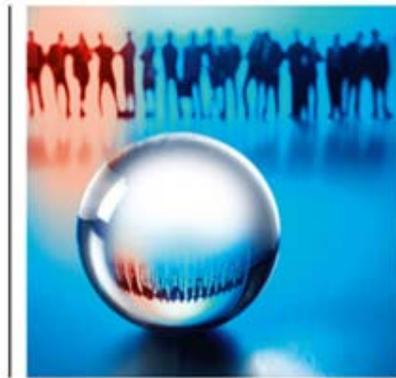


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Incurred Claims Assessment: A Private Health Insurance Study

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Incurred Claims Assessment: A Private Health Insurance Study

by David W. McSweeney

Abstract

Management needs to have a clear picture of how net profit is progressing from period to period. This can only be achieved if management is provided with an accurate appraisal of the claims incurred in each period; this will lead to profit being correctly allocated to the period in which it is earned.

The common accounting approach is to determine incurred claims as the claims paid during the period plus the change in the Outstanding Claims Provision during the period. This amount is then recorded as the incurred claims for the period and is not subject to future revision. Sometimes this change in the Outstanding Claims Provision is not calculated correctly; it is sometimes calculated (wrongly) as the difference between the estimate of the Outstanding Claims Provision at the beginning of the period which is made at the beginning of the period and the estimate of the Outstanding Claims Provision at the end of the period which is made at the end of the period. However, the reality is that the Outstanding Claims Provision at any point in time is an estimate that can continue to be recalculated with the benefit of subsequent claim payment data. For example, with the benefit of three months delay, the Outstanding Claims provision at both the start and end of any prior period can be recalculated to produce a revised Incurred Claims estimate for the period. This continual updating of the incurred claims estimate for a period provides a more useful data source for claims trend analysis compared to the accounting claims data.

In this paper, we analyse the relationship between incurred claims and outstanding claims estimates, and we discuss:

The magnitude of the differences which can arise between these two approaches to determining incurred claims.

How revising the estimate of incurred claims results in revising the timing of earnings.

How revising the reported timing of earnings can affect the Financial Condition Report and the Rate Rise Submission.

Key Words: Outstanding Claims; Estimated Incurred Claims

1. The Problem

The insurer's accounting department may "lock-in" the outstanding claim provisions at the values which were calculated at the corresponding month-ends, and not update these outstanding claim provisions, and the incurred claim estimates derived using them, as better estimates become available as more complete claims history becomes available.

This may result in an incorrect allocation of underwriting profit between periods. Also, the accounting department may confuse the OSC provision with the total month-end provision.

1.1 An Example: Product Profitability

The actuary might analyse the profit (or loss) made by each of a Private Health Insurer's products for the financial year using several months of run-out. For example, the analysis might be of the profit earned by each product during the year 1st July 2011 to 30th June 2012 using claims paid through 30th September 2012. The sum of these profits and losses should equal the insurer's underwriting profit for that financial year. However this sum may not agree with the figure which the insurer's accounting department has booked as the underwriting profit for that financial year, and management might ask the actuary to explain the discrepancy. It is likely that the figure the accounting department has booked for claims incurred in the period will not agree with the total of the claims in the actuary's analysis.

2. Some Notation

It will help the clarity of the discussion to establish some notation.

$X\#OSC(s@t)$ means the estimate of the outstanding claims for product or component X at time s estimated using claims paid through time t ("component" will normally be Hospital, Medical, Ancillary, or Total). For example, $H\#OSC(30/6/2012@30/9/2012)$ means the estimate of the outstanding hospital claims at 30th June 2012 estimated using claims paid through 30th September 2012.

$X\#Inc((r,s)@t)$ means the estimate of the claims incurred between time r and time s for product or component X, estimated using claims paid through time t.

$X\#Paid(r,s)$ means the claims paid between time r and time s for product or component X.

3. The Relationship between the OSC Estimate and the Incurred Claims Estimate

Consider your credit card. At time s the balance you owe will be the amount you owed at prior time r, plus any charges made between time r and time s, less any payments made between time r and time s:

$$\text{owe}(s) = \text{owe}(r) + \text{charges}(r,s) - \text{paid}(r,s) \tag{1}$$

The corresponding relationship for insurance claims is

$$OSC(s@t) = OSC(r@t) + Inc((r,s)@t) - Paid(r,s)$$

which can be written

$$Inc((r,s)@t) = Paid(r,s) + OSC(s@t) - OSC(r@t) \tag{2}$$

Note that in equation (1) all four of the terms can be known exactly, whereas in equation (2) only the term Paid(r,s) is known exactly, and the other three terms are estimates, which will change as t changes. Normally these three estimates will become closer to their true value as t increases. For hospital claims (in Australia) H#OSC((r,s)@t) will normally be very close to its true value if $t > s+12$ (units in months). The appendix provides a demonstration of the correctness of equation (2).

4. What the Accountant Might Book

At the end of each month, someone (the actuary perhaps) provides the accountant with an estimate of the outstanding claims at that time, T#OSC(s@s), where T means the total for all products and components and time s is the month-end. For the financial year, for example the year 1st July 2011 to 30th June 2012, the accountant might book for the total of all claims incurred the total of all claims payments made during the year plus the change in the total OSC, but the accountant may calculate the change in the total OSC as

$$AT\#OSC(30/6/12@30/6/2012) - AT\#OSC(30/6/2011@30/6/2011) \quad (3)$$

and so calculate the booked value of the total incurred claims as

$$BT\#Inc(1/7/2011,30/6/2012) = T\#Paid(1/7/2011,30/6/2012) + AT\#OSC(30/6/2012@30/6/2012) - AT\#OSC(30/6/2011@30/6/2011) \quad (4)$$

where AT means that the accountant's total may include components besides just H, M, and A, as explained in Section 5. We note that the relationship (4) does not correspond with the actuary's estimate of incurred claims even at time $t = 30/6/2012$, because (disregarding any extraneous components) the estimate of the outstanding claims at 30/6/2011 is OSC(30/6/2011@30/6/2011) instead of OSC(30/6/2011@30/6/2012).

4.1 An Example: Product Profitability - continued

The discrepancy which arises in the situation discussed in Section 1.1 can be explained by noting that the actuary's estimate for total profit is based on estimating the total incurred claims as

$$T\#Inc((1/7/2011,30/6/2012)@30/9/2012) = T\#Paid(1/7/2011,30/6/2012) + T\#OSC(30/6/2012@30/9/2012) - T\#OSC(30/6/2011@30/9/2012)$$

where T means H + M + A. So the difference between the booked value of incurred claims and the actuary's (more accurate) estimate is

[AT#OSC(30/6/2012@30/6/2012) – T#OSC(30/6/2012@30/9/2012)] -
[AT#OSC(30/6/2011@30/6/2011) – T#OSC(30/6/2011@30/9/2012)].

5. What Other Components might the Accountant Include

In Australia the provision at the month-end includes, in addition to the provision for the OSC, provision for the administrative expense for paying the outstanding claims, provision for Risk Equalisation related to the outstanding claims, and a risk margin. The change in these three provisions between time r and time s is not relevant to estimating the claims incurred between time r and time s, and if the accountant does include them then this will magnify any inaccuracy in the booked change OSC provision. Any change in the expense, risk equalisation, and margin provisions should not be rolled into the change in the OSC if formula (2) is used to estimate the incurred claims.

6. What is the Effect of a Change in the Estimate of OSC(r@t)

Consider equation (4), and disregard for the moment that the accountant may have included extraneous components (such as expense, risk equalisation, and margin) in the OSC estimates. The corresponding equation for the prior financial year is

$$\begin{aligned} BT\#Inc(1/7/2010,30/6/2011) = T\#Paid(1/7/2010,30/6/2011) + \\ T\#OSC(30/6/2011@30/6/2011) - T\#OSC(30/6/2010@30/6/2010) \end{aligned} \quad (5)$$

If the estimate of the OSC at 30/6/2011 is updated to OSC(30/6/2011@30/6/2012) in both equation (4) and in equation (5), then equation (4) becomes

$$\begin{aligned} T\#Inc(1/7/2011,30/6/2012) = T\#Paid(1/7/2011,30/6/2012) + \\ T\#OSC(30/6/2012@30/6/2012) - T\#OSC(30/6/2011@30/6/2012) \end{aligned} \quad (4A)$$

which can be written

$$\begin{aligned} T\#Inc(1/7/2011,30/6/2012) = T\#Paid(1/7/2011,30/6/2012) + \\ T\#OSC(30/6/2012@30/6/2012) - T\#OSC(30/6/2011@30/6/2012) + \\ [T\#OSC(30/6/2011@30/6/2011) - T\#OSC(30/6/2011@30/6/2011)] \\ = BT\#Inc(1/7/2011,30/6/2012)+ \\ T\#OSC(30/6/2011@30/6/2011) - T\#OSC(30/6/2011@30/6/2012) \end{aligned} \quad (4B)$$

and equation (5) becomes

$$\begin{aligned} T\#Inc(1/7/2010,30/6/2011) = T\#Paid(1/7/2010,30/6/2011) + \\ T\#OSC(30/6/2011@30/6/2012) - T\#OSC(30/6/2010@30/6/2010) \end{aligned} \quad (5A)$$

which can be written

$$\begin{aligned} T\#Inc(1/7/2010,30/6/2011) = T\#Paid(1/7/2010,30/6/2011) + \\ T\#OSC(30/6/2011@30/6/2012) - T\#OSC(30/6/2010@30/6/2010) + \end{aligned}$$

$$\begin{aligned}
& [T\#OSC(30/6/2011@30/6/2011) - T\#OSC(30/6/2011@30/6/2011)] \\
& = BT\#Inc(1/7/2010,30/6/2011)+ \\
& T\#OSC(30/6/2011@30/6/2012) - T\#OSC(30/6/2011@30/6/2011) \quad (5B)
\end{aligned}$$

Hence we see that the effect of updating the estimate of the outstanding claims at 30th June 2011 from OSC(30/6/2011@30/6/2011) to OSC(30/6/2011@30/6/2012) is to increase the estimate of the claims incurred between 1st July 2010 and 30th June 2011 by the increase in the estimate of the outstanding claims at 30th June 2011 and decrease the estimate of the claims incurred between 1st July 2011 and 30th June 2012 by the same amount. Note that updating the estimate of the outstanding claims at 30th June 2011 does not change the estimate of the total of the claims incurred in the two year period 1st July 2010 to 30th June 2012, it just results in a reallocation between the two financial years. (However, changing the estimate of the outstanding claims at 30th June 2012 would change this total.)

Note that reallocating the claims expense between the two years will result in reallocating the net underwriting profit between these years, and so will affect the picture that management and the board have of how the profitability of the insurer is progressing from year to year.

7. A Numerical Example

Suppose that the outstanding claims at 30/6/2011 estimated at 30/6/2011 were

$$H\#OSC(30/6/2011@30/6/2011) = \$5.25 \text{ million}$$

$$M\#OSC(30/6/2011@30/6/2011) = \$0.96 \text{ million}$$

$$A\#OSC(30/6/2011@30/6/2011) = \$1.34 \text{ million}$$

and that the outstanding claims at 30/6/2011 estimated at 30/6/2012 were

$$H\#OSC(30/6/2011@30/6/2012) = \$5.64 \text{ million}$$

$$M\#OSC(30/6/2011@30/6/2012) = \$1.03 \text{ million}$$

$$A\#OSC(30/6/2011@30/6/2012) = \$1.44 \text{ million}$$

and that the outstanding claims at 30/6/2012 estimated at 30/6/2012 were

$$H\#OSC(30/6/2012@30/6/2012) = \$7.42 \text{ million}$$

$$M\#OSC(30/6/2012@30/6/2012) = \$1.28 \text{ million}$$

$$A\#OSC(30/6/2012@30/6/2012) = \$1.15 \text{ million}$$

and that claim payments $T\#Paid(1/7/2011,30/6/2012)$ were \$89.00 million.

Suppose that the accounting department made provision for the expense of administering the OSC of 3% for Hospital claims and 6% for Medical and Ancillary claims, and a risk margin of 5% of the total of claims and expenses. (We will ignore the provision for risk equalisation in this example.) Then, if the accounting department includes expenses and margin in its calculation of the OSC provision, we see that

$$AT\#OSC(30/6/2011@30/6/2011) = (5.25 \times 1.03 + 0.96 \times 1.06 + 1.34 \times 1.06) \times 1.05 = \$8.24 \text{ million}$$

$$AT\#OSC(30/6/2012@30/6/2012) = (7.42 \times 1.03 + 1.28 \times 1.06 + 1.15 \times 1.06) \times 1.05 = \$10.73 \text{ million}$$

and so (see equation (4)) the accounting department would book

$$BT\#Inc(1/7/2011,30/6/2012) = \$91.49 \text{ million} \quad (6)$$

If the accounting department did not include expenses and margin in its calculation of the OSC provision then the accounting department would calculate the OSC provisions

$$T\#OSC(30/6/2011@30/6/2011) = (5.25 + 0.96 + 1.34) = \$7.55 \text{ million}$$

$$T\#OSC(30/6/2012@30/6/2012) = (7.42 + 1.28 + 1.15) = \$9.85 \text{ million}$$

and so the accounting department would book

$$BT\#Inc(1/7/2011,30/6/2012) = \$91.30 \text{ million} \quad (7)$$

The correct estimate at 30/6/2012 of the claims incurred from 1st July 2011 to 30th June 2012 would use

$$T\#OSC(30/6/2011@30/6/2012) = (5.64 + 1.03 + 1.44) = \$8.11 \text{ million}$$

giving

$$T\#Inc((1/7/2011,30/6/2012)@30/6/2012) = 89.00 + 9.85 - 8.11 = 90.74 \text{ million} \quad (8)$$

This means that if the booked total incurred claims in equation (7) was restated to the total in equation (8), then \$0.56 million of claims would be reallocated from the period 1st July 2011 through 30th June 2012 to the period 1st July 2010 through 30th June 2011, with a corresponding adjustment in the net underwriting profit allocated to these periods.

7.1 Other Provisions

Note that if the accounting department rolled the expense and margin provisions (as calculated in this example, as a percentage of the OSC provisions) into the OSC provision then this would introduce a further error of about \$200,000 into the estimate at 30/6/2012 of the incurred claims for the period 1st July 2011 through 30th June 2012 (compare equations (6) and (7)). These provisions should not be included in the calculation of the incurred claims. If however the accounting department insists on including them, the way to neutralise their effect would be to have a constant, flat amount for the expense provision and for the risk margin, which would mean that these provisions would cancel out in equation (3).

8. Possible Magnitude of the Error in the Booked Value of the Underwriting Profit

In Australia, it is common for claims to be about 82% of the premium, for the total of net risk equalisation and ambulance levies to be about 5% of the premium, and for management expenses to be about 9% of the premium, leaving about 4% for net underwriting profit. At the end of the financial year, the OSC provision can be about 11% of the value of the claims incurred during the year, or about 9% of the premium. It is possible for the OSC provision booked to the end of the year to be 7.5% off from the true value of the OSC at the year end.

Consider two consecutive years, for example the year 1/7/2010 through 30/6/2011 and the year 1/7/2011 through 30/6/2012, and assume that the true value of the net underwriting profit was 4% in each year. The worst case scenario (assuming that the OSC estimates are not off by more than 7.5%) would be if

- T#OSC(30/6/2010@30/6/2010) was 7.5% higher than the true value,
- T#OSC(30/6/2011@30/6/2011) was 7.5% lower than the true value, and
- T#OSC(30/6/2012@30/6/2012) was 7.5% higher than the true value.

Then

- BT#Inc(1/7/2010,30/6/2011) would be about $.15 \times .09 = 1.35\%$ of premium too high, and
- BT#Inc(1/7/2011,30/6/2012) would be about $.15 \times .09 = 1.35\%$ of premium too low.

This would mean that the booked value of the net underwriting profit in the year 1/7/2010 through 30/6/2011 would be about 5.35% of premium, and the booked value of the net underwriting profit in the year 1/7/2011 through 30/6/2012 would be about 2.65% of premium. Thus if management and the board of the insurer were relying on the booked value of underwriting profit they would assume that the year 1/7/2011 through 30/6/2012 was only half as profitable as the year 1/7/2010 through 30/6/2011, when in fact the two years were equally profitable.

8.1 A Numerical Example

Consider two consecutive years, for example the year 1/7/2010 through 30/6/2011 and the year 1/7/2011 through 30/6/2012, and assume that the insurer had identical results in each year, in each year: the premium earned was \$110 million; paid claims = incurred claims = \$90 million; the total of net risk equalisation and ambulance levies was \$5.5 million; and management expenses were \$10 million. Assume also that the real value of the total of the OSC at each of 30/6/2010, 30/6/2011, and 30/6/2012 was \$10 million. Hence the net underwriting profit in each year was $110 - (90 + 10 + 5.5) = \4.5 million. However, the estimates of the OSC made at each of these year-ends were off by 7.5%:

- T#OSC(30/6/2010@30/6/2010) was \$10.75 million
- T#OSC(30/6/2011@30/6/2011) was \$9.25 million
- T#OSC(30/6/2012@30/6/2012) was \$10.75 million.

However, with 3 months more claim data each of the estimates was much improved:

- T#OSC(30/6/2010@30/9/2010) was \$10.0 million
- T#OSC(30/6/2011@30/9/2011) was \$10.0 million

T#OSC(30/6/2012@30/9/2012) was \$10.0 million.

If management and the board relied on the values of incurred claims booked by the accounting department then they would be seeing (as per equation (4)) for the year 1/7/2010 through 30/6/2011

$$BT\#Inc(1/7/2010,30/6/2011) = 90 + 9.25 - 10.75 = \$88.5 \text{ million}$$

and so booked net underwriting profit would be $110 - (88.5 + 10 + 5.5) = \6.0 million, or 5.45% of premium. For the year 1/7/2011 through 30/6/2012 they would be seeing

$$BT\#Inc(1/7/2011,30/6/2012) = 90 + 10.75 - 9.25 = \$91.5 \text{ million}$$

and so booked net underwriting profit would be $110 - (91.5 + 10 + 5.5) = \3.0 million, or 2.73% of premium. Note that if management and the board had been presented with reports based on the updated estimates of these outstanding claims, and thus also of the incurred claims, then they would be informed that the net underwriting profit had been the same in each year, instead of relying on information that showed that the net underwriting profit fallen by 50% from the year 1/7/2010 through 30/6/2011 to the next year.

Note that though the error in the initial estimate of the outstanding claims was only 7.5%, the resulting error in the net underwriting profit was 33%. This is because the underwriting profit is a small difference between two large numbers (the premium and the claims plus expenses), so an error in one (or both) of the large numbers which is small as a percentage of the large number makes for a big percentage change in the difference between them.

8.2 The Reverse Scenario

In the example in section 8.1 the estimate at the first year-end, T#OSC(30/6/2010@30/6/2010), was higher than the true value, the estimate at the second year-end, T#OSC(30/6/2011@30/6/2011), was lower than the true value, and the estimate at the third year-end, T#OSC(30/6/2012@30/6/2012), was higher than the true value. If the direction of the estimation errors was reversed, so that the estimate at the first year-end was low, the estimate at the middle year-end was high, and the estimate at the third year-end was low, then the result of relying on the booked values of the net underwriting profit would be that the profit in the year 1/7/2010 through 30/6/2011 would be understated and the profit in the year 1/7/2011 through 30/6/2012 would be overstated.

9. Affect on the Financial Condition Report

The objective of the FCR is to provide the insurer's board with insight into the financial condition of the insurer, both current and future. Also, many boards feel that the FCR

should tell them something that they do not already know. The recent trend in net underwriting profit is very material to the insurer's financial position. Unless the insurer's management has instituted a management information system which includes regular updating of the assignment of profit to each reporting period (be it by month, by quarter, or by year) it is likely that the board is relying on reports provided by the accounting department which are based on equation (4) (which might be the case for a smaller insurer which has a small staff). As we have discussed, reports provided by the accounting department which are based on equation (4) may not assign profit to the correct period, and so the board may not have an accurate view of the trend in underwriting profit. The AA could provide, in the FCR, a report on the trend in underwriting profit based on more complete claims data than was available at the end of each reporting period.

10. Possible Affect on the Rate Rise Submission

The insurer's board is responsible for deciding on (or at least approving) the increase in contribution rates which the insurer will apply for in its submission. If the board does not have correct information on the trend in underwriting profit it may decide on a rate increase which is not appropriate. For example if the board was relying on reports from the accounting department which incorrectly showed that the underwriting profit had declined (as in the example in section 8.1) the board may have (unfounded) concerns that the insurer had entered a downward spiral and so authorise requesting an unnecessarily high increase. If the reverse scenario applied, where the reports from the accounting department incorrectly showed that the underwriting profit had increased (as discussed in section 8.2) then the board may have an (unfounded) optimism and so authorise requesting an insufficient increase, which might lead to the insurer needing a very high increase the year after.

11. Conclusion

The estimate $T\#OSC(s@s)$ of the outstanding claims at the end of month s made using only claims paid through the end of month s is based on minimal information. Thus $T\#OSC(s@s)$ may vary from the true value of the outstanding claims at time s (many actuaries consider that consistently getting this estimate within 5% of the correct value is about the best that can be reasonably expected). If the accounting department "locks-in" the estimate $T\#OSC(s@s)$ for booking the incurred claims, this may result in an incorrect allocation of underwriting profit between periods, which may in turn lead to the board relying on reports which do not give an accurate account of the trend in underwriting profit. The error in the allocation of profit to reporting period can be substantial. The narrower the underwriting margin the greater this error can be as a percentage of the underwriting margin. A much more accurate estimate can be made once further claims data becomes available. The insurer's management and board will have a more accurate view of the trend in the insurer's financial position if they are provided with reports which are updated periodically as more complete claims data becomes available.

References

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This paper provides a comprehensive discussion of the chain ladder method applied to health claims.

Appendix: Demonstration of the Correctness of Equation (2)

For concreteness, let us consider the payments made up to 30th June 2012, and suppose that all payments are made by lag-month 12. Then the payments made and the estimates of future payments can be laid out as in Table 1, which is the layout familiar to all who are familiar with the chain ladder method (although for this demonstration it is not necessary that the estimated numbers are calculated using the chain ladder method). The payments made are denoted $p(x,y)$ and the estimates **made as of 30th June** are denoted $e(x,y)$.

Suppose we wish to calculate $\text{Inc}((1/1/2012,31/3/2012)@30/6/2012)$, the estimate of claims incurred in the first quarter estimated as of 30th June. Clearly the estimate $\text{Inc}((1/1/2012,31/3/2012)@30/6/2012)$ is the sum of all the numbers in the three rows labelled Jan-12, Feb-12, and Mar-12 in Table 1. Then it is easy to see that this sum is equal to the sum of the numbers in the three shaded diagonals and the numbers in the triangle outlined with the bold line minus the sum of the numbers in the triangle outlined with the double line. The sum of all the numbers in the three shaded diagonals is $\text{Paid}(1/1/2012,31/3/2012)$. The sum of all the numbers the triangle outlined with the bold line is $\text{OSC}(31/3/2012@30/6/2012)$. The sum of all the numbers the triangle outlined with the double line is $\text{OSC}(31/12/2011@30/6/2012)$. Thus we see that

$$\text{Inc}((1/1/2012,31/3/2012)@30/6/2012) = \text{Paid}(1/1/2012,31/3/2012) + \text{OSC}(31/3/2012@30/6/2012) - \text{OSC}(31/12/2011@30/6/2012)$$

Now consider the equation

$$B\#\text{Inc}(1/1/2012,31/3/2012) = \text{Paid}(1/1/2012,31/3/2012) + \text{OSC}(31/3/2012@31/3/2012) - \text{OSC}(31/12/2011@31/12/2011) \quad (9)$$

(which is the number that the accounting department might book for the claims incurred in the first quarter). Consider Table 2, which is the situation at 31/3/2012: again the payments made are denoted $p(x,y)$, but the estimates **made as of 31st March** are denoted $f(x,y)$. We note that some of the p 's of Table 1 are just f 's in Table 2, and the e 's of Table 1 may not have the same value as the corresponding f 's in Table 2 (for example

$e(3,4)$ of Table 1 may not equal $f(3,4)$ of Table 2). Thus it is clear that the sum of all the numbers the triangle outlined with the bold line in Table 1 is not equal to sum of all the numbers the triangle outlined with the bold line in Table 2, that is $OSC(31/3/2012@30/6/2012)$ is not equal to $OSC(31/3/2012@31/3/2012)$. Similarly, it is clear that the sum of all the numbers the triangle outlined with the double line in Table 1 is not equal to sum of all the numbers the triangle outlined with the double line in Table 3, that is $OSC(31/12/2011@30/6/2012)$ is not equal to $OSC(31/12/2011@31/12/2011)$. It is not too strong a statement to say that equation (9) is a hybrid of inconsistent estimates.