

## The 'Rule of Four'

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### Introduction<sup>2</sup>

Recently we have found ourselves, like so many people, preoccupied by deficits and debt. This is a difficult subject, both to understand and about which to write simply and clearly.

Moreover we have found that, perhaps because it is so complicated a matter, many policymakers failed to appreciate how serious a situation they would find themselves in were economic growth suddenly to slow, public sector deficits sharply to increase, or the state become obliged to take chunks of private debt on to the public books. The costs of that unawareness are evident today, and will be measured as having been, over a run of years, in the tens of percentage points of GDP.

This raises the question whether some simple 'rule of thumb' could warn of impending trouble. And this thought led us to remember such a rule, that one of us (Qvigstad) first espoused many years ago: that, at least where budget deficits and current account deficits are concerned, there is for most OECD economies a magic number: 'Four'.

The Qvigstad 'Rule of Four' states that:

"OECD economies are generally heading for trouble if either the public sector or the current account of the balance of payments is in sustained deficit of more than four per cent of GDP". (The so-called 'single-deficit' condition.)

A stronger version is that:

"Economies face double jeopardy when fiscal and current account deficits both exceed four per cent of GDP for a sustained period." (The so-called 'twin-deficit' condition.)

Like all rules of thumb, the 'Rule of Four' has to be employed with caution. For example, while it applies to economies with moderate rates of economic growth, such as those of most OECD economies, it cannot be applied uncritically to ultra-fast-growth economies or, for that matter, to ultra-slow-growing economies. Rules of thumb are generally most useful in a first screening of the data: there is ultimately no substitute for a full-blown analysis.

Nevertheless the fact is that, simple though it is, the 'Rule of Four' would have warned, over the years in the run-up to the 2008 crisis, that trouble lay ahead for a number of economies:

- The twin-deficit version of the rule would have flagged Greece and Hungary every year from 2001 through to 2007, Portugal in several of those years, and Ireland in 2008.
- The single-deficit rule would have flagged in addition Iceland and Spain.<sup>3</sup>

Had policymakers been sensitised to this simple rule, and had they thereby felt impelled to take policy action to bring their deficits back down into line with the Rule of Four, they

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<sup>2</sup> Helpful comments on an earlier draft were given by James Hirst.

<sup>3</sup> Highly-indebted Belgium, Italy, and Japan would have been picked up as far back as the 1970s.

would have thereby equipped their economies better to withstand the 2008 shock, and be in less trouble today.

While the twin-deficit version of the rule would not have systematically flagged any other OECD country, it would have flagged the United States in 2003 and 2004. And the single-deficit flag has been waving every year since 2002. These warnings have been prescient: US public debt is now in excess of 100% of GDP. So far at least, neither markets nor policymakers have reacted as they have done elsewhere. Perhaps owning the world's principal reserve currency confers a unique and perpetual privilege: or perhaps not. Only time will tell.

In the years up to 2008, the single-deficit version would have also have flagged a further six OECD economies – Australia, Estonia, New Zealand Poland, Slovakia, and Turkey – and it continues to flag the latter four. In these cases, the 'Rule of Four' is flagging potential problems: indeed recently (2010) Poland became a twin-deficit economy, and its public debt rose above 60% of GDP. Thus the 'Rule of Four' would have served quite well, in the run-up to the 2008 crisis; and it also seems to be performing usefully thereafter.

Accordingly, it would seem worthwhile to examine:

- The basic analytics that lie behind the rule; and
- The rule itself in more detail.

## Untenable levels of debt

It might be thought that, at the level of the economy as a whole, any level of aggregate debt would be tenable, given that every component of the aggregate debt is matched by a corresponding credit: one person's liability is another person's asset. In practice, however, the higher is the level of aggregate debt, the greater is the likely number of individual debts that are large relative to debtors' incomes. Hence the greater is total debt, the greater the likely number of defaults.

Markets therefore become understandably uncomfortable when total debt becomes, or moves to becoming, in some sense 'too high'. Governments, for their part, become concerned about debt for a number of reasons. They are concerned by:

- **Private sector debt** because of the risk of knock-on effects of defaults on the financial system, which often oblige them to take chunks of this debt on to the public books;
- **Public debt** because of the increasing cost of servicing it, all the more when interest rates rise; and
- **The two together** because it is so difficult to reduce both simultaneously, unless the current account offsets, through strong growth of net exports.

To illuminate the government's problem, it is appropriate to consider the dynamics of public sector debt.

## The dynamics of public sector debt

The evolution of the public debt, in relation to GDP, is a function of three components:

1. **The primary balance** – the government budget before payment of debt interest;
2. **The snowball** – the difference between the (nominal) effective interest rate on public debt and the (nominal) growth rate of the economy – scaled by the outstanding stock of debt; and

3. **The stock-flow adjustment** – a catch-all term which includes, *inter alia*, realised losses/gains from intervention in the banking sector and valuation effects (especially important when debt is denominated in a foreign currency). These effects are highly uncertain *ex-ante*, but can be quantitatively important *ex-post*.

It is generally the snowball term that drives debt dynamics: and in the case of economies with high public debt it can quickly become a killer. This can be seen from the algebra of public-debt dynamics. The snowball term is circled.

The change in the public-debt/GDP ratio from one period to the next can be written as:

$$\Delta(D_t/Y_t) = - (PB_t/Y_t) + \left[ (D_{t-1}/Y_{t-1}) * (i_t - g_t) / (1 + g_t) \right] + (SF_t/Y_t)$$

Primary balance
Snowball
Stock-flow adjustment

Where:

D is the outstanding debt;

Y is nominal GDP;

g is the growth rate of nominal GDP;

PB is the primary balance;

SF is the stock-flow adjustment;

i is the implicit interest rate on the outstanding debt; and

t represents the time period.

The necessary condition for the debt/GDP ratio to remain constant can be seen by setting the left-hand side of the equation equal to zero: the snowball term and the primary balance term need to offset one another.<sup>4</sup>

There are three key scenarios, which depend on the sign of the interest rate-growth rate differential (i-g):

- **If the growth rate equals the interest rate**, (as tends to be the case over the long term), the snowball term disappears: the economy can maintain a stable public-debt ratio if it is in primary balance.
- **If the growth rate exceeds the interest rate**, the snowball works in the economy's favour: the economy can maintain a stable public-debt ratio provided that its primary deficit does not exceed a certain size.
- **If however the interest rate exceeds the growth rate**, the snowball works the other way: the debt ratio can remain stable only if the economy runs a primary surplus of requisite size.<sup>5</sup>

The third scenario can readily become a disaster scenario if: debt is already high; the interest rate considerably exceeds the growth rate; and the primary balance is in large deficit. In this situation the debt/GDP ratio can climb by double-digit percentage points in just a few years.

For example, in Greece, as a result of debt dynamics wrecking their devilish work, the debt/GDP ratio increased from an already high 115% in 2007, to around 165% in 2011. Moreover, unless further debt relief is offered, the figure will remain well above 120% for the foreseeable future.

<sup>4</sup> Assuming, as is usually assumed in such cases, that the value of the stock-flow adjustment term is zero.

<sup>5</sup> Particularly troubling is the property that, because the value of the snowball term is also a function of (i.e. is scaled by) the value of the debt/GDP ratio, 'debt begets debt': the larger is the (preceding period's) debt/GDP ratio, the larger the following period's debt/GDP ratio. The scaling effect becomes more serious still when the debt/GDP ratio rises above 100%.

Knowing all this, investors observing a high and rising debt ratio – i.e. a high public-debt ratio in combination with a large fiscal deficit – at some point begin to demand an increasing risk premium, i.e. they raise the rate of interest at which they are prepared to lend. And that is where disaster starts to set in. The average rate of interest on the outstanding stock of debt can soon start to exceed, or exceed further, the rate of economic growth: the economy is on its way to a public-debt explosion.

Matters then deteriorate rapidly. To check this snowballing rise in the country's public-debt/GDP ratio, the primary balance has to be increased. But the tightening of fiscal policy that this requires in turn slows the economy's growth – indeed GDP may well decline – and this further widens the gap between the rate of interest and the economy's growth rate. Debt dynamics thus rapidly take the situation from bad to worse. The situation ultimately, and quickly, becomes untenable.

## Thresholds

It would be unwise – indeed probably impossible – to assert a general, precise, one-size-fits-all figure at which the fiscal situation becomes definitively unsustainable. Many factors, generally country-specific, influence the sustainability of an economy's fiscal position, including:

- The maturity structure of the public debt;
- The proportion of the public debt that is held domestically;
- The prospects for the balance of payments;
- The likely behaviour of the private sector; and
- The country's record of fiscal adjustment and the financial credibility of its present and/or likely future governments.

Nevertheless, various broad thresholds for sustainable government debt levels are suggested in the literature. Reinhart and Rogoff point to a debt threshold – around 90% of GDP – beyond which growth performance tends to drop off, thereby exacerbating the debt problem.

In an IMF Staff Note, Ostry et al. (2010) emphasise the limits that derive from a country's historical record of fiscal adjustment. Moderate increases in public debt typically elicit an increase in primary fiscal balances sufficient to sustain a stable debt level. However, beyond some threshold, reaction on the scale of previous historical responses may be insufficient, pointing to the risk of public debt being on an upward, and perhaps explosive, path.

The implication is that, given that conditions tend to become progressively more fragile as debt approaches such a threshold level, it is advisable to stay well below it.

With all this in mind, we opt for a public-debt threshold of 60% of GDP. This is close to the median level of debt in the advanced economies immediately prior to the 2008 crisis (IMF, 2010). It is also the level enshrined in the Maastricht criteria for the euro area economies. It is with reference to such a value that the 'Rule of Four' has most of its operational significance. Where debt is significantly in excess of 60%, the economy is arguably already in trouble: a more restrictive setting than implied by the 'Rule of Four' would *prima facie* seem warranted.

In terms of the public sector deficit, we opt for a threshold of 4%. The arithmetic of debt dynamics might suggest three, rather than four, as the crucial number. And indeed the Maastricht criterion is three. But it seems sensible, at least at a first cut, to leave a little leeway.

The stock of public debt and the budget balance are not, however, the only relevant factors to monitor when assessing fiscal soundness. High investment in certain sectors or sub-sectors can generate large tax receipts, and thereby improve the budget balance: but such expenditures have to be financed. Consequently, the counterpart of a sound budget balance may be a substantial current account deficit. Accordingly, the current account too warrants scrutiny. As with the fiscal threshold, we opt for a figure of 4%.

Today, in 2012, the world knows which economies have run into serious public-debt problems. The next section therefore considers whether, or to what extent, attention to the 'Rule of Four' – in respect of both the public sector and the current account of the balance of payments – would have raised appropriate warning flags.

## Would the 'Rule of Four' have revealed a crisis in the offing?

Data were examined<sup>6</sup> for the period 1970-2009, although with significant (unavoidable) variation between countries and variables.<sup>7</sup> For 28 OECD economies the data were taken from the *OECD Economic Outlook* database. The variables considered, expressed as a percentage of GDP, were:

- Government budget balances (B);
- Current account balances (CA); and
- General government gross financial liabilities (D).

The analysis was undertaken in three stages:

1. First, a 'misery index' was constructed from government budget balance, current account balance, and public debt data;
2. Second, an 'overall balance' figure was constructed by combining just the budget balance and the current account. Economies were filtered on the basis of this measure; and
3. Third, based on the index and the filtering procedure, various economies were singled out for closer inspection of their debt/balance profiles.

### Constructing a 'misery index'

The misery index was constructed from the values for all three variables B, CA, and D, as described above. Threshold levels, expressed as percentages of GDP, were taken to be:

- Budget balance: -4
- Current account balance: -4
- Gross public debt: 60

A set of binary indicators was constructed, values 1 or 0 being attributed according to whether or not the thresholds for each variable were exceeded. The indicator values were added together, so that the maximum possible value of the misery index in any one year was three. An increase in the index implies an increased budget deficit to above 4%, an increased current account deficit to above 4%, an increase in the debt level to above 60%, or any combination of these.

Time series of the 'misery index' were then constructed for each economy.<sup>8</sup> Differences in data availability between countries and variables were a limitation. A period of missing data

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<sup>6</sup> The analysis which follows draws on Berg, Qvigstad and Vonen (2011), available on the Norges Bank's website [www.norges-bank.no](http://www.norges-bank.no).

<sup>7</sup> Starting dates range from 1970 to 2002. Data series for budget balances and current account balances start between 1970 and 1995. These (unavoidable) variations between countries and variables pose potential challenges. A discussion of these issues is given in Berg, Qvigstad and Vonen (2011).

<sup>8</sup> Country-by-country charts of these indexes are available on request.

can suggest changes that are not real: an increasing index value could suggest a deterioration of fiscal conditions, but this could be due simply to the insertion of new data.

Ideally, missing data entries should be filled by data from other sources, and data from national sources were consulted where possible. However, this raises potential problems of comparison.

Notwithstanding these caveats, a rather clear picture emerged. In some economies, imbalances were building up over time, the value of the misery index moving progressively away from zero. The United States and Spain are two cases in point. The indexes of other economies, by contrast, followed such a path for a while, but thereafter fell, suggesting a more sound, or a less unsound, performance. Sweden and Denmark are two such economies.

Based on these rather stylised descriptions, the various economies were categorised as either 'sliders' or 'rebounders'. In the case of the so-called 'sliders', the 'misery index' tended to increase over time; whereas in the case of the 'rebounders' it tended ultimately to decrease. This being a somewhat coarse measure, it was not possible to classify all economies according to these two categories, and so some were labelled 'borderline'.

The real-world dynamics of debt are clearly more complex than can be represented by such a simple index. For example, a high budget deficit is more problematic when the level of debt is already high. Similarly, budget deficits combined with current account deficits, so-called 'twin deficits', are likely to be more severe than a deficit of a similar size in only one of the accounts.

Accordingly, various alternative indicators were constructed. In one version, a country was given extra points if both the budget balance (B) and the current account balance (CA) exceeded their respective thresholds, over and above the two points given in the basic index. In another version, extra points were assigned if the thresholds of both the budget balance (B) and the public debt (D) were exceeded. In yet another version, index points were assigned according to the size of deviations from thresholds.

However, these alternative indexes served only to confirm, or perhaps even strengthen, the picture given by the basic 'misery index'.

#### **An alternative, 'overall balance', index**

Economies were also examined by considering the so-called 'overall balance' (O)<sup>9</sup>: created by simply adding the budget balance (B) and the current account balance (CA). Thus an economy with a budget deficit of 1% and a current account deficit of 7% would have an overall deficit of 8%. The same would be true for an economy with deficits of 7% and 1% respectively, 4% and 4%, or any pair of values that totalled 8% or more.

**Filter 1.** To focus on countries running twin deficits, economies in which both the current account and the budget were in deficit by more than 4% of GDP were singled out. Then, in an attempt at sensitivity analysis, progressively larger threshold levels of 10%, 12%, and 16% were applied in order to differentiate further between economies.

In addition, a time dimension was added to the filter. Deficits sustained over several years are likely to be more problematic than one-year events. Twin deficits occurred fairly frequently in OECD economies between 1970 and 2009.<sup>10</sup> However, in only four cases were they sustained for four years or more: in Greece, Hungary, Ireland, and Slovakia. In Greece

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<sup>9</sup> Note that this variable is not in itself intrinsically meaningful: it has no particular interpretation.

<sup>10</sup> The full list includes Australia, Cyprus, Czech Republic, Spain, Finland, Greece, Hungary, Ireland, Iceland, Italy, Poland, Portugal, the US, and Slovakia.

and Hungary, twin deficits, giving rise to a sustained overall deficit of 10% or more occurred in the run-up to 2008.<sup>11</sup>

**Filter 2.** There could also be reason to examine cases with large deficits on only one of the accounts. Balance in one account may be combined with a large deficit in the other. Sensitivity analysis was therefore repeated, on the same time dimension as above, but this time including all countries with a sustained overall deficit above 8%, not just those running a sustained deficit of more than 4% on both accounts.

This inspection flags nine additional economies (in addition to the four twin-deficit economies above), including Iceland, Portugal, and the US in the years up to 2008.<sup>12</sup>

### Inspection of individual economies

Finally, to consider further the timing of deficits and also the stock of debt, a number of economies were inspected individually. The selected economies were grouped into the categories 'sliders', 'borderline', and 'rebonders':<sup>13</sup>

- **'Sliders'**. In general, the 'slider' economies – Greece,<sup>14</sup> Portugal,<sup>15</sup> Spain,<sup>16</sup> Iceland,<sup>17</sup> and the US<sup>18</sup> – had overall deficits for most of the period in question. Such deficits can lead quickly to a build-up of debt, are thereby generally not sustainable, and leave the economy less able to handle shocks.
- **'Borderline'** economies. Some of the economies examined – including Ireland,<sup>19</sup> Italy,<sup>20</sup> and the Slovak Republic<sup>21</sup> – are more difficult than others to classify. Nevertheless, these countries incline towards the notion of a 'slider'.
- **'Rebonders'**. The 'rebonders' – these include Belgium, Canada, Sweden, and Finland – have, at least for periods, run surpluses. In general, these countries typically showed smaller deficits and lower or falling levels of debt.

### Closing thoughts on the figure Four

Interestingly, although we would not wish to push the point too far, the figure four is suggestive of actual or potential problems in other areas too:

- An inflation rate of 4% or more over a run of years can be troublesome. While international investors will not necessarily punish a country with such a record, a market economy operates by relative prices functioning as price signals, and these tend to be obscured when inflation is high.
- Likewise, a structural unemployment rate of 4% over a run of years may indicate that the labour market is not functioning well. Resources are being wasted. Again,

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<sup>11</sup> Ireland and Slovakia were flagged in the past.

<sup>12</sup> The remaining six economies would not have been flagged in the years up to 2008. Australia, Belgium, Canada, Czech Republic, and Italy would have been flagged long ago, some as early as the 1970s.

<sup>13</sup> Time series charts for this subset of economies are available on request.

<sup>14</sup> The overall balance in Greece was in increasing deficit until 1985. This overall deficit became somewhat smaller, but from 1999 it underwent another trend deterioration.

<sup>15</sup> Portugal's overall deficits were substantial in the early 1980s, but reversed and then remained stable for some years, before deteriorating over the decade to 2008.

<sup>16</sup> Spain's overall balance was in fairly stable deficit throughout much of the period, but rose substantially in the run-up to 2008.

<sup>17</sup> Iceland's overall deficit was stable until 2002, but increased substantially thereafter: the overall deficit reached 32% in 2008.

<sup>18</sup> The overall balance of the US has been in deficit throughout, has shown a trend increase, and became substantial from 2002.

<sup>19</sup> Substantial overall deficits in Ireland in the years up to 1980 turned into surpluses in the 1990s. These declined progressively, and in 2007 started to move into large deficit.

<sup>20</sup> Developments in Italy's overall balance may suggest a "rebounder", the high deficits of the 1970s and 1980s being followed by a rebound to balance by 1997. Thereafter however, the balance went into increasing deficit.

<sup>21</sup> The Slovak republic's overall balance deteriorated sharply in the mid-1990s (note: prior data are not available) but this was followed by a gradual reduction in deficits.

this may not invoke concern on the part of international investors; but for policymakers it can be a good indication that structural reform is needed.

- Interestingly, a banking sector larger than four times GDP can also signal potential trouble. The lender of last resort-function is threatened. Saving the banks can be ruinous for the taxpayers, or for taxpayers in other countries if the country in question does not fulfil its international obligations.<sup>22</sup>

## Conclusions

The analysis summarised above suggests five broad conclusions:

1. Had the 'Rule of Four' been applied in the Western economies in the years before 2008, it would have warned of impending trouble. It is always tempting for policymakers to think that "*this time is different*" – but that is seldom so.
2. A basic 'misery index', constructed by simply adding binary scores derived from threshold values for the budget balance, the current account balance, and gross public debt, appears to serve as well as do more complex alternative constructs.
3. Like any such rule, the 'Rule of Four' has to be used with care. It is applicable neither to fast-growing economies, nor to economies whose growth is ultra-slow. A rule of thumb is no substitute for a full-blown analysis.
4. The rule identifies the US economy as having a configuration that, in other economies, correctly foreshadowed fiscal crisis.
5. Monitoring the 'Rule of Four' requires few data, and no sophisticated econometrics. More challenging is taking the implications of such information into account in policy, and translating it into fiscal action.■

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<sup>22</sup> See Berg et al (2001).



## References:

*Works that have informed this paper, and which have in many cases been explicitly cited, include:*

Abbas, S. M. A., J. Bouhga-Hagbe, A. J. Fatas., P. Mauro and R. Velloso (2010), *Fiscal Policy and the Current Account*. IMF Working Paper 10/121.

Alesina, A. and R. Perotti (1996), *Reducing budget deficits*. Swedish Economic Policy Review (3)

Barnes, S., J. Lawson and A. Radziwill (2010), *Current account imbalances in the euro area: A comparative perspective*. OECD Economics Department Working Paper No. 826

Berg, S. A., J. F. Qvigstad and N. Vonen (2011), *Two essays on the magic number 4*, Norges Bank Staff Memo 2/2011

Blanchard, O. (2007), *Current Account Deficits in Rich Countries*. IMF Staff Papers Vol. 54 (2)

Frisch, R. (1933), *Saving and circulation regulation*, in *Rivista di storia economica* 23 (2), 2007.

Giammarioli, N., C. Nickel, P. Rother and J.-P. Vidal (2007), *Assessing fiscal soundness. Theory and practice*. ECB Occasional Paper Series No 56.

Gjedrem, S. (2010), *Business cycles, crises and public finances – will governments be able to honour their debts?* Speech by the governor of Norges Bank, September 24th 2010.

Hagemann, R. (2010), *Improving fiscal performance through fiscal councils*. OECD Economics Department Working Papers No. 829

Hoel, M. and J. F. Qvigstad (1986), *Statsgjelden - et problem når veksten er lav og renten er høy?* *Sosialøkonomen* (in Norwegian only)

IMF (2010), *Navigating the fiscal challenges ahead*. Fiscal Monitor May 2010

Larsen, U. and B. Støholen (2010), *Public finances – the difficult path back to sustainable levels*. Economic commentaries (2), Norges Bank.

Midthjell, N.L. (2010), *Fiscal policy and financial crises – what are the actual effects of fiscal policy?* Economic Bulletin 2011. Norges Bank

Nickel, C. and I. Vansteenkiste (2008), *Fiscal policies, the current account and Ricardian equivalence*. ECB Working Paper Series No. 935

Ostry, J.D., A.R. Ghosh, J.I. Kim and M.S. Qureshi (2010), *Fiscal space*. IMF Staff Position Note No 2010/1

Reinhart, C. M. and K. S. Rogoff (2009), *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press

Reinhart, C. M. and K. S. Rogoff (2010), *Growth in a Time of Debt*, American Economic Review