

# Methodology note:

## Coniferous Standing Sales Price Index

Last reviewed:

November 2020

Next review due:

November 2021

### Introduction

An in-depth review of the methodology used to produce the coniferous standing sales price index (referred to in this paper as CSSPI or 'the index') was undertaken in 2007-2008 and led to a change in methodology for producing the index that was introduced from the November 2008 edition of Timber Price Indices.

This paper is an updated version of the original paper from August 2008, explaining the rationale for changing the method used to calculate the index and comparing the results obtained from the new method with those under the previous method. The assistance of ONS methodologists in the development of the new index is gratefully acknowledged

### Background

Forest Research, on behalf of the Forestry Commission and devolved administrations, has released a Coniferous Standing Sales Price Index for many years. The index is published twice yearly:

- Data for the year to end March are published in May, and
- Data for the year to end September are published in November.

The CSSPI is an index of the average prices per cubic metre overbark standing achieved for standing sales of conifers by Forestry England, Forestry and Land

Scotland and Natural Resources Wales<sup>1</sup>. Standing sales are those where the crop is sold standing, for the purchaser to harvest. It covers all conifer standing sales (open market and negotiated) over the twelve month period. All thinning and clearfell data is combined within the index. It includes all species, tree sizes, working practices and conditions. It does not include any private sector data.

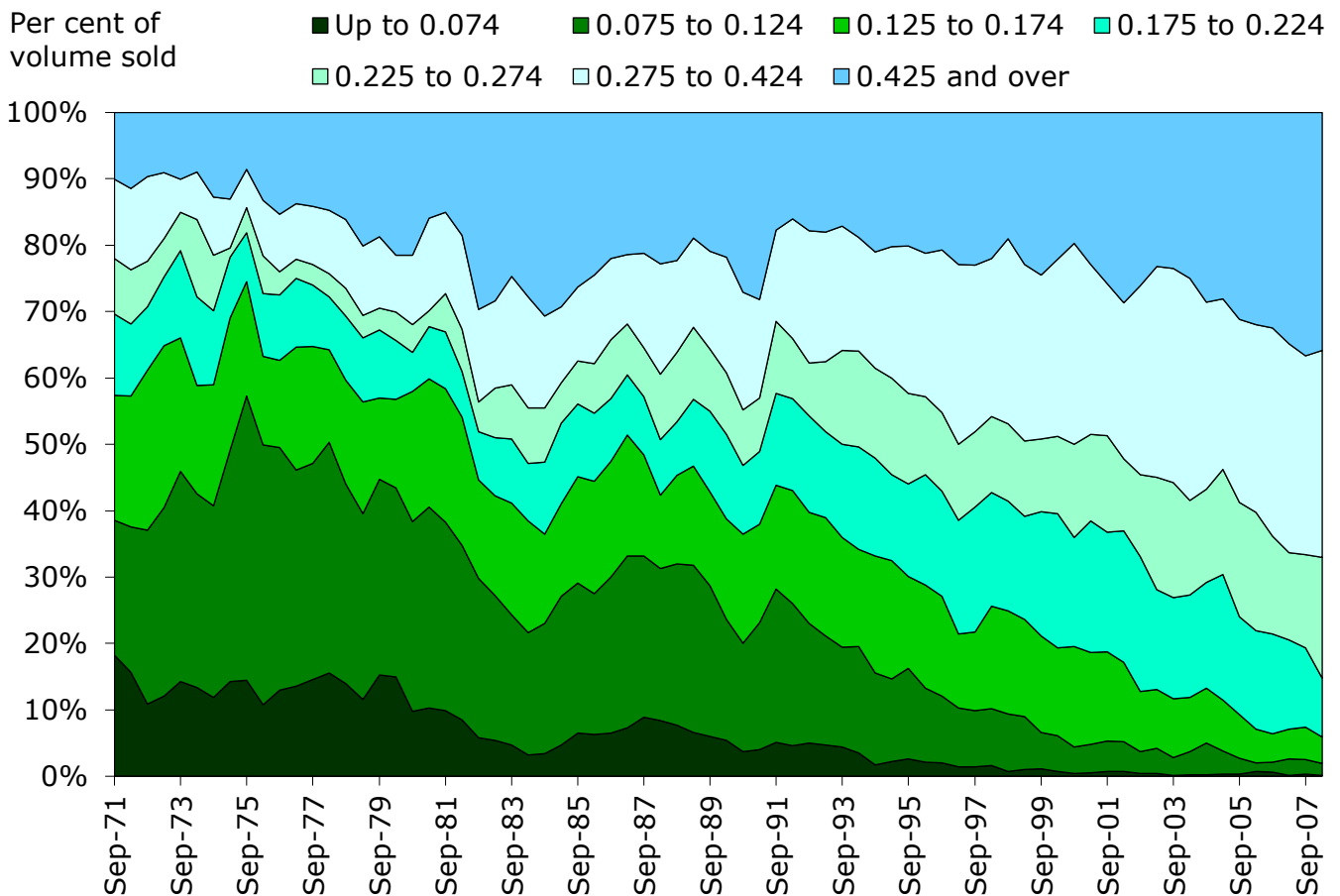
The previous index was constructed using the Laspeyres method, which corrects distortions in the average price caused by variations in average tree size. This enables prices in different years to be compared on the basis of a constant size mix (the size mix in the base year) but does not consider possible changes in quality or working conditions.

## Need for change

The base year for the previous index at the time of the review was September 1996. Over time, the size mix of standing sales had changed, with a reduction in the volume of sales from small size categories and a corresponding increase in some of the larger size categories. As a result, the index did not reflect the more recent size mix of standing sales. Chart 1, below, shows how the size mix of standing sales had changed between 1971 and 2008.

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<sup>1</sup> As data on standing sales by average tree size has been unavailable from Natural Resources Wales since April 2017, data for Wales in more recent periods has not been included in the index.

**Chart 1: Volume of sales by average tree size (m<sup>3</sup>)**


## Options for change

A first stage of the review considered whether factors in addition to size should be taken into account, particularly species mix or clearfell/ thinning. It concluded that the addition of these factors would have little impact on the standing sales index. Charts of index values since 1971 showed that standing sales prices had fluctuated over time, but there was no clear evidence of cyclical changes. Instead, prices were driven by a range of factors, including international (e.g. global supply and demand for timber, exchange rates, etc) as well as domestic factors. It was concluded that the chosen index should be selected to perform well over periods of changing size mix and fluctuating prices.

Once it had been decided that the index should continue to be based solely on size mix, a number of options for a revised index were considered.

These covered:

- Type of index, i.e. the choice of index number formula;
- Whether to chain-link or rebase and, if so, how frequently.

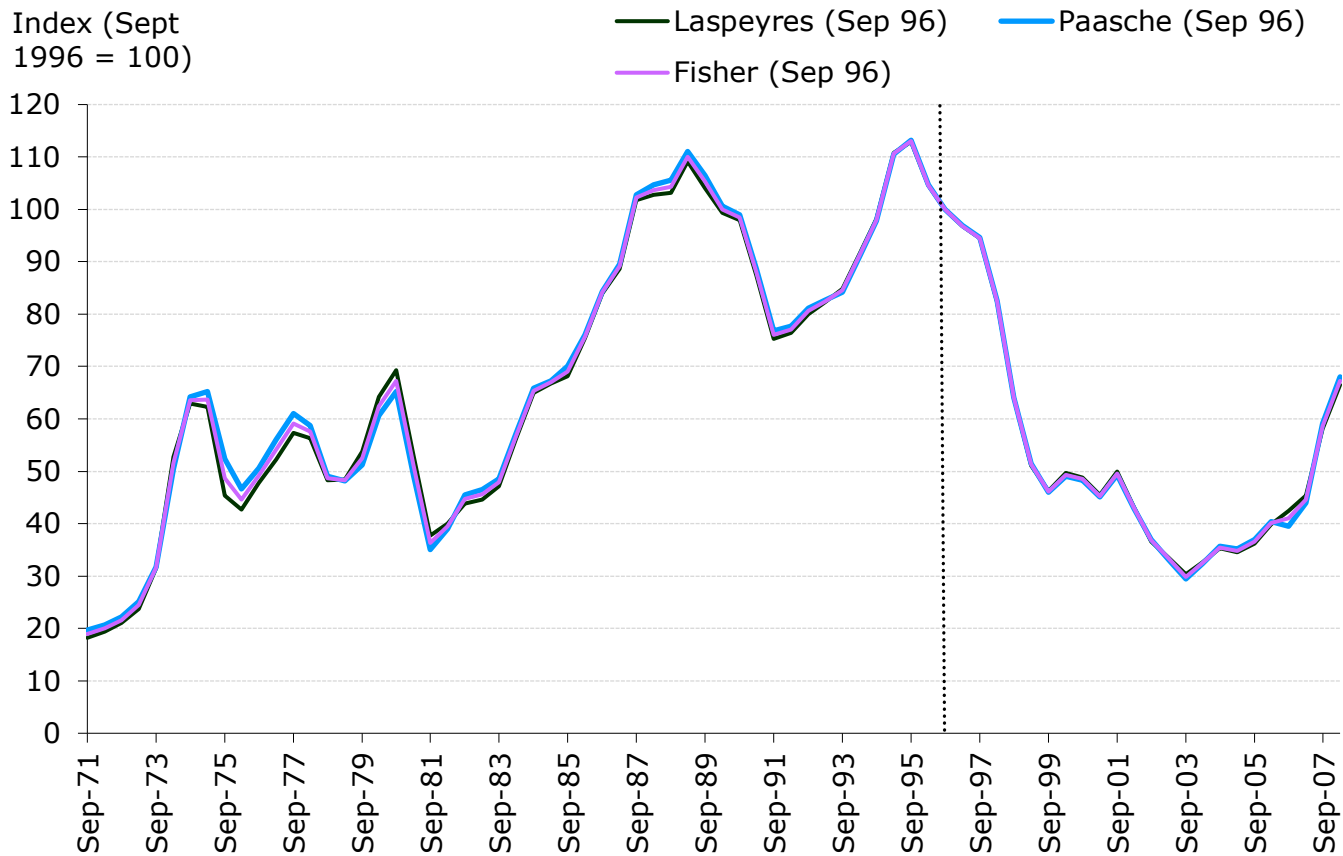
### Type of index

Three types of index were considered. These are:

- Laspeyres index – This was the method in use at the time, which uses the size mix in a base year (September 1996) to compare prices over time.
- Paasche index – This method uses the size mix in each year for that year's index value.
- Fisher index – A combination of the Laspeyres and Paasche indices, this is calculated as the geometric mean of the above two indices.

Chart 2 shows each of these indices, with September 1996 set to 100 for each and September 1996 used as the base for the Laspeyres index. Table 1 shows the effect of the different indices when comparing data for the most recent periods available at the time of the review, to establish trends over time. The Laspeyres and Paasche indices show very similar trends, with the Laspeyres index tending to show smaller increases (or larger falls) than the Paasche. However, the two indices can diverge by more in individual years, as shown by 2005-2006 and 2006-2007.

As the geometric mean of the Laspeyres and Paasche indices, the Fisher index produces figures that lie between the other two indices. As the Fisher index is considered to have more desirable properties than either the Laspeyres or Paasche index, a Fisher index was recommended.

**Chart 2: Type of index**

**Table 1: Change in index over time by type of index**

Time period	per cent increase		
	Laspeyres index (base = Sep 1996)	Paasche index (base = Sep 1996)	Fisher index (base = Sep 1996)
1 year (2004-2005)	2%	4%	3%
1 year (2005-2006)	17%	7%	12%
1 year (2006-2007)	37%	49%	43%
5 years (2002-2007)	59%	60%	59%
10 years (1997-2007)	-39%	-37%	-38%
20 years (1987-2007)	-43%	-42%	-43%
30 years (1977-2007)	1%	-3%	-1%

Note:

- In order to simplify the tables presented, tables 1 to 6 only show data for the year to September. Data for the year to March show a similar effect.

## Chain-linking/ rebasing

Rebasing a Laspeyres index involves changing the base date that provides the index size mix. It is possible to change the full index series to the new base date, but that would make it less relevant for earlier time periods.

In order to ensure that the index remained relevant over time, chain-linking at regular intervals was recommended. This involves updating the size mix on a regular basis and linking the indices together in a chain, for example:

- 10 yearly – a ten-year chain linked index could be preferred if the fluctuating price could be represented as a 10-year cycle. However, as the long term size mix was changing, this could result in index values being calculated on the basis of less meaningful size mixes.
- Annual chain-linking – rebasing each year would ensure that the index takes account of the changes in size mix over shorter time periods. However, chain-linked Laspeyres indices tend to have an upward bias (that is, they tend to produce price increases in the upwards part of a cycle that are not fully offset by corresponding price decreases in the downwards part of a cycle).
- 5 yearly – would provide a compromise between the above two options, but may result in bias if the chain-linking coincides with the peaks and troughs of the cycle.

All the periods were selected to include year ending September 1996 as one of the base periods. For example, the 10-yearly chain-linking used:

- year ending September 1976 until September 1986;
- year ending September 1986 until September 1996;
- year ending September 1996 until September 2006; and then
- year ending September 2006.

A further advantage of chain-linking is the opportunity to make use of additional data (more detailed size breakdowns for larger tree sizes) which are not available for the entire time series. Thus, the revised index could make use of the additional

size breakdown for the average tree size category of “0.425 m<sup>3</sup> and over”, which is only available for data from October 1984.

Chart 3 shows the rebasing options for the Fisher index, each referenced to the year to September 1996. Table 2 shows the effect of the different rebasing options when comparing data for the most recent periods to establish trends over time.

**Chart 3: Comparison of rebasing periods for Fisher index**

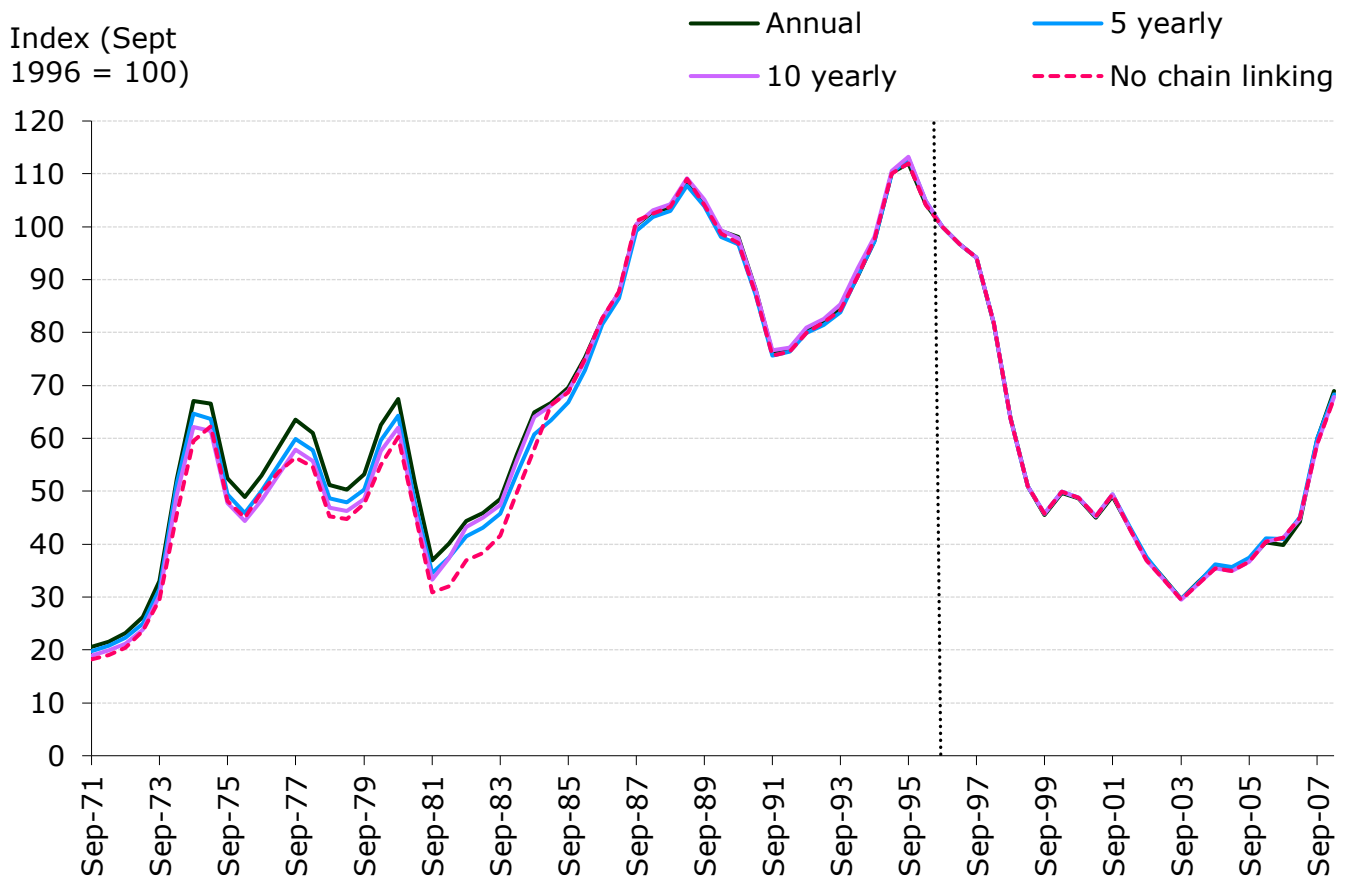


Table 2: Comparison of rebasing periods for Fisher index

Time period	per cent increase		
	Annual re-basing	5-yearly rebasing	10-yearly rebasing
1 year (2004-2005)	3%	4%	4%
1 year (2005-2006)	8%	9%	12%
1 year (2006-2007)	50%	46%	43%
5 years (2002-2007)	61%	60%	60%
10 years (1997-2007)	-36%	-36%	-37%
20 years (1987-2007)	-40%	-39%	-41%
30 years (1977-2007)	-6%	0%	2%

In order to consider which of the rebasing options was most suitable for the coniferous standing sales price index, the resulting index movements under each option for all three of the index types were compared.

Table 3 shows the effect of annual chain-linking for each of the three index types when comparing data with the most recent periods (available at the time of the review) to establish trends over time. Whilst all three indices were very similar over 1 year, there were some large differences in the estimated percentage increase in coniferous standing sales prices over longer time periods.



Table 3: Comparison of index types – annual chain-linking

Time period	per cent increase		
	Laspeyres index	Paasche index	Fisher index
1 year (2004-2005)	4%	3%	3%
1 year (2005-2006)	9%	6%	8%
1 year (2006-2007)	51%	50%	50%
5 years (2002-2007)	66%	55%	61%
10 years (1997-2007)	-29%	-43%	-36%
20 years (1987-2007)	-34%	-46%	-40%
30 years (1977-2007)	4%	-14%	-6%

Table 4 shows the effect of 5 yearly chain-linking for each of the three index types when comparing data with the most recent periods (available at the time of the review) to establish trends over time. Under this option, the index types were reasonably similar when compared over both short and long time periods.

Table 4: Comparison of index types – 5 yearly rebasing

Time period	per cent increase		
	Laspeyres index	Paasche index	Fisher index
1 year (2004-2005)	4%	4%	4%
1 year (2005-2006)	12%	7%	9%
1 year (2006-2007)	43%	49%	46%
5 years (2002-2007)	61%	59%	60%
10 years (1997-2007)	-36%	-37%	-36%
20 years (1987-2007)	-39%	-40%	-39%
30 years (1977-2007)	2%	-1%	0%

Table 5 shows the effect of 10 yearly chain-linking for each of the three index types when comparing data with the most recent periods (available at the time of the review) to establish trends over time. Whilst all three indices were reasonably

similar for longer time periods (10 years or 20 years), there were some large differences in the percentage changes in the index over shorter time periods.

Table 5: Comparison of index types – 10 yearly rebasing

Time period	per cent increase		
	Laspeyres index	Paasche index	Fisher index
1 year (2004-2005)	3%	4%	4%
1 year (2005-2006)	18%	7%	12%
1 year (2006-2007)	37%	50%	43%
5 years (2002-2007)	61%	59%	60%
10 years (1997-2007)	-37%	-37%	-37%
20 years (1987-2007)	-41%	-42%	-41%
30 years (1977-2007)	0%	4%	2%

Based on the above results, it was concluded that the Fisher index with 5 yearly rebasing offered the best compromise for producing reliable results over both short and long time periods.

## Effect of the change in index

Table 6 shows the previous Laspeyres index (as published in “Timber Price Indices”, May 2008) and the new Fisher index with 5 yearly chain-linking. The Fisher index is expressed on two scales:

- The first (Sept 1996 = 100) is provided for ease of comparison with the currently published Laspeyres index, which uses this September 1996 date as a base.
- The second (Sept 2006 = 100) shows the Fisher index re-referenced to give September 2006 as 100, to illustrate the format of the index in future publications.

The Fisher index with 5 yearly chain-linking gave a larger price increase in the most recent year (available at the time). Under this revised methodology, the new coniferous standing sales price index was estimated to be 46% higher in nominal terms in the year to September 2007, compared with the previous year, whereas the previous index had reported a 37% rise. However, this is balanced by a similar change in the opposite direction for the previous year, resulting in similar percentage changes over the 5 year period to September 2007.

Table 6: Comparison of current and new indices

Year to	Laspeyres index (base = Sep 1996) (Sep 1996 = 100)	Fisher index (5 yearly) (Sep 1996 = 100)	Fisher index (5 yearly) (Sep 2006 = 100)	Year-to-year % change: Laspeyres (Sep 1996)	Year-to-year % change: Fisher index (5 yearly)
30-Sep-71	18.2	19.8	48.2	..	..
30-Sep-72	21.0	22.3	54.3	15%	13%
30-Sep-73	31.5	31.6	76.9	50%	42%
30-Sep-74	62.9	64.6	157.5	100%	105%
30-Sep-75	45.3	49.4	120.4	-28%	-24%
30-Sep-76	47.8	50.0	122.0	6%	1%
30-Sep-77	57.4	59.9	146.1	20%	20%
30-Sep-78	48.4	48.6	118.6	-16%	-19%
30-Sep-79	53.7	50.3	122.7	11%	3%
30-Sep-80	69.3	64.3	156.8	29%	28%
30-Sep-81	37.7	34.5	84.2	-46%	-46%
30-Sep-82	43.9	41.5	101.1	16%	20%
30-Sep-83	47.2	45.8	111.7	8%	10%
30-Sep-84	65.0	60.8	148.1	38%	33%
30-Sep-85	68.1	66.8	162.8	5%	10%
30-Sep-86	84.0	81.6	199.0	23%	22%
30-Sep-87	101.8	99.3	241.9	21%	22%
30-Sep-88	103.1	103.0	251.1	1%	4%
30-Sep-89	104.1	103.9	253.2	1%	1%
30-Sep-90	98.0	96.6	235.5	-6%	-7%
30-Sep-91	75.3	75.7	184.4	-23%	-22%
30-Sep-92	80.0	79.9	194.8	6%	6%
30-Sep-93	84.9	83.9	204.4	6%	5%
30-Sep-94	98.2	97.2	236.9	16%	16%
30-Sep-95	112.9	113.0	275.4	15%	16%

30-Sep-96	100.0	100.0	243.7	-11%	-11%
30-Sep-97	94.5	94.1	229.4	-5%	-6%
30-Sep-98	64.1	63.8	155.5	-32%	-32%
30-Sep-99	46.2	45.7	111.5	-28%	-28%
30-Sep-00	48.8	48.8	119.1	6%	7%
30-Sep-01	49.9	49.4	120.4	2%	1%
30-Sep-02	36.6	37.5	91.5	-27%	-24%
30-Sep-03	30.3	29.6	72.3	-17%	-21%
30-Sep-04	35.4	36.1	88.0	16%	22%
30-Sep-05	36.2	37.5	91.4	2%	4%
30-Sep-06	42.5	41.0	100.0	17%	9%
30-Sep-07	58.1	60.1	146.4	37%	46%

The National Statistics release also shows the index in real terms, dividing by the GDP deflator. The same GDP deflator is used for all series, so the comparison remains the same. For completeness, Table 7 shows the index in real terms, at 1996 or 2006 prices as appropriate.

Table 7: Comparison of current and new indices

Year to	Average price:		Laspeyres			
	Nominal terms (£)	Real terms (£2006)	Laspeyres (Sep 1996) Nominal terms (Sep 1996 = 100)	Laspeyres (Sep 1996) Real terms (1996 prices) (Sep 1996 = 100)	Fisher (5 yearly): Nominal terms (Sep 2006 = 100)	Fisher (5 yearly): Real terms (2006 prices) (Sep 2006 = 100)
31-Mar-83	7.06	16.97	44.6	83.7	105.1	252.6
30-Sep-83	7.34	17.15	47.2	86.1	111.7	261.0
31-Mar-84	8.94	20.53	56.3	100.8	130.0	298.4
30-Sep-84	10.37	23.19	65.0	113.4	148.1	331.2

31-Mar-85	10.26	22.37	66.7	113.4	154.5	336.8
30-Sep-85	10.36	22.00	68.1	112.9	162.8	345.7
31-Mar-86	11.26	23.10	75.4	120.7	177.5	364.3
30-Sep-86	12.19	24.83	84.0	133.5	199.0	405.4
31-Mar-87	12.62	25.27	88.7	138.7	210.8	422.4
30-Sep-87	14.59	28.44	101.8	154.8	241.9	471.6
31-Mar-88	15.36	29.13	102.7	152.0	248.2	470.8
30-Sep-88	15.29	28.17	103.1	148.2	251.1	462.5
31-Mar-89	15.80	28.03	109.1	150.9	262.7	465.9
30-Sep-89	15.57	26.63	104.1	139.0	253.2	433.2
31-Mar-90	15.14	25.03	99.4	128.2	239.2	395.5
30-Sep-90	15.48	24.59	98.0	121.4	235.5	374.1
31-Mar-91	13.75	21.09	87.3	104.5	212.2	325.5
30-Sep-91	11.06	16.46	75.3	87.4	184.4	274.4
31-Mar-92	11.22	16.21	76.4	86.2	186.3	269.3
30-Sep-92	11.99	16.99	80.0	88.4	194.8	276.0
31-Mar-93	12.33	17.26	82.2	89.8	198.4	277.8
30-Sep-93	12.68	17.54	84.9	91.6	204.4	282.8
31-Mar-94	13.87	18.94	91.5	97.5	221.3	302.2
30-Sep-94	15.25	20.69	98.2	104.0	236.9	321.4
31-Mar-95	17.28	23.24	110.8	116.3	268.1	360.6
30-Sep-95	17.74	23.48	112.9	116.6	275.4	364.5
31-Mar-96	16.59	21.65	104.6	106.5	255.8	333.8
30-Sep-96	15.97	20.47	100.0	100.0	243.7	312.4
31-Mar-97	15.92	20.09	96.8	95.3	235.6	297.4
30-Sep-97	15.52	19.34	94.5	91.9	229.4	285.9
31-Mar-98	13.35	16.37	82.3	78.8	199.4	244.5
30-Sep-98	10.32	12.48	64.1	60.5	155.5	188.1
31-Mar-99	8.44	10.09	51.1	47.7	124.1	148.5
30-Sep-99	7.65	9.04	46.2	42.6	111.5	131.8
31-Mar-00	8.13	9.53	49.7	45.5	121.6	142.6

30-Sep-00	8.02	9.35	48.8	44.4	119.1	138.8
31-Mar-01	7.54	8.71	45.4	41.0	110.2	127.3
30-Sep-01	8.32	9.51	49.9	44.6	120.4	137.7
31-Mar-02	7.34	8.29	43.2	38.1	105.4	119.0
30-Sep-02	6.38	7.08	36.6	31.7	91.5	101.5
31-Mar-03	5.69	6.22	33.6	28.7	81.3	89.0
30-Sep-03	5.08	5.47	30.3	25.5	72.3	77.9
31-Mar-04	5.60	5.96	32.6	27.1	79.6	84.7
30-Sep-04	6.19	6.51	35.4	29.0	88.0	92.5
31-Mar-05	6.13	6.35	34.5	27.9	86.9	90.0
30-Sep-05	6.58	6.74	36.2	29.0	91.4	93.6
31-Mar-06	7.25	7.35	39.9	31.6	100.0	101.4
30-Sep-06	7.13	7.13	42.5	33.1	100.0	100.0
31-Mar-07	7.97	7.86	45.4	35.0	109.9	108.4
30-Sep-07	10.79	10.47	58.1	44.0	146.4	142.1
31-Mar-08	12.48	11.94	66.4	49.6	166.7	159.4

## Implementation of change in methodology

The new index was introduced for the first time in the November 2008 edition of Timber Price Indices. A transition period ran for 5 years, in which the previous version of the index (Laspeyres, without chain linking) was released alongside the new index (Fisher, with 5-yearly chain-linking), as in table 7, to aid users in moving to the new index.

The Fisher index with 5-yearly chain linking is now well established and is still believed to produce the most reliable estimates of change in timber prices over time.

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