
2004	-0.5	-0.1	1.8	-0.7
2005	-2.3	-4.1	-1.7	-4.0
2006	-3.9	-6.2	-1.6	-2.0
2007	-5.8	-7.6	-1.9	-1.4
2008	-5.4	-7.3	0.3	0.3

Current Account Revisions

- Given that there were substantial revisions to the data, it is worth exploring what drove these revisions.

- In particular were they driven by changes to exports and imports or were they driven by primary/secondary income.

Current account revisions (€bn, Real Time vs latest)

Current Account – International

- Was the Irish experience unique?

- Did other countries have significant current account imbalances pre-crisis?

- Was this reflected in the initial data or only in later vintages?

- The OECD real time database is used to investigate this.

Current Account – International

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- Portugal appears to have had a similar experience to Ireland, with pre-crisis current account imbalances, which are significantly larger than reported in real time.

- The opposite was the case in the Netherlands, with a surplus pre crisis. It also saw its data revised, with the latest vintage further from balance than the real time estimates.
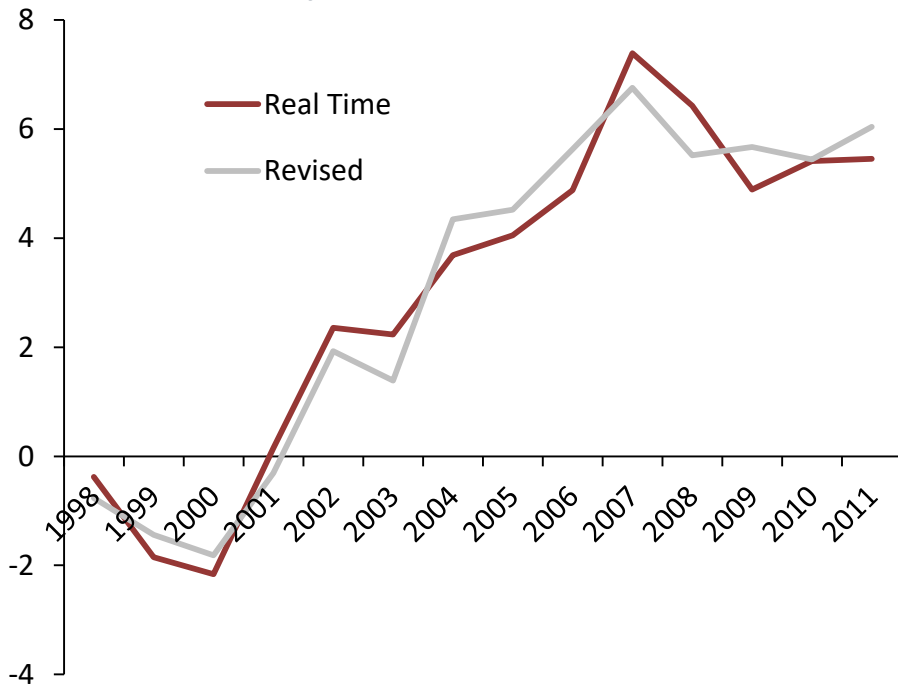

Portugal Current account (% of GDP)
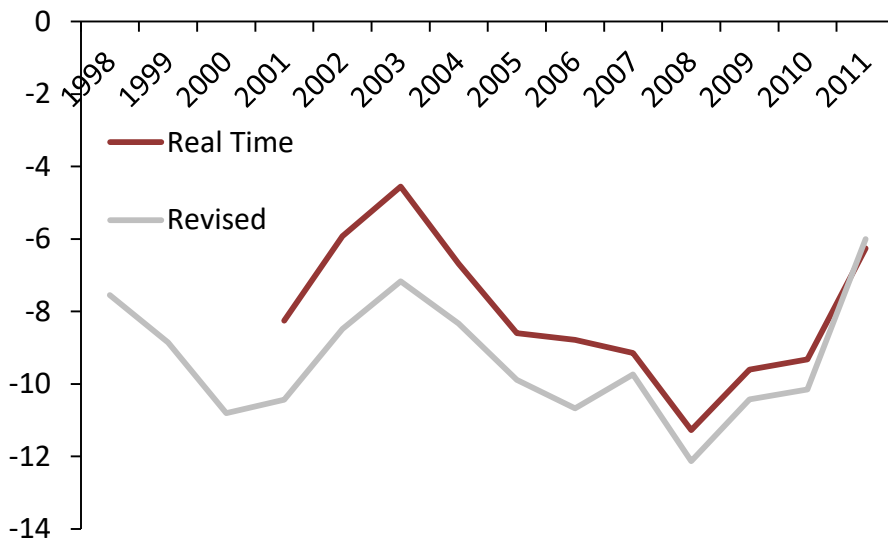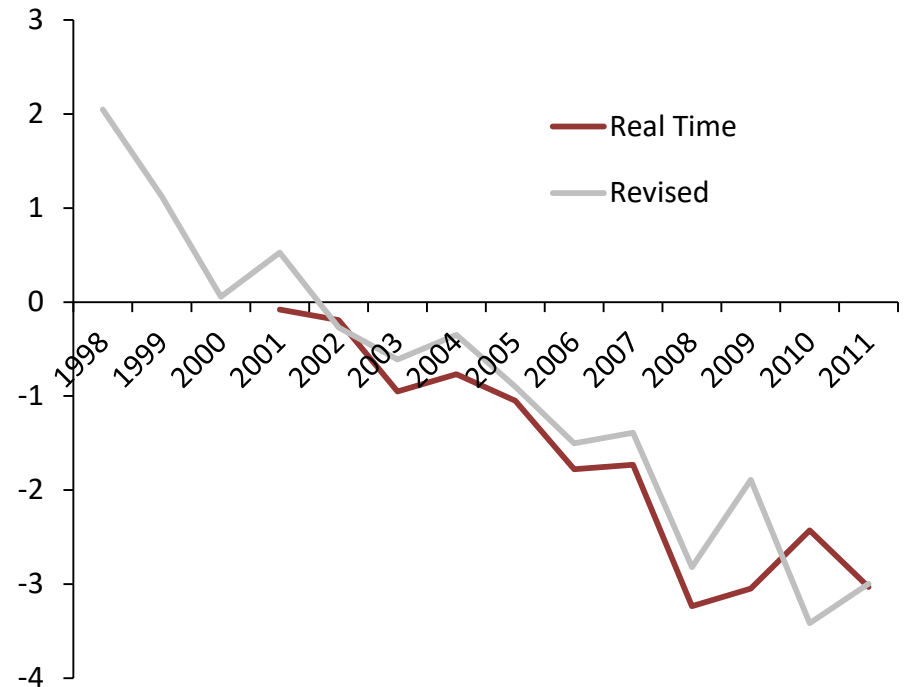

Netherlands Current account (% of GDP)

Current Account – International
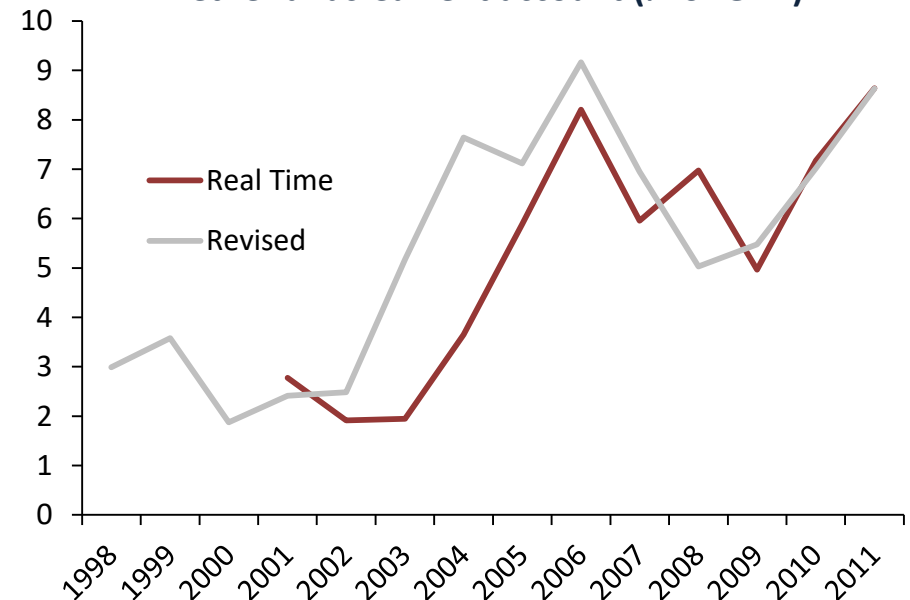
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- Larger economies might be expected to have smaller revisions all else being equal.

Germany Current account (% of GDP)

Legend: Real Time, Revised

Italian Current account (% of GDP)

Legend: Real Time, Revised

Current Account – International

- Looking at the revisions to the current account balances of 13 small open economies.

- Of the 13 Small Open Economies examined, 10 of them have had revisions which brought the current account further away from balance (larger deficits or surpluses than indicated in real time).

- This result holds for the full sample of data (1998 – 2016) and for a pre crisis sample (2001-2007).

- If this were to be a recurring feature, it would be a drawback of the current account as a warning signal in real time, as it underestimates the extent of the imbalance in the economy.

Challenges in Real-Time: Conclusions

While the current account can highlight possible imbalances in the economy, there are a number of factors which make this a less reliable indicator:

- It is heavily distorted at present and requires several adjustments to arrive at an underlying current account.

- It is often heavily revised, meaning the real time data may give very different signals to the final vintage of data.

- This has been the case in the past not just for Ireland, but for other SOEs. The tendency of initial estimates to underestimate the imbalance compared to the final vintage.