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The Current Account, a Real-Time Signal of Economic Imbalances or 20/20 Hindsight?

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Abstract: The current account balance has a rich tradition as an indicator of macroeconomic imbalances – one considered essential in terms of presaging the recent financial crisis. However, we show that the current account balance may be misleading in real time. Preliminary estimates are subject to large revisions and are often of a sufficient magnitude to cross key international thresholds for signalling macroeconomic imbalances. We find some evidence that revisions in certain countries may be systematically biased and, hence, predictable. Exploring the Irish current account data in detail, we find that trade statistics dominate revisions.

I INTRODUCTION

In the aftermath of the financial crisis, macroeconomists have been able to discern obvious warning signs which were ignored in the lead up to it. However, we show that warning signs may flash amber rather than red when they are most needed due to the absence of critical information that only became available at a much later stage.

The current account balance has a rich tradition as an indicator of imbalances in the economy. Obstfeld (2012) cites David Hume's eighteenth century account

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of price-specie flow mechanisms (Hume, 1752) as bringing focus to the idea of the current account balance as a conduit for global shock transmission. The importance of current account imbalances was highlighted on the eve of the financial crisis when, in 2006, the IMF held a multilateral consultative process aiming to promote the orderly unwinding of large global imbalances.

Concerns with imbalances linked to external positions have also persisted over the post-crisis period. Blanchard and Milesi-Ferretti (2012), in a discussion paper prompted by G20 anxieties with global current account imbalances, emphasises how current account imbalances that had emerged in the G20 largely reflected underlying domestic distortions that were desirable to unwind in an orderly manner. In a similar vein, the European Commission proposed an enhanced surveillance framework in 2010 for EU Member States that would involve ongoing monitoring and assessment of a broad range of indicators of potential macroeconomic imbalances. A key indicator included in the framework is the current account balance.

An overly simplistic view is that all current account imbalances are bad. This is only partly true (Blanchard and Milesi-Ferretti, 2012). Yes, large deficits may reflect failures in financial regulation, unsustainable credit booms, and reductions in national saving caused by governments running excessive deficits. Correspondingly, large surpluses may reflect inadequate social insurance that entails higher private saving; inefficient financial intermediation that causes low investment rates; and other distortions such as financial repression that dampens savings returns (Obstfeld, 2012). Correcting such distortions is generally desirable. But current account imbalances might also arise for good reasons. Deficits might simply be the result of a temporary weakness in commodity prices, temporarily lower savings prompted by an anticipated economic strengthening in the near future, or a high marginal product of capital that leads to higher levels of investment. Equally, surpluses might be considered good when they reflect ageing populations accumulating savings for retirement, the existence of limited domestic investment opportunities, and/or positive productivity spillovers arising from a more export-oriented growth strategy.

Corrections in an unsustainable current account position can be fast or slow. Sudden stops in funding markets or reversals in capital flows might result in sharp corrections. As Blanchard (2007) notes, slower corrections might be expected in a currency union, especially when nominal rigidities mean that downward wage adjustments following competitiveness losses associated with sustained current account deficits can take considerable time to unwind (Blanchard, 2007); while large surpluses do not depend on the willingness of foreign investors to finance domestic consumption and investment, and hence are not hostage to changes in investor sentiment (Blanchard and Milesi-Ferretti, 2012).

Regardless of whether current account imbalances arise for good or bad reasons, and the pace of their ultimate correction, policymakers should want to

know with some degree of precision how the current account balance is performing. This can facilitate appropriate policy responses where needed or the anticipation of eventual corrections. One might surmise that, had policymakers been alert to increasingly unsustainable domestic orientations and competitiveness losses prior to the crisis, this could have helped to alleviate its worst effects (Obstfeld, 2012 and Lendvai *et al.,* 2011).

Contrary to the idea that current account imbalances – if scrutinised closely before crises – might help to alert us to looming crises, we find that current account balances may sometimes be a misleading indicator in real time. This is due to real-time estimates being prone to significant data revisions.

Looking at the OECD data, we find that typical revisions are economically significant, with open economies having larger revisions on average. While revisions are mean zero for most countries, there is a tendency for revisions to bring initial estimates back towards balance. Significant revisions may imply that the current account is a less useful real-time indicator of potential imbalances in the economy. We also show that these revisions may be somewhat predictable.

In addition, we also find significant revisions to the trajectory of the current account when there are large improvements or deteriorations to the current account balance. Revisions are found to be somewhat predictable, with real-time estimates tending to show a smaller change in the current account balance than revised estimates.

Examining more closely the limitations of the current account balance as a real-time indicator of imbalances, we explore the Irish case. One indicator that many believe pointed towards unsustainable activity in the Irish economy in the lead up to the crisis was the current account balance. FitzGerald (2012), for example, considers the recent crisis through the lens of a current account crisis requiring large adjustments in Ireland and other EU countries after entering the crisis with substantial current account deficits.

Ireland's current account balance offers a compelling example of why the current account can be a fraught indicator. Casey and Smyth (2016) show that macroeconomic aggregates in Ireland are amongst the most heavily revised in the OECD, with the structure of the traded sector offering a compelling reason for why this is the case. We find that initial estimates of the Irish current account balance showed some deterioration prior to the financial crisis. Yet the deteriorations initially observed were of an order of magnitude that would have posed relatively less concern to policymakers than final revised estimates would have were they to have been known at the time. Revised estimates now show a sharper and deeper pre-crisis deterioration, which would have given rise to far greater concerns had they been known. For example, the macroeconomic imbalance procedure of the European Commission is triggered if a deficit larger than 4 per cent of GDP is recorded (a three-year average is used when applying the procedure, but here we just use the one-year level for illustrative purposes). Using the revised data, the

current account deficit would have exceeded 4 per cent two years earlier than was actually the case using the real-time data. We document how these revisions were almost exclusively trade-related (as opposed to primary or secondary income).

The current account is often an important indicator of macroeconomic imbalances. Macroeconomists now point to evidence of how unsustainable positions opened up prior to the financial crisis. However, we show that hindsight is 20/20, and policymakers can easily be assuaged by a current account balance that is ostensibly benign in real time.

II RELEVANT LITERATURE

The literature relevant to this paper is primarily that which uses the current account balance in empirical studies as a means of predicting various macroeconomic crises.

The evidence on using current account balances as predictors of crises is mixed. Obstfeld (2012) and Edwards (2002) both offer useful surveys of the literature. Obstfeld highlights the role that current account imbalances played in the lead up to the recent financial crisis noting that, while some of these imbalances were consistent with economic fundamentals, others, he argues, were evidence of large macroeconomic distortions.

Frankel and Rose (1996) use a panel of annual data for over 100 developing countries from 1971 through 1992 to examine currency crises. They define a "currency crash" as a nominal depreciation of the currency of at least 25 per cent that is also at least a 10 per cent increase in the rate of depreciation. They use probit models with their binary crash measure to examine the predictive power of a variety of macroeconomic indicators (including domestic macroeconomic variables, indicators of international indebtedness, and other external variables). Their findings indicate that large external deficits are not statistically significant predictors of currency crises in emerging markets.

Building on a similar approach, Edwards (2002) shows that the results are sensitive to how crises are defined and to the regions assessed. Using an unbalanced panel dataset that covers 120 countries over the period 1970-1997, they find that broader crisis definitions and the exclusion of African nations from the sample result in significant findings. In this case, higher current account deficits are indeed shown to increase crisis probabilities significantly. The author concludes that large deficits should be a cause for concern, though not every large deficit is likely to lead to a crisis.

Gourinchas and Obstfeld (2012) extend the study of current account balances as predictors of crises to examine currency, banking, and default crises. They use panel logit models for each crisis type on data covering the period 1973-2010 for both advanced and emerging market economies. They find that, while larger current

account deficits often precede a crisis, the current account generally does not play a statistically significant role in helping to predict various types of crises.

By contrast, Catão and Milesi-Ferretti (2014) focus strictly on external debt crises, which include external defaults, rescheduling events, and large disbursements from multilateral support programmes. Their findings indicate that larger current account deficits and larger net external debt liabilities both raise the likelihood of various definitions of debt crises across a number of probit/logit model specifications. This is true if measured either unconditionally or as deviations from conventionally estimated "norms". Their sample includes emerging markets and advanced countries over the period 1970-2010.

There are further studies of current account imbalance as a predictor of banking crises in the form of early warning systems. Kauko (2014) provides a useful survey of the literature on modelling banking crises and finds that current account imbalances can often be a key predictor.[1]

The evidence is reasonably mixed, though there is sufficient compelling evidence to suggest that current account imbalances can be significant predictors in some circumstances, if not all. It is worth noting however, that signals given at the time may not be consistent with what we can see now with hindsight. With this in mind, when considering if an indicator is a warning signal for potential imbalances in the economy, one has to consider the data available in real time as opposed to the revised data which are available now.

We make a key contribution to the literature on current account balances by showing that their usefulness as real-time predictors of crises may be undermined by significant data revisions.

III DATA AND METHODOLOGY

3.1 Data

The key variables we focus on are the real-time vintages of the current account balance and nominal GDP. We obtain data for 27 countries from the OECD real-time dataset.[2] Having these two variables in real time allows us to examine how the current account balance (as a percentage of GDP) in real time compares to the final, revised vintage. To ensure that changing exchange rates play no part in revisions, the data are taken in current prices and in local national currency for each country.

[1] Alessi *et al.* (2015) provide a comprehensive overview of studies on early warning systems by members of the European System of Central Banks, many of which feature current account imbalances.

[2] The OECD dataset gives access to 21 time series for economic variables as originally published in each monthly edition of the OECD Main Economic Indicators release from February 1999 onwards. It is available at http://www.oecd.org.

A more detailed dataset is compiled for Ireland. Around March of each year, the Quarterly National Accounts for the final quarter of the previous year are published. This gives the initial estimate of the National Accounts data for all four quarters of the previous year. The Balance of Payments data are also published concurrently. For constructing the Irish dataset, GNP and the current account balance are recorded for each vintage, along with the contributions to the current account balance (exports, imports and other items).[3]

The real-time data here refer to what the variable looked like when they were initially released, i.e. 2005 GNP as recorded in the 2005 Q4 Quarterly National Accounts (released in March 2006), as opposed to later vintages that incorporate revisions.

3.2 Methodology

One way to examine the usefulness of current account balance estimates as real-time indicators is to examine the extent to which preliminary estimates might represent rational estimates. That is to say, are estimates free from any systematic bias or are revisions in some way predictable?

Using the OECD and Irish datasets, we define real-time current account balances as the preliminary estimate obtained from either the first vintage available in the OECD dataset or the preliminary fourth quarter estimate in the CSO's Balance of Payments data for Ireland. The latest vintage of data (available as of the 2018 Q3 release in both cases) is defined as the "revised" estimate.

We also wish to know whether or not revisions to data releases incorporate all of the available information at the time of publication? If this is not the case, then perhaps future revisions may in some way be predictable on the basis of currently available information.

We explore systematic tendencies in data revisions on the basis of (i) the standard "noise versus news" hypotheses; (ii) standard and modified t-tests; and (iii) the Mincer-Zarnowitz (1969) test.

Noise versus News Hypotheses: Properties of Rational Estimates

The noise versus news hypotheses of Mankiw *et al*. (1986) examines whether or not a preliminary estimate may be said to be rational. The two hypotheses may be understood as:

- News hypothesis: initial estimates are expected to incorporate all available information efficiently at the time of publication. Subsequent revisions therefore simply reflect the availability of new – previously unavailable – information.

[3] GNP is used as a denominator rather than GDP, as it is less distorted by activities of multinationals, particularly prior to 2015. While alternative metrics like GNI* or Domestic GVA may be better measures for activity in Ireland, these have only been recently developed and real-time estimates are only available back to 2016 and 2012 respectively.

- Noise hypothesis: revisions to the initial estimate do not incorporate new information, but arise due to the correction of earlier inaccuracies or bias in the data.

The distinction is an important one. It might be expected that revisions may contain some predictable elements arising from bias or otherwise predictable errors. This would imply that the initial estimate is not as informative as it could be and is therefore not a "rational" estimate of the "true" value.

If we assume that the true estimate is close to the latest available estimate, we can define the preliminary estimate p as equal to the latest value l, plus an error term, $\in$:

$$p_t = l_t + \in_t$$

… so that the revision R_t is described as:

$$R_t = l_t - p_t$$

A rational estimate is defined by Mankiw *et al*. (1986) as having three key properties:

1. $\bar{R} = 0$ … the mean revision should equal zero.
2. $\rho_{RtPt} \leq \rho_{RtLt}$ … the preliminary estimate p_t should not be more strongly correlated with the revision than the final estimate. If the initial estimate were more strongly correlated with the revision, this would indicate that the initial estimate did not fully avail of all available information.
3. $\sigma^2_{pt} < \sigma^2_{lt}$ … .the variance of the preliminary estimate p_t should be lower than the variance for the latest estimate l_t. If the initial estimates are efficient predictors of the true estimates, then these should have lower variances that those of the true values.

Standard and Modified T-Tests

Statistical bias in revisions can also be formally tested for using standard and modified t-tests. Standard t-tests examine whether revisions, on average, are significantly different from zero. Information on the mean of a revisions series and its standard deviation are examined under the assumption that the sample of revisions is normally distributed. If the revision is not statistically significant, this implies that any observed revisions may have occurred due to chance rather than due to any systematic bias in a given direction.

To deal with potential serial correlation of the revisions, we also explore a modified test statistic.[4] It is reasonable to expect that such an issue may arise given

[4] The modified t-test applied here is the same as that used by the ONS for analysing bias in UK macroeconomic data. See Jenkinson and Stuttard (2004) for details.

the nature of macroeconomic revisions. As noted in Casey and Smyth (2016), revisions typically occur following the release of new survey information which will often relate to a string of consecutive quarters. This is common as many of the key surveys are of an annual frequency. In such cases, standard t-tests could overstate the significance of any results where successive revisions are not independent. An argument against controlling for serial correlation in revisions is that the correlation itself might represent some informative characteristic of the data. While this could be a factor, revisions to a number of quarters tend to take place simultaneously. This would imply that there is no exploitable signal to avail of. Not controlling for serial correlation in these circumstances could lead one to incorrectly conclude that successive revisions have some predictable pattern.

Mincer-Zarnowitz Test

Another formal test of bias is that proposed by Mincer-Zarnowitz (1969). The test assumes that a rational estimate is one where subsequent revisions cannot be predicted by information available at the time of the initial estimate. The test is based on the regression:

$$(l_t - p_t) = \alpha + \beta p_t + \mu_t$$

… where the revision is equal to a constant α plus a coefficient β times the preliminary estimate plus an error term μ. The test checks to see whether the revision can be forecast using the preliminary estimate. If so, the initial estimate is considered to be an irrational one. Rationality is examined under the joint hypothesis:

$$H_0: \ \alpha = \beta = 0.$$

Root Mean Squared Revision (RMSR)

One way to summarise the typical revisions on the current account balance that we employ in this paper is using the RMSR statistic. This is given by:

$$RMSR = \sqrt{\frac{1}{n}\sum_{t=1}^{n}(l_t - p_t)^2}$$

where n is the total number of revisions for each of the data time periods t; l_t is the latest estimate of the observation relating to time period t; and p_t is the preliminary estimate of the observation for time period t. Each observation at time t represents a given period's current account balance as a percentage of GDP.

This is a standard measure of revisions employed in the literature. It is designed to overcome problems of positive and negative observations offsetting one another

by taking the squared values of revisions and then returning the square root of their mean.

Trajectory of the Current Account

While the level of the current account balance is important (and hence the revisions to it), the trajectory of the current account is also important when considering economic imbalances. With this in mind, we examine what the different vintages of the data would imply for changes to the current account over different horizons. We examine changes to the current account over one, two and three years.

Two versions of the data are used, the real-time data and the revised data. The real-time data use the vintage of data which had the first estimate of the current account balance for year t. That same vintage of data is used when taking estimates of the current account for years $t-1$, $t-2$ and $t-3$. This means that we are using the data available at that time for both the year t and the previous years which we are comparing to. This provides an accurate reflection of what the trajectory of the current account balance looked like at that time.

IV RESULTS

4.1 Current Account Balances in the OECD

Using the OECD database described above, we can examine what the current account looked like (relative to GDP) both in real time and using the latest (revised) vintage of data. A number of avenues can then be explored regarding how useful the current account is as an indicator of economic imbalances in real time.

- Do countries typically experience significant revisions to initial estimates of the current account?
- Are more open economies more prone to large revisions?
- Do initial estimates of the current account satisfy criteria rational estimates (for example, mean zero revisions)?
- Would real-time estimates of the current account before the crisis have signalled potential imbalances in the economy, or is this only apparent when looking at the revised data?
- Are the trajectories of the current account balance significantly impacted by revisions?

One can easily see how these issues could inform the usefulness of the current account as an indicator of imbalances in real time.

Looking at 27 OECD countries, we find that revisions are quite significant. Over the period 1998-2016, the average absolute revision was 1.1 percentage points of GDP. This scale of revision could easily tip a country from surplus to deficit or

change what looked initially to be a relatively modest surplus or deficit to a far more significant one (or vice versa). Looking at the both the pre-crisis and crisis periods (defined here as 2002-2006 and 2007-2012 respectively), the average absolute revision is pretty similar to the full sample.[5]

Table 1: Mean Absolute Revisions to the Current Account Percentage Point of GDP

	Revision
Full sample (1998-2016)	1.1
Pre-Crisis (2002-2006)	1.1
Crisis (2007-2012)	1.1
Median (1998-2016)	0.7

Source: OECD, CSO and Authors' calculations.
Note: Initial estimates of the current account balance (as a percentage of the initial estimate of GDP) are compared to the latest vintage.

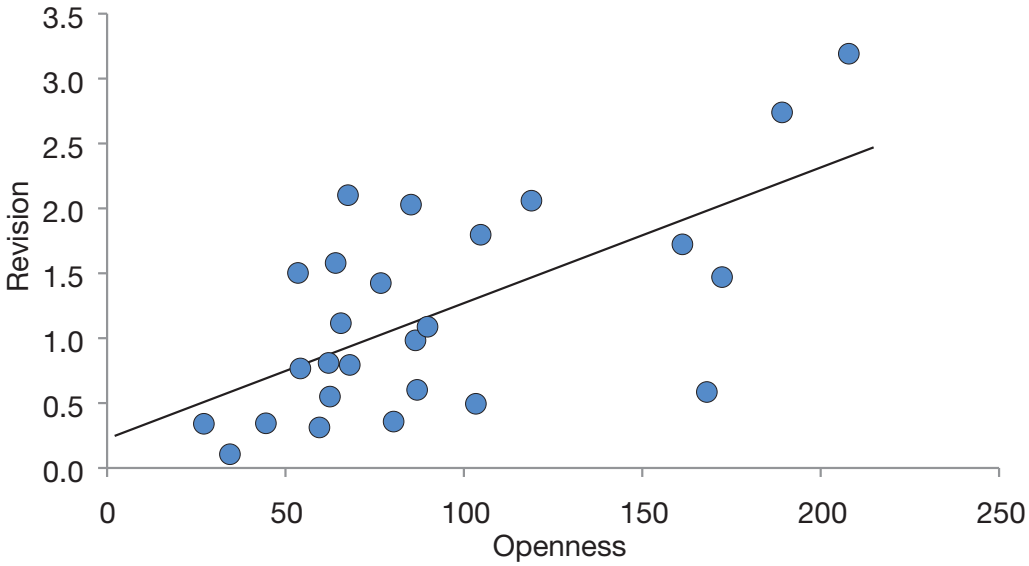
Figure 1 shows average absolute revisions to the current account and average openness (both over the period 2001-2016).[6] We can see that economies which are more open do on average tend to have larger average absolute revisions. This correlation is found to be significant at a 1 per cent level.

Figure 2 shows the typical revision (RMSR) of the OECD countries examined. This shows that there is a great deal of variation in the average size of revisions to the current account across OECD countries. Taking the 2001-2016 period, Ireland has the highest revisions across the OECD. Most of this is driven by large revisions in recent years. If taking the 2001-2011 data, Ireland exhibits the ninth largest average revisions of the 27 OECD countries shown in Figure 2.

The nature of real-time data and subsequent revisions needs to be further examined. There are three important characteristics for rational estimates.[7] Firstly, the mean revision should be zero. Secondly, the initial estimate should not be more strongly correlated with the revision than the final estimate. If the initial estimate were more strongly correlated with the revision, this would indicate that the initial estimate did not fully avail of all information available at that time. Thirdly, the variance of the initial estimate should be lower than the variance for the final estimate. If the initial estimates are efficient predictors of the true estimates, then these should have lower variances that those of the true values.

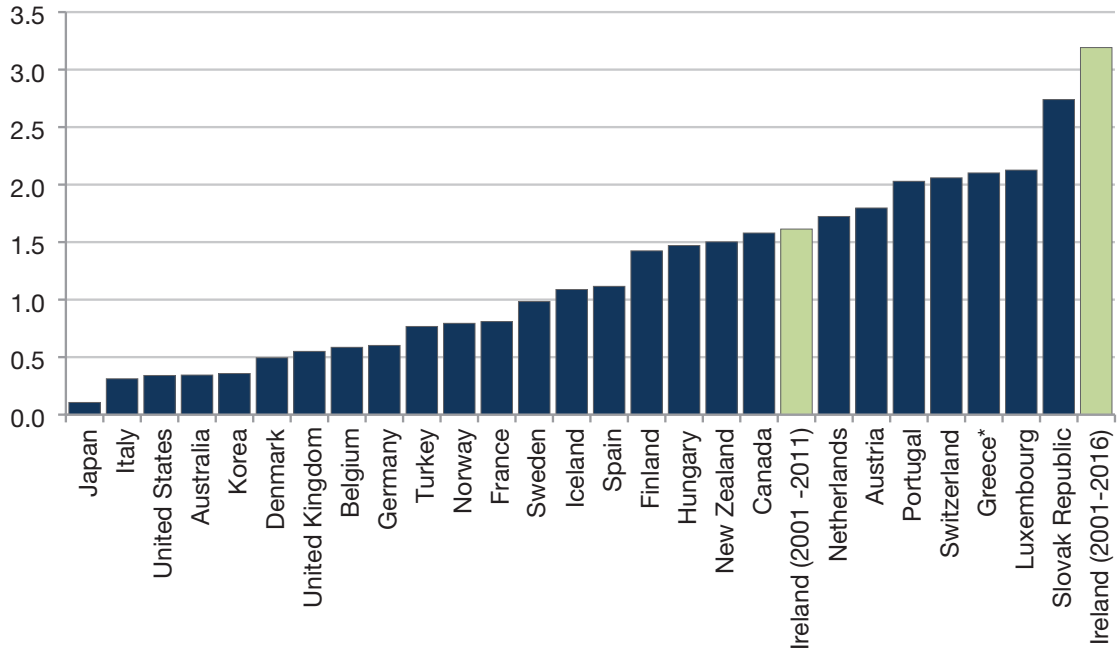
[5] Regardless of what years are classified as "crisis", the revisions in the crisis period are not significantly larger than the average over 2001-2016 or the pre-crisis period.
[6] 26 countries are shown here; Luxembourg is excluded as it is an outlier with exports and imports equivalent to over 300 per cent of GDP.
[7] Mankiw *et al.* (1986) perform similar tests when examining GNP revisions.

Figure 1: Average Absolute Revision and Openness



Sources: OECD, CSO and Authors' calculations.
Notes: Openness is measured as the sum of exports and imports divided by GDP. Revision is the absolute average revision of current account balance estimates as a percentage of GDP across vintages and over time. The sample period is 2001-2016.

Figure 2: Root Mean Squared Revisions
Percentage Point of GDP



Sources: OECD, CSO and Authors' calculations.
Notes: The average value of the period 2001-2016 is taken. The exception to this is Greece, for which real-time estimates of the current account in 2010-2012 are not available. Ireland is shown in green.

Looking at the average revisions, if one pools all the data from the 27 countries examined here, the mean revision is not significantly different from zero at a 5 per cent significance level, but is significant at a 10 per cent level (P-value of 0.08 in Table 2).

Table 2: Testing Rationality of Current Account Estimates

	OECD
Mean revision	–0.14
T statistic	–1.75
P-Value	0.08
Countries with P-Value < 0.05	12 (of 27)
Modified T-statistic	–1.22
Modified P-Value	0.23
Countries with modified P-Value <0.05	6 (of 27)
Correlations (with revisions)	
Initial	–0.08
Final	0.21
Countries where Initial < Final	27 (of 27)
Variance	
Variance (Initial)	35.2
Variance (Final)	36.5
Countries where Initial < Final	12 (of 27)
N	473

Sources: OECD and Authors' calculations.

Looking at the pooled data may not be informative, as some countries with persistently positive revisions could cancel out countries with persistently negative revisions. With this in mind, each of the 27 countries is examined individually to see if many have mean revisions which are significantly different to zero. We find that 12 of the 27 countries examined showed evidence of statistically significant bias (P-value below 0.05) in the initial estimates.[8] While 12 countries showed mean revisions which were significantly different from zero, this is based on quite a small number of observations for each country (18 on average).

To deal with potential serial correlation of the revisions, we also explore a modified test statistic. We find that using this metric, only six countries of the 27 countries examined showed evidence of statistically significant bias (P-value below 0.05) in the initial estimates (compared to 12 countries when using the standard test statistic).

Looking at the correlations, we find that the initial estimate is more weakly correlated with the subsequent revision than the final estimate. All 27 countries exhibit this when examined on a country-by-country level.

[8] Eight countries are significantly different from zero at a 1 per cent significance level, while 14 are significantly different from zero at a 10 per cent level.

Finally, looking at the variances, we find that the variance of the initial estimates is lower than the variance of the final estimates when looking at the pooled sample of all 27 countries. Looking on a country-by-country level however, we find that just under half of countries had initial estimates with a lower variance than the final vintage (12 of 27).

Overall, when looking at the pooled data of all 27 countries examined here, the conditions for rational estimates appear to be satisfied. However, when looking on a country-by-country level, this is not always the case. Some countries exhibit revisions which on average are statistically different from zero. In others, the variance of the initial estimates is higher than that of the final estimates. Table 3 shows how each of the 27 countries' estimates performed when examined under these different criteria.

Table 4 shows how many countries satisfied zero, one, two or all three of the criteria specified above. The vast majority of countries satisfy at least two of the three conditions.

The next test performed is to see if the initial estimate of the current account is a predictor for subsequent revisions. A negative correlation would suggest that negative initial estimates get revised up and positive initial estimates get revised down. This would imply that the revision is bringing the current account closer to balance than the initial estimate.[9]

Firstly, this is tested by regressing the revision on the initial estimate of the current account and a constant (Table 5, Column 1). When this is done, we find a negative but insignificant coefficient on the initial estimate of the current account. However, given that we earlier found that some of the countries have revisions which are not mean zero, we may need to include country fixed effects.

After including country fixed effects, a significant negative correlation is found between the revision and the initial estimate (Column 2 in Table 5). This implies that the current account balance tends to be revised back towards balance.[10] The coefficient (-0.10, Column 2) implies that on average, 10 per cent of the first estimate of current account imbalance is revised away. For example, if the initial estimate of the current account was a surplus of 2 per cent, one would expect this to be revised down by 0.2 per cent to 1.8 per cent.

When this analysis is performed on a country-by-country level, rather than with pooled data, we find nine instances where there is a significant (at a five per cent level) negative coefficient on the initial balance. There are three instances of a positive significant coefficient, with the remaining 15 countries yielding statistically insignificant results.

[9] By contrast, a positive correlation would imply that revisions bring the current account further from balance compared to the initial estimate.

[10] If country dummies are not included, then the initial current account estimate is not a significant predictor of the subsequent revision.

Table 3: Testing Rationality of Current Account Estimates

	T-Stat	*Modified T-Stat*	*Correlations*	*Variances*	*Desirable properties (out of 3)*
Australia	No	Yes	Yes	Yes	3
Austria	No	Yes	Yes	No	2
Belgium	Yes	Yes	Yes	No	2
Canada	Yes	Yes	Yes	No	2
Denmark	No	No	Yes	Yes	2
Finland	Yes	Yes	Yes	Yes	3
France	No	Yes	Yes	No	2
Germany	Yes	Yes	Yes	Yes	3
Greece	No	No	Yes	No	1
Hungary	Yes	Yes	Yes	Yes	3
Iceland	Yes	Yes	Yes	No	2
Ireland	No	Yes	Yes	No	2
Italy	Yes	No	Yes	Yes	2
Japan	Yes	Yes	Yes	No	2
Korea	No	No	Yes	Yes	2
Luxembourg	Yes	Yes	Yes	Yes	3
Netherlands	Yes	Yes	Yes	No	2
New Zealand	No	Yes	Yes	No	2
Norway	Yes	Yes	Yes	No	2
Portugal	No	Yes	Yes	Yes	3
Slovak Republic	Yes	Yes	Yes	No	2
Spain	Yes	Yes	Yes	Yes	3
Sweden	Yes	Yes	Yes	No	2
Switzerland	Yes	Yes	Yes	Yes	3
Turkey	No	Yes	Yes	Yes	3
United Kingdom	No	No	Yes	No	1
United States	No	No	Yes	No	1

Sources: OECD and Authors' calculations.

Notes: Yes corresponds to a desirable property of rationale estimates (e.g. mean zero revisions, initial estimates should have weaker correlations with revisions than final estimates and initial estimates have lower variance than final estimates). For the purposes of scoring the number of desirable properties each countries' estimates exhibit, the modified T-statistic is used, rather than the standard measure. In each case, 5 per cent significance levels are used.

Table 4: Countries Meeting Criteria for Rational Initial Estimates

Number of conditions met	*Number of countries*
0	0
1	3
2	15
3	9

Sources: OECD and Authors' calculations

Table 5: The Relationship between the Initial Current Account Estimate and Subsequent Revisions

	(1) Full sample	*(2) Full sample*	*(3) Restricted sample*	*(4) Restricted sample*
Initial balance	–0.02	–0.10**	–0.02	–0.15**
	(–1.3)	(-4.8)	(–1.26)	(–4.96)
Constant	–0.09		–0.10	
	(–1.1)		(–0.85)	
R^2	0.00	0.19	0.00	0.26
Observations	473	473	268	268
Country fixed effects	No	Yes (27)	No	Yes (26)

Sources: OECD and Authors' calculations.
Notes: The dependent variable is the revision (final – initial) to the current account as a percentage of GDP. T-statistics reported in brackets. ** denotes significance at the 1 per cent level. The restricted sample in (3) and (4) refers to cases where the initial estimate of the current account was a surplus or deficit greater than 3 per cent of GDP. As France did not have an initial estimate of a current account surplus or deficit in excess of 3 per cent in the 1998-2016 period, it is not included in the restricted analysis (hence only 26 countries are included in Columns 3 and 4).

As the focus of this paper is on the current account as a signal of imbalances in the economy, this analysis is repeated for a sample restricted to instances where the initial estimate of the current account balance was a deficit or surplus greater than 3 per cent of GDP. When the analysis is restricted to cases with large current account imbalances, we get similar findings. When fixed effects are excluded (Column 3), there is no significant correlation between the initial current account estimate and the subsequent revision. When fixed effects are included (Column 4) a stronger negative correlation is found, compared to the full sample. In instances where there is a large (greater than 3 per cent) current account balance, 15 per cent of this is revised away. So for example, an initial estimate of a deficit of 4 per cent would be revised by 0.6 per cent down to a final estimate of 3.4 per cent.

Another simple test applied to the initial and final estimates of the current account is how consistent they are in providing warnings of imbalance. Here, we examine how often each series (the initial and the final) breaches the thresholds for the macro imbalance procedure (+6 per cent or –4 per cent of GDP).[11] Using the initial estimates of the current account, there are 92 instances of current account surpluses in excess of 6 per cent or of deficits greater than 4 per cent. Using the final estimates, there are 107 such cases. There are 24 cases where initial estimates would not have breached these thresholds, but where final estimates would have. In the opposite direction, there are nine cases where initial estimates would suggest a breach but the final estimates do not. In 72 per cent of cases where one of the series (the real-time or revised series) suggest that the imbalance thresholds are breached, the other series gives the same signal.

The final tests performed relate to the trajectory of the current account. We examine the changes to the current account balance using the revised data and real-time vintages of data. We test to see if there are significant differences in the changes to the current account implied by the real-time and revised estimates. One-year, two-year and three-year changes in the current account are examined.

Looking at the full sample of data, the differences between the changes implied by the revised and real-time vintages of the data are not statistically significant. This is found when looking at a one-year, two-year or three-year change. This is also robust to using absolute values of the changes (as reported) or not. These results are shown in Column (1) of Table 6.

The next stage of the analysis examines instances where there have been significant changes (improvements or deteriorations) in the current account balance.[12] Column (2) examines cases where significant improvements or deteriorations have taken place. Taking the absolute values of these changes, we find that initial and real-time estimates are significantly different. Looking over a one, two- or three-year time horizon, we find that final estimates of the current account imply larger changes than those from the real-time data. These differences are significant at a 1 per cent significance level in each case.

In the final part of this analysis, we examine if this result is driven by instances where the current account has improved significantly or when it has deteriorated significantly. These results are shown in Columns (3) and (4) respectively. We can see that both in cases, we find that final estimates of the current account imply larger (absolute) changes than those implied by the real-time data. In short, the result in Column (2) is driven both by instances where the current account balance has improved (Column 3) and deteriorated (Column 4) significantly. Finally, we can examine if these differences are economically significant, as well as statistically

[11] When formally applied, the macro imbalance procedure takes a three-year average of the current account balance. For simplicity here, we just use the annual levels of the current account balance.

[12] Here we define a significant change as one of greater than one per cent per year i.e. 1 per cent for the one-year change, 2 per cent for the two-year change etc.

significant. Looking at the results in Columns (2), (3) and (4), the average differences between the real-time and revised estimates are generally between 0.5 and 1.25 percentage points of GDP, which could be very significant in assessing imbalances in the economy.

Table 6: Testing the Trajectory of Vintages

	(1) Full sample	*(2) Significant changes*	*(3) Significant improvement*	*(4) T-Stat significant deterioration*
1-Year Mean	0.07	0.50	0.64	–0.76
P-Value	(0.32)	(0.00)	(0.00)	(0.00)
N	445	217	112	105
2-Year Mean	0.06	0.65	0.63	–1.25
P-Value	(0.50)	(0.00)	(0.01)	(0.00)
N	417	156	86	70
3-Year Mean	0.05	0.63	0.36	–1.24
P-Value	(0.62)	(0.02)	(0.12)	(0.02)
N	389	125	72	53

Sources: OECD and Authors' calculations.
Notes: The variable being used in Columns (1) and (2) is absolute value of final change – absolute value of initial change. This means that a positive value implies that the revised version shows a bigger change in the current account than the real-time vintage. The variable being tested in Columns (3) and (4) is final change – initial change. As the values in Column (4) are negative, a negative T-stat suggests the change in the initial estimates is smaller than that from the final estimates. Significant changes in the one-year analysis are defined as changes of 1 per cent of GDP or more in the current account, 2 per cent or more for the two-year change, and 3 per cent or more for the three-year change. P-values shown are modified P-values as described earlier. Results using standard P-values are qualitatively equivalent.

While the current account can be a useful indicator of dangerous imbalances in the economy, there is evidence to suggest that real-time estimates are prone to substantial revisions in some OECD countries. This undermines the effectiveness of real-time signals with respect to macroeconomic imbalances.

4.2 The Irish Current Account Balance

The Irish current account balance provides a useful case study of revisions to current account balances. Many economists have noted that unsustainable activity in the Irish economy in the lead up to the crisis was evident from the current account of the Balance of Payments. FitzGerald (2012) considers the recent crisis in the EU

through the lens of a current account crisis requiring large adjustments in Ireland and other EU countries after entering the crisis with substantial current account deficits.

However, Irish macroeconomic data are particularly prone to revisions. Casey and Smyth (2016) show that macroeconomic aggregates in Ireland are amongst the most heavily revised in the OECD. While large distortions are now present and make the headline current account a less useful indicator, these distortions were not as severe in the lead up to the last crisis. With this in mind, examining the real-time and revised data in the lead up to the crisis can provide an interesting case study.

Figure 3 shows the Irish current account balance as a percentage of GNP. The pink line labelled "Revised" uses the latest vintage of data (2018 Q3 Quarterly National Accounts) for both the current account of the Balance of Payments and for GNP. The red line shows what the current account looked like in each of these years in real time. This uses the initial estimate of the current account balance and GNP. For example, the data used for 2000 are those that would have been published with the 2000 Q4 Quarterly National Accounts (published in April 2001). Naturally, the data are revised later on as more data sources become available to the statistical agency.

Given the earlier findings that more open economies tend to have larger revisions to the current account (Figure 1), one would expect relatively large revisions to the Irish current account. Looking at the period 1999-2016, the average absolute revision was 2.9 per cent of GNP, more than double the average in the OECD.[13]

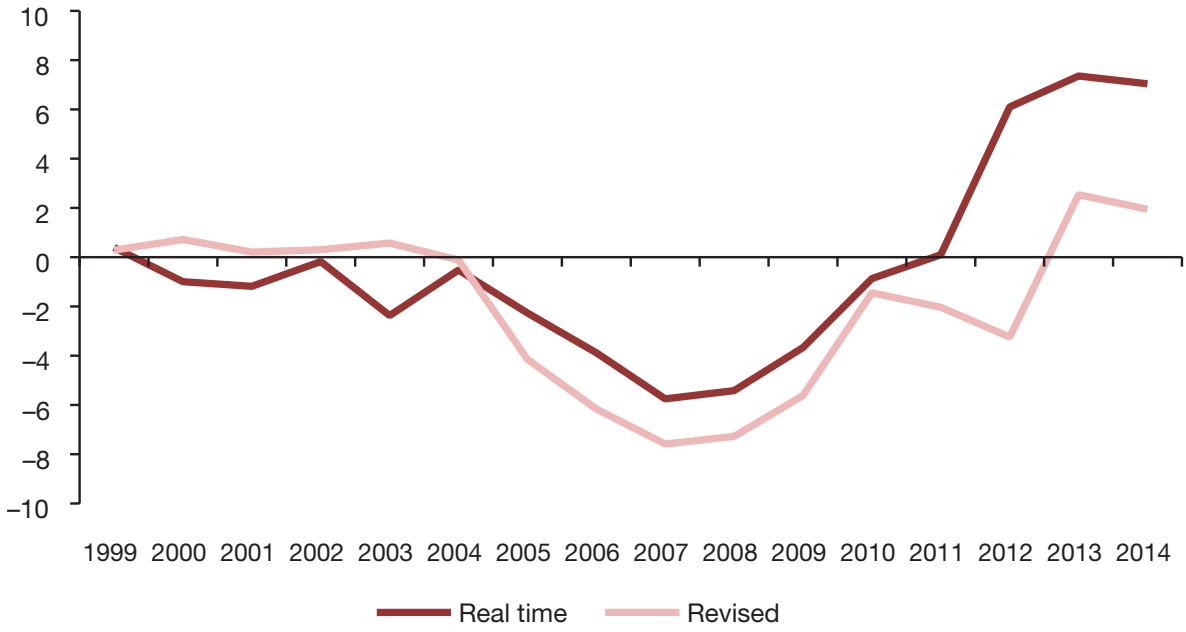
Recent developments regarding the imports of intellectual property, redomiciled plcs and aircraft leasing activities mean the headline balance is not currently useful for examining the true external balance of the Irish economy. While there have been distortions to the Irish current account due to activities of foreign owned multinational firms previously, the extent of the distortions has been far greater in the last number of years. This has resulted in much larger revisions to the current account occurring since 2012. The average absolute revision in the period 2012-2016 has been 6.6 percentage points of GNP.

With this in mind, much of the analysis focuses on the data up until 2011. As most of the analysis that follows focuses on the crisis/pre-crisis years, this does not have a significant impact.

Looking first at the revised data (in line with 2018 Q3 Quarterly National Accounts), a clear picture emerges. From 1999 to 2004, the current account is broadly in balance with small surpluses in most years. Thereafter, there is a sharp deterioration in 2005, 2006 and 2007 leading to a deficit of almost 8 per cent of GNP. Both the significant deficit and the sharp deterioration over a three-year period

[13] Revisions to the current account have been much larger in recent years. From 1999-2011, for example, the average absolute revision was 1.5 per cent of GNP.

Figure 3: Current Account of the Balance of Payments Percentage of GNP (Real-Time and Revised)



Sources: CSO and Authors' calculations.
Notes: Real-time data relate to the estimate of the current account and GNP in the National Income and Expenditure Accounts. Values for 2015 and beyond are excluded here due to the larger distortions present in the data for those years.

would give cause for concern. Using the revised data, the sharp deterioration in 2005 and 2006, as well as the substantial deficits recorded in those years, would give a warning of potential dangers before the crisis took hold in 2007/2008.

Looking at the real-time data, the picture is not quite so clear. In the period 1999-2004, the current account varied from balance to relatively minor deficits (the largest being 2.3 per cent in 2003). In 2004 a small deficit of 0.5 per cent of GNP was recorded. The following years did see a gradual deterioration occur, with the deficit widening by less than 2 per cent each year. Using the real-time data, the largest current account deficit recorded was in 2007 (5.8 per cent). While this is large, it is significantly smaller than using the revised data (7.6 per cent). In terms of warning signals of an impending crisis, 2006 could be considered as an illustrative cut-off for considering warning data.

Table 7 compares the real-time and revised data in the lead up to the crisis. If one looks at the revised data, we can see that the current account went from being broadly balanced in 2004 to a significant deficit in 2005 (over 4 per cent of GNP). The current account continued to deteriorate in 2006, reaching a deficit of more than 6 per cent of GNP. Looking at this data series, it would seem that the rapid deterioration in 2005/2006 would give cause for alarm and would suggest potential imbalances in the economy might have been considered prior to 2007.

Table 7: Changes in the Current Account Real-time and Revised Data (% GNP)

	Current Account Balance		*Annual Change in Current Account Balance*		
	Revised	*Real-time*	*Revised*	*Real-time[1]*	*Real-time[2]*
2004	–0.1	–0.5	–0.7	1.8	1.1
2005	–4.1	–2.3	–4.0	–1.7	–1.3
2006	–6.2	–3.9	–2.0	–1.6	–0.8
2007	–7.6	–5.8	–1.4	–1.9	–1.0
2008	–7.3	–5.4	0.3	0.3	1.0

Sources: CSO and Authors' calculations.
Notes: Rounding can affect totals. Red cells indicate values beyond the Macroeconomic Imbalance Procedure thresholds (above +6 per cent or below –4 per cent, albeit these refer to percentage of GDP rather than GNP, and are taken as three-year averages when formally applied). Real-time[1] refers to taking the change between each real-time estimate (e.g. the March 2006 estimate of 2005 and the March 2007 estimate of 2006). Real-time[2] refers to taking the change at each point in time (e.g. using the March 2007 estimate of 2005 and 2006 to calculate the change between 2005 and 2006).

Using the real-time series, a somewhat different picture emerges. In 2004 the current account is broadly balanced (deficit of 0.5 per cent of GNP) as is the case in the revised data. By contrast however, the real-time data show a slower, more gradual deterioration in the current account. In 2006, the real-time data show a deficit of less than 4 per cent of GNP.

Looking at the rates of change is also informative. There are two ways this can be done using the real-time data. Firstly, one can take the first estimate of each year to construct changes from year to year. For example, one would use the March 2006 estimate of 2005 and the March 2007 estimate of 2006 to calculate the change from 2005 to 2006. Alternatively, one can use the estimates of the current and previous years at a given point in time. In this case, one would use the March 2007 estimate of 2005 and 2006 to calculate the change from 2005 to 2006. Using either methodology, the current account is deteriorating at a much slower rate using the real-time data compared to the revised data.

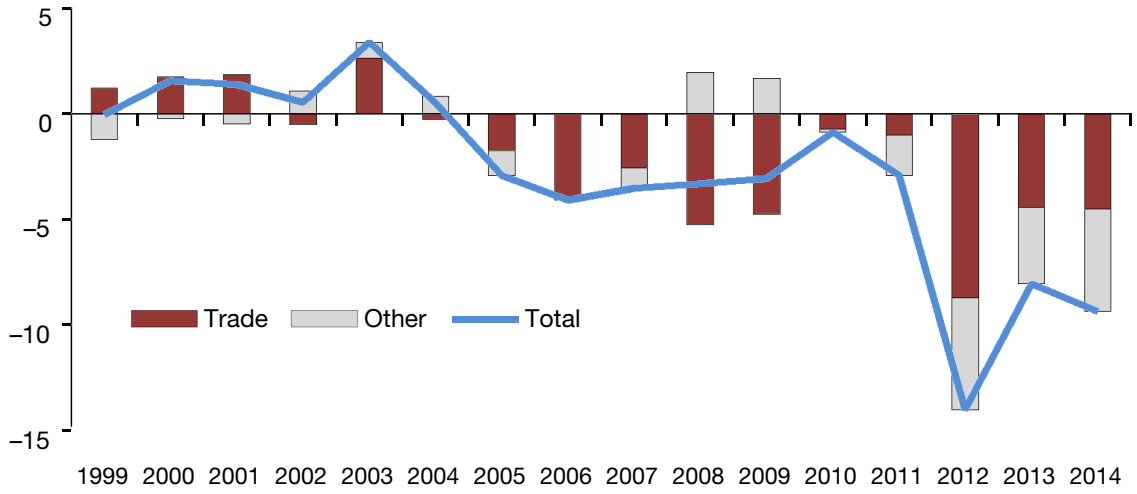
So while the revised data may point towards significant imbalances, the real-time data would have given less obvious signals towards imbalances in the economy. Looking both at the levels and the rates of change, the real-time data would have given a weaker warning signal at the time than the revised data would suggest now. The Macroeconomic Imbalance Procedure of the European Commission sets out thresholds for imbalances for various indicators which may signal potential imbalances in the economy. For the current account, an upper

threshold of +6 per cent of GDP and a lower threshold of –4 per cent of GDP are set out.[14]

This example of the current account being revised further away from balance is in contrast to the finding from the OECD data, that revisions tend to bring the final current account closer to balance (Table 5). However, it is consistent with the earlier finding that significant changes in the current account (over a one-, two- or three-year horizon) tend to be larger in the revised data than the real-time estimates (see Table 6).

Given the importance of revisions to data seen above, Figure 4 shows the breakdown of the elements of the current account which were revised over the period 1999-2014.[15] For the purposes of clarity this is broken down into those due to revisions to net trade (exports less imports) and other items (primary income, secondary income and current transfers).

Figure 4: Current Account Revisions
€ Billion, Net trade (Exports – Imports) and Other



Sources: CSO and Authors' calculations.
Note: The revisions to the Irish current account are broken into net trade (exports minus imports), and other (mainly transfers and primary/secondary income).

As described above, there were significant revisions to the current account balance in the period 2005/2006/2007, with the latest vintage showing a larger current account deficit (revisions of between €2.9 billion and €4.1 billion). From Figure 4, it is clear that these revisions were mainly driven by net trade (shown in the red bars above). Within net trade, both imports and exports have been revised up since the initial estimates, but imports have been revised up to a greater degree, hence contributing to a larger current account deficit.

[14] See https://ec.europa.eu/info/sites/info/files/file_import/ip039_en_2.pdf#page=42 for details.
[15] Values for 2015 and beyond are excluded here due to the larger distortions present in the data for those years.

A deteriorating current account may signal that the economy is becoming less competitive and is becoming imbalanced. It may also signal that the growth in the economy is becoming disproportionately domestic oriented. With this in mind, we might consider deterioration in the current account driven by the trade balance to be more worrying than if it were driven by (primary and secondary) income or transfers. With this mind, the revisions to the current account in 2005/2006/2007 are particularly significant as the revision is mainly driven by the trade side.

The tests performed on the OECD data (to determine if the initial estimates are rational estimates) are also performed on the Irish data, with results reported in Table 8. These tests are performed on two different sample periods. In the first set of tests, all data are utilised (1999-2016). Due to some of the distortions described earlier, a separate analysis is performed excluding the data from 2012 onwards. With this in mind, the same tests are performed separately for the period 1999-2011.

From Table 8, we can see that revisions are significantly different from zero in 12 OECD countries when using the standard test statistic. When using the modified test statistic, this drops to six countries. Looking at the Irish estimates, if examining the full sample, revisions are significantly different from zero.[16] A different picture emerges when looking at the data up until 2012, with the mean revision not significantly different from zero.

Another desirable property of revisions is that the initial estimate should have a lower variance than the final estimate. Just under half of OECD countries examined exhibit this desirable characteristic. Looking at the Irish data up until 2012, the variance of initial estimates is indeed lower than that of the final estimates. Conversely, using the full sample, the initial estimates of the Irish current account show a higher variance than the final estimates.

All OECD countries examined have weaker correlations between initial estimates and revisions than between final estimates and revisions. This also holds when looking at the Irish data for the whole sample or the restricted sample.

Finally, as outlined earlier, the Mincer-Zarnowitz test assumes that a rational estimate is one where subsequent revisions cannot be predicted by information available at the time of the initial estimate. The test is based on the regression:

$$(l_t - p_t) = \alpha + \beta p_t + \mu_t$$

… where the revision is equal to a constant α plus a coefficient β times the preliminary estimate plus an error term μ. The test checks to see whether the revision can be forecast using the preliminary estimate. If so, the initial estimate is considered to be an irrational one. Rationality is examined under the joint hypothesis:

[16] At a 10 per cent significance level when using the modified test statistic.

$$H_0: \ \alpha = \beta = 0$$

When using the pooled OECD data, we cannot reject the null hypothesis that $\alpha = \beta = 0$, hence concluding that estimates are mean zero and efficient.[17] However, when this analysis is repeated on a country-by-country basis, in 16 cases the null hypothesis is rejected.

In 12 cases we find that the β coefficient is significantly different from zero. The majority of these cases (nine) are with a negative coefficient, the remaining three are with a positive coefficient. This would suggest that for nine countries, revisions tend to bring the final estimate of the current account closer to balance when compared with the initial estimate.

For the full sample of Irish data, the null hypothesis of the Mincer-Zarnowitz test is strongly rejected, which is to be expected given that we find revisions to be significantly different from zero on average. For the restricted sample we cannot reject the null hypothesis that $\alpha = \beta = 0$, hence concluding that estimates are mean zero and efficient.

Using the full sample of Irish data, the β coefficient is negative and statistically significant, indicating that initial estimates tend to be revised back towards balance. When using the restricted sample, the β coefficient is not significantly different from zero.

In conclusion, we find contrasting evidence on the properties of the initial estimates of the current account in Ireland depending on the sample period chosen. Using the full sample of data, we find that revisions are not mean zero and that the variance of initial estimates is higher than that of final estimates. In contrast, when data up until 2012 are examined, Irish estimates exhibit the characteristics of rational estimates.

Even apart from the impact on revisions, distortions to the current account also limit its usefulness in Ireland. Recent developments regarding the imports of intellectual property, redomiciled plcs and aircraft leasing activities mean the headline balance is not currently useful for examining the true external balance of the Irish economy. While it is possible to come up with adjusted measures of the current account balance (see Coffey, 2017, for example), these are not always available in a timely fashion. In addition, new distortions could be introduced in any new release, which can take time to understand and correct for by constructing a new underlying measure of the current account.

[17] However, we find that when specified with country dummies instead of the constant, the coefficient on the initial estimate is negative and significant, implying that revisions tend to bring the balance back towards zero.

Table 8: Testing Properties of Revisions to the Current Account

	OECD (1998-2016)	*Ireland (1998-2016)*	*Ireland (1998-2011)*
Mean	–0.14	–2.05	–0.44
T statistic	–1.75	–2.28	–0.91
P-Value	0.08	0.04	0.38
Countries with P-Value < 0.05	12 (of 27)		
Modified T-statistic	–1.22	–1.84	–0.49
Modified P-Value	0.23	0.08	0.64
Countries with modified P-Value < 0.05	6 (of 27)		
Variance			
Variance (Initial)	35.2	16.6	3.91
Variance (Final)	36.5	12.6	9.56
Countries where Initial < Final	12 (of 27)		
Correlations (with revisions)			
Initial	–0.08	–8.8	1.45
Final	0.21	4.9	4.2
Countries where Initial < Final	27 (of 27)		
Mincer-Zarnowitz			
β	–0.02	–0.53	0.37
T statistic	–1.3	–2.89	1.63
F-stat	1.65	7.9	1.81
P(F-stat)	0.19	0.004	0.21
Countries with P-Value < 0.05	16 (of 27)		
N	473	18	13

Sources: OECD, CSO and Authors' calculations.

V CONCLUSIONS

The current account of the Balance of Payments is one of a number of indicators of potential imbalance within the economy. Given that this is the case, it is important to examine the properties of the real-time estimates of the current account as well as the final vintage, which incorporate revisions. Looking at the revisions to the current account balance in OECD countries, many countries exhibit most of the signs of rational initial estimates. We find that approximately half of countries have revisions which are mean zero and a similar proportion show initial estimates with a lower variance than final estimates, which is a desirable property. All countries examined have weaker correlations between revisions and initial estimates than revisions with final estimates.

However, some undesirable properties are also exhibited. The average absolute revisions across the OECD are typically quite large (over 1 per cent of GDP).

Importantly from an imbalances point of view, revisions could mean that an initially insignificant deficit is revised to a larger deficit, which could raise concerns around economic imbalance (or vice versa). We also find that revisions to the current account on average tend to be larger (in absolute terms) in more open economies. In addition, the revisions in some countries appear to be somewhat predictable. In most of these cases, we find that revisions tend to bring estimates back towards balance, though in some countries revisions typically lead to wider deficits/ surpluses emerging. Looking at the trajectory of the current account, we see that when large changes to the current account balance occur, they tend to be larger in the revised vintages of data, compared to the real-time estimates.

Looking at the Irish data, the average absolute revision to the current account is more than twice as large as the OECD average (mainly driven by large revisions and distortions in recent years). In the lead up to the recent crisis, there were significant revisions to the current account. The revised estimates suggest a substantial current account deficit (in level terms) preceding the crisis which was growing rapidly. This would give a clear signal of imbalances building up in the economy. The real-time data showed a different picture, with smaller deficits and a more modest year-to-year deterioration. While this may have given some indication of economic imbalances building up, it would have been a much weaker signal than the revised data would now imply.

These large revisions were driven by the trade side, with imports revised up significantly. Again, this may have signalled the declining competitiveness of the Irish economy and the domestic demand focus of growth.

Significant distortions to the current account make the headline balance of limited value for monitoring economic imbalances in Ireland. While adjustments can be made to the current account to get a more meaningful measure this is not timely, and there is a possibility of a new set of distortions to be corrected for in each release. A combination of present distortions to the current account and large revisions to initial estimates make the current account a less useful signal of imbalances in the Irish economy.

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