**UNDERSTANDING GROWTH RATES AND ANNUALIZATION**

The term % change on a year ago means the amount at a certain time minus the amount a year ago and expressed as a percentage. If a country’s GDP was $10.1 billion at the end of Q4 (the fourth quarter) of 2009, and was $10 billion at the end of Q4 of 2008, then growth in Q4 2009 on a year ago would be

 10.1– 10 X 100 % = 1%

 10

The media has traditionally cited GDP growth rates for China as % change on a year ago. The data for Q2 2011 was 9.6 %.[[1]](#footnote-1) This means that from the end of Q2 2010 to the end of Q2 2011, GDP in China grew by 9.6 %.

In a section above that discussed seasonal adjustment, it was mentioned that in countries where statistical data gathering and assessment capabilities are not well developed, seasonally adjusted data would not be available. In these countries, growth rates will typically be expressed as % change on a year ago, e.g., Q4 2010 compared to Q4 2009. This way, a period in one year is compared to a similar period a year earlier, ensuring, for example, that a quarter in which there is a seasonal occurrence will be compared to a quarter a year earlier in which there was the same kind of seasonal occurrence. This kind of comparison cancels out the effect of the seasonal occurrence and gives information on the impact of underlying economic conditions.

Percentage change on a previous quarter expressed at an annual rate means the growth in a quarter is compared to the previous quarter **and expressed as if it continued for a whole year**. Let’s use some simple numbers to see what this means. If an amount is 100 at the end of Q4 2009 and 110 at the end of Q1 2010, this is a 10 % growth in the Q1 2010. To express this at an annual rate, we calculate what would be the percent increase over 2010 if growth continued at 10 % for every quarter for a whole year. The table below shows that if this 10 % growth continued through every quarter of the year, at the end of Q4 2010, the amount would be 146.41. Since the amount at the end of 2009 was 100, the growth over 2010 would be 46.41 %.

**TABLE 4**

**Amount at end of 2010 if 10 % growth continued**

**through every quarter of 2010**

|  |  |
| --- | --- |
| Amount at end of Q1 2010 | 110 |
| Amount at end of Q2 2010 | 110 + 10 % of 110 = 110 + 11 = 121 |
| Amount at end of Q3 2010 | 121 + 10 % of 121 = 121 + 12.1 = 133.1 |
| Amount at end of Q4 2010 | 133.1 + 10 % of 133.1 = 133.1 + 13.31 = 146.41 |
| Amount change over 2010 | 46.41 |

The percent growth for Q1 2010 **expressed at an annual ra**te would be 46.41 %. So, to reiterate, the growth in Q1 2010 is 10 %. But the growth in Q1 2010 **expressed at an annual rate** is the percent growth that would result if this 10 % growth continued for a whole year, as illustrated in Table 4.[[2]](#footnote-2)

A common mistake is to think that the growth for Q1 2010 expressed at an annual rate should be 4 times 10 %. This is incorrect because not only is the amount that Q1 2010 started with growing at 10 % but also the increment due to growth in each quarter is also growing at 10 % in the subsequent quarter. In the example depicted in the Table 4, in the second quarter it is not 110 (not just 100) growing at 10 %; during the third quarter it is 121 (not just 100) growing at 10 %, and so on.

The US authorities give quarterly GDP growth rate as percent change from the previous quarter expressed at an annual rate.As noted above, GDP growth rates for China are typically cited as percent change from the year ago period. When you come across GDP growth rates for countries, and want to compare them, check to see what are the yardsticks being used to express them.

When data is expressed at an annual rate it is said to be annualized. We have just seen how to annualize a growth rate.

If just an amount, not a growth rate, is to be annualized, this means it is measured for a period that is less than a year and then calculated for what it would be for a single year. A person’s salary is a common example. If you are earning $4,000 per month, this is $48,000 at an annual level. Multiply the monthly level by 12 to get the annual level. If a quarterly level is to be expressed at an annual level, just multiply it by 4 to get the annual level.

If you check US Department of Commerce data for the amount of US GDP, you will see US quarterly GDP data annualized. For example, Q2 2011 real GDP data is listed at a $13260.5 billion **annual rate**, this means the amount of real GDP produced in Q2 2011 was a quarter of $13260.5 billion and this amount when annualized (multiplied by 4) gives $13260.5 billion.

Notice how easy it is to annualize an amount that is not a growth rate. If it is an amount for a quarter, you simply multiply it by 4. (If it is an amount for a month, you multiply it by 12.) If a **growth rate** is to be annualized, however, compounding has to be taken account of, and you cannot simply multiply a quarterly growth rate by 4 to express it at an annual growth rate—as was demonstrated in the discussion above on “percentage change on a previous quarter expressed at an annual rate”.

**EXERCISE 5**

1. As noted above, data for China’s GDP growth is typically cited as % change on a year ago. Suppose the data for Q1 2011 is 9.7 %. Does this tell you by how much GDP grew from the end of Q4 2010 to the end of Q1 2011?
2. In *The Economist* magazine, in the table “Output, prices and jobs”, the following data is given for the US GDP for Q2 2011:

|  |  |
| --- | --- |
| % change on a year ago | % change on previous quarter, annual rate |
| 1.5 | 1.0 |

Explain what these two numbers mean.

1. If output in an economy in Q1 2010 is valued at $3 billion, what is it expressed at an annual rate?
2. An economy grew at 2 % in Q1 2011 when compared to Q4 2010. Which one of the following is the economy’s growth rate for Q1 2011 compared to the previous quarter expressed at an annual rate?
	1. 2 %
	2. 8 %
	3. Less than 8 %
	4. More than 8 %

**ANSWERS**

**EXERCISE 5**

1. No, it does not—this data alone gives us no information on how GDP grew from the end of Q4 2010 to the end of Q1 2011. It tells us how much GDP grew from the end of Q1 2010 to the end of Q1 2011.
2. The % change on a year ago of 1.5 for Q2 2011 means that in the year preceding the end of Q2 2011, i.e., from the end of Q2 2010 to the end of Q2 2011, GDP in the US grew by 1.5%.

The % change on previous quarter, annual rate, of 1.0 for Q2 2011 means that from the end of Q1 2011 to the end of Q2 2011 GDP growth occurred, which, when expressed at an annual rate, amounted to 1.0 %. It does not mean that the actual amount of GDP by which GDP grew in Q2 2011 was 1.0 % but only that amount by which GDP grew **when expressed at an annual rate** was 1.0 %.

1. To get the annual rate for this quarterly amount simply multiply by 4, which gives $12 billion. (As this amount is not a growth rate, no compounding is involved, so multiplying by 4 is all that is necessary to get the annual rate.)
2. The answer is d—as the discussion of percentage change on a previous quarter expressed at an annual rate illustrated.
1. Be reminded that the authorities that issue these data usually revise them. So if later on you check the data for Q2 2011 and see it is different from what is stated here, this just means the data has been revised. [↑](#footnote-ref-1)
2. It’s like if you put $100 in a bank account that is earning 10 % interest per quarter compounded. This means that after the first quarter you will be earning interest not just on the $100 but on the interest in previous quarters. For those of you familiar with it, the compound growth rate formula for expressing quarterly growth at an annual rate is r = [(GDPq/GDPq-1)4–1] x 100, where r is the % change expressed at an annual rate, GDPq is the amount of GDP in the quarter for whichthe growth rate is being annualized, and GDPq-1 is the amount of GDP in the previousquarter. So if GDP grows from 100 at the end of one quarter to 110 at the end of the next quarter, the % growth of GDP at an annual rate for the latter quarter is [(110/100)4 – 1] x 100 = 46.41 %. [↑](#footnote-ref-2)