

# The Monthly UnEconomist

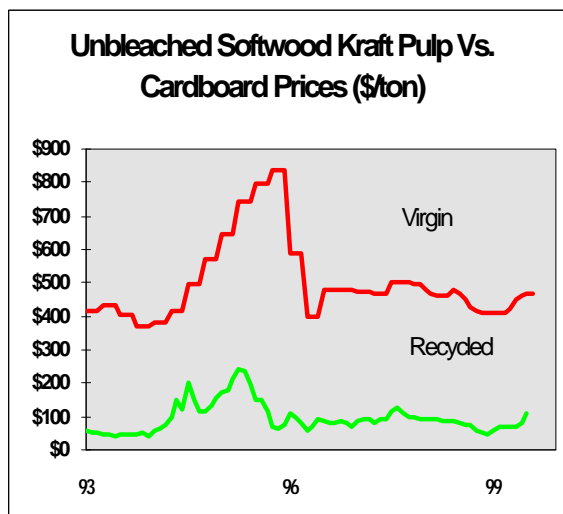
## Forecasting Recycled Paper Prices

Market prices in the Puget Sound Region of Washington state for the bulk grades of recycled paper/paperboard – mixed paper (MXD), old newspaper (ONP), and old corrugated cardboard (OCC) – are primarily driven by four forces:

- Aggregate demand in the US economy.
- Inventory levels in comparison to sales in the paper industry.
- Aggregate demand in the international economy, especially Asia.
- Seasonal swings in the amount of material recycled.

In addition, prices in paper recycling markets are constrained and capped by prices for virgin wood pulp. Understanding the latter phenomenon is useful in predicting future prices in a situation like the present where recent prices for bulk grades, especially OCC, have suddenly surged upwards. The two line plots in Figure 1 show market prices over the past six and a half years for unbleached softwood kraft pulp and OCC.<sup>1</sup>

Figure 1



Many paper/paperboard industry manufacturers using OCC as a fiber source could switch to virgin market pulp if OCC prices

rose too close to virgin pulp prices. As a result, OCC price increases are limited by the virgin pulp price ceiling. In the current situation improved paper and containerboard sales can begin to pull prices for recycled paper up. But unless virgin pulp prices also begin to rise, recycling market price increases cannot continue beyond a certain point.

Pulp producers have responded to improving sales by announcing list price increases of \$30 to \$40 per ton effective September 1 for the pulp market benchmark northern bleached softwood kraft. The almost two-year-long doubling in pulp prices during 1994-95 began with this type of gradual monthly price increase. But the subsequent plummet in less than six months back to early-1994 price levels suggests that \$700 to \$900 pulp prices are unsustainable. For this reason one can be reasonably sure that market pulp prices are not about to begin an upward movement similar to their increase during the 1994-95 period. Continuing availability of relatively lower priced pulp imports, such as Brazilian Eucalyptus hardwood kraft, reinforces that conclusion.

This prediction of limited virgin pulp price increases, in turn, suggests that near term OCC prices may move up in response to manufacturer inventory needs, continued domestic economic growth, or economic recovery in Asia. But that upward movement also will be limited.

### Predicting Recycled Paper Prices When Virgin Pulp Prices Are Stable

Another relationship exhibited in Figure 1 is the seemingly close correlation between price fluctuations for unbleached kraft pulp and recycled cardboard. In fact, about 70% of the variations in virgin kraft pulp and OCC prices are related.

At the same time, OCC prices sometimes move independently. For example, in mid-1994 OCC prices fell sharply while pulp prices were at a temporary pause in

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their two-year rise. And in mid-1995 OCC prices began their decline from historic highs while kraft pulp continued to rise for another six months.

The fact that OCC prices do not move in lock step with virgin kraft prices actually is not surprising, given that kraft pulp is not an economically feasible fiber substitute for recycled cardboard users under normal market conditions. Thus, it might be tempting to use industry forecasts of pulp prices as a way to predict future OCC price movements. But unless the virgin pulp price differential above OCC threatens to drop to where substitution of pulp for recycled cardboard could become economically practical, there are forces other than market pulp prices that more directly drive OCC price movements.

These more fundamental drivers on the demand side are factors such as foreign and domestic purchases of paper industry products, and inventory levels at manufacturing establishments using recycled fiber feedstock. Important supply side influences include discard levels for paper and cardboard, as well as the availability of cost effective recycling collection services for businesses and households. A good forecasting model will use a not too large number of these supply and demand variables to predict the future course of prices for OCC, as well as for ONP and other types of recycled paper.

## Supply Side Factors

On the supply side it is reasonably safe to assume that there will be no widespread governmental action to expand recycling collection systems like that which occurred with residential curbside recycling programs during the late eighties and early nineties. In this case the main supply side influence on recycling market prices will be the seasonal ebb and flow of paper and cardboard discards. These seasonal supply variations are captured by seasonal price indices in the

model used to forecast recycled paper prices.

Table 1 shows these seasonal price indices estimated for ONP (#8) and OCC (#11) from Puget Sound Region recycling market prices during January 1996 through mid-1999. The table of seasonal indices shows, for example, that during the summer months (June through September) prices for both OCC and ONP are higher than average. One explanation for this is that the supply of recycled ONP and OCC is typically lower during the summer months due to lower collection of materials in recycling programs.

**Table 1**  
**Seasonal Price Indices**

Month	ONP (#8)	OCC (#11)
Jan	89.0%	98.4%
Feb	88.3	101.2
Mar	85.6	101.8
Apr	86.6	91.5
May	104.7	100.6
Jun	104.1	102.6
Jul	101.0	107.9
Aug	103.8	109.2
Sep	113.6	103.1
Oct	113.1	99.9
Nov	109.2	95.9
Dec	101.0	87.9

## Demand Side Factors

Variables reflecting aggregate demand in the US economy, paper/paperboard industry inventory turnover, and export demand for recycled paper explained 99% of the variation in deseasonalized prices for ONP (#8) and OCC in the Puget Sound Region during the months between January 1996 and the present. In addition, export demand was a relatively unimportant driver of ONP price changes during this period, while domestic paper industry inventory turnover was not important for OCC price changes. This reflects the fact that much of the ONP (#8) recycled in the western states is sold to

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domestic deinking mills for manufacturing recycled-content newsprint, with export markets taking a much smaller share of this recycled news grade, while export markets consume a more significant proportion of recycled OCC.

## **Forecasting Demand Side Factors**

Having statistically determined the relationship between ONP or OCC prices and the three demand side influences, there remains the problem of forecasting future levels for these three determinants of recycling prices. This was done by analyzing the historical time series profile of each determinant, as well as by taking into account current predictions by other informed sources.

## **US Aggregate Demand**

Aggregate US economic demand in the model for forecasting recycled paper prices is measured by The Conference Board's (TCB) index of leading economic indicators. This index, which used to be maintained by the US Department of Commerce and is now generated by the private economic research firm The Conference Board, is based on ten economic variables that tend to lead the US economic cycle (manufacturing work week, initial claims for unemployment, new orders for consumer goods and for non-defense capital goods, vendor delivery times, new housing building permits, stock prices, the money supply, an interest rate spread, and consumer expectations).

The leading index is useful in forecasting recycling market prices because it tends to lead market price changes by five to ten months. For predicting price changes within the next few months the forecast model can use actual values of TCB's index of leading indicators, thus eliminating forecasting errors caused by inaccurate predictions for the demand side variables.

The Conference Board's index of leading indicators has trended up since its Janu-

ary 1996 level of 100.6 to a June 1999 value of 107.7. Based on current expectations of continued growth in the US economy, the UnEconomist expects that the index of leading indicators will continue its upward trend for another three years through June 2002 to a level of 114.8. The index then declines moderately for about a year to the 113 level before climbing up to about 116 by the end of 2004.

This forecast for the leading indicators index is rather optimistic, given that the longest period of steady growth in the leading index between 1960 and the present was just over five years during the 1961-66 period. At the same time, since 1981 the index has only once declined by as much as two points. Thus, moderate growth for the next three years appears to be the most likely course for the US economy.

## **Inventory Turnover in the Paper Industry**

Since 1958 monthly inventory turnover, the ratio of monthly sales to inventory, in the paper/paperboard industry has fluctuated between a low of 0.70 and a high of 1.22. In June of this year shipments to purchasers amounted to 80% of average inventory levels. Based on currently increasing operating rates in the US containerboard industry, the expectation that operating rates will continue to trend irregularly upward through 2002<sup>2</sup>, and the fall seasonal pickup in newsprint sales, inventory turnover is projected to increase to a peak of 1.16 in the last half of 2000. Inventory turnover then drops irregularly to 0.72 by January 2004 before beginning its next cycle.

The six years between the cyclical low at 0.78 in December 1998 and the subsequent trough point projected for January 2004, with a projected peak at 1.16 in between, mirrors industry behavior during the past 30 years. During that time there have been five peaks in inventory turnover above 1.13, and five troughs below 0.78.

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## Export Market Demand for Recycled Paper

Since 1987 the US Bureau of Labor Statistics (BLS) has tracked recycled paper export prices in their monthly report on producer price indexes (PPI). The recycled paper export PPI is used to portray export demand for recycled paper. Except for the 1994-95 period when it peaked at 283, the PPI for recycled paper exports has fluctuated between 60 and 145.

The BLS recycled paper export price index is projected to show a dramatic cyclical upswing through the rest of 1999, reflecting renewed vigor in the Asian economies, peaking at about 185 in January 2000. Then it is projected to drop to about 105 by the second quarter of 2001. Between that time and the end of 2004 export prices are projected to complete one moderate cycle, peaking at 145 mid-2003 and falling back to 105 during mid-2004.

## Forecasts for Recycled Paper Prices, 2000-2004

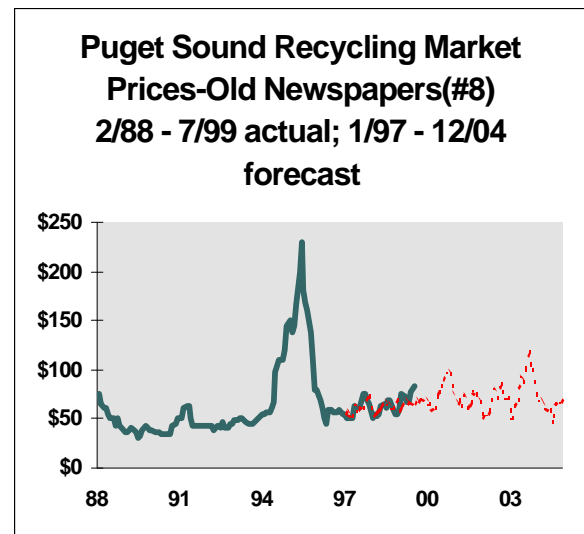
Based on the predictions for the three demand side variables and the estimated effect of supply side forces captured in seasonal indices, Figures 2 through 4 show forecast prices for ONP, OCC and mixed paper in the Puget Sound Region over the period through 2004. The three figures also show historical prices and provide a comparison of actual to forecast for the period between January 1997 and the present.

### The ONP Forecast

Figure 2 shows the prediction that ONP (#8) prices will maintain moderate price levels through early 2000 rather than sustaining the recent price surge. Beginning mid-2000, however, ONP prices are projected to cycle up, reflecting the lagged impact of continued vigor in the domestic economy and higher paper industry inventory turnover, as well as seasonal supply side effects. These three factors drive moderate cycles in ONP prices during 2001 and 2002 as well. The cycle in

ONP prices beginning in early 2003, however, is projected to peak at a higher price point due to complimentary timing in positive movements for TCB's leading index, the lagged effect of a minor peak in paper inventory turnover late in 2002, and seasonal supply side effects.

Figure 2



### The OCC Forecast

Figure 3 shows forecasted OCC prices peaking late summer-early fall and then declining through year end due to the seasonal upsurge in OCC discards. The projected surge in export market prices into early 2000 is expected to cause OCC prices to pick back up briefly. For most of the remaining 2000-04 period, OCC prices are forecast to fluctuate moderately around an average level just above \$100, higher than the \$86 average attained during 1996-98. This is due to the projection of continued moderate economic expansion domestically, with only a slight downturn in 2003, and export prices fluctuating around levels similar to prices during the late 1980s and mid-1997.

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Figure 3

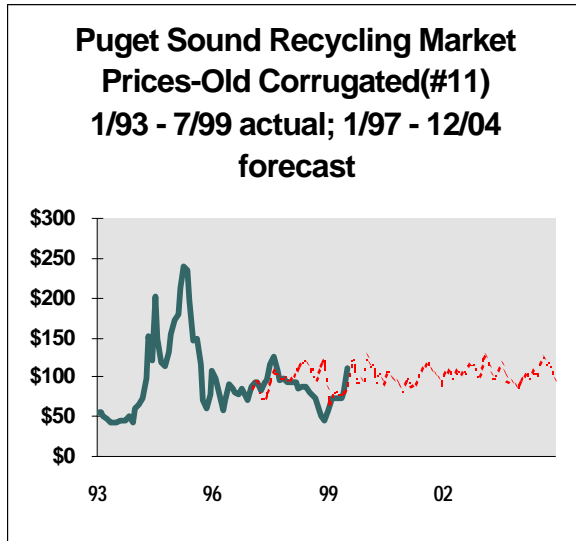
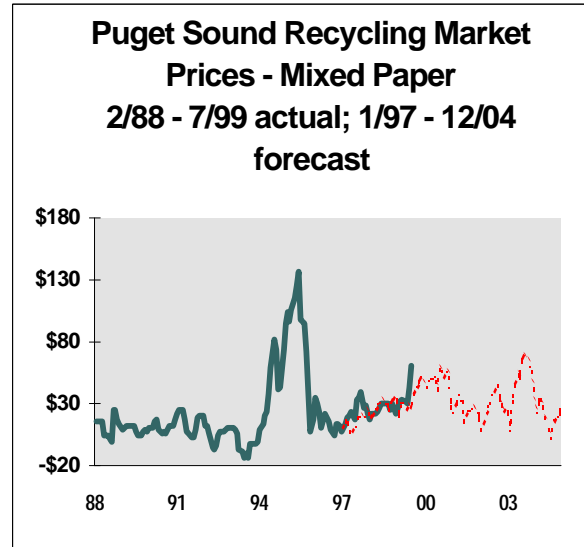


Figure 4



### The Mixed Paper Forecast

Figure 4 indicates that mixed paper prices in the Puget Sound Region through late next year are expected to fluctuate within a range near the \$50 per ton levels attained in recent months. This projection reflects the assumption of continued moderate growth in the domestic economy, strong export markets in Asia, and continuation of the recent upturn in paper industry inventory turnover. In 2001 and 2002 the mixed paper price is expected to cycle at more moderate levels, before rising to a peak of nearly \$70 early in the second half of 2003. As with ONP prices, this higher than normal peak in mixed paper prices is related to complimentary timing in the domestic economic cycle, paper industry inventory cycles, and seasonal supply side effects.

### Actual vs. Forecast – Track Record for January 1997 Through July 1999

The UnEconomist is not aware of other published forecasts of monthly prices for recycled materials. So there is no standard to compare with the forecasting track record for bulk grades of recycled paper displayed in Figures 2 through 4.

Nevertheless, Table 2 provides a comparison of forecast prices versus actual for the 31 months from January 1997 through July 1999. The Table indicates that Sound Resource Management's price forecasts for recycled paper have been very accurate for ONP. ONP's average forecast price was \$62.76 during the thirty-one month period ending July 1999, compared with actual of \$62.44. Only in a few months did the actual ONP price fall significantly outside of a \$10 plus or minus band around the forecast price.

**Table 2**  
**Forecast Versus Actual Paper Prices**  
**1/97 through 7/99**

	ONP	OCC	Mixed
<b>Avg.Price</b>			
Actual	\$62.76	\$85.46	\$27.50
Forecast	\$62.44	\$95.59	\$23.32
Error (\$)	\$0.32	\$(10.13)	\$4.18
Error (%)	0.5%	(10.6)%	17.9%
<b>Price Range</b>			
Actual	\$50-84	\$45-125	\$7-61
Forecast	\$52-73	\$65-122	\$8-34

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The comparison between forecast and actual for OCC is not as good. The annually updated forecast prepared at the beginning of 1998 did not anticipate the crash in Asian export markets for cardboard. As a result, Sound Resource Management's price forecast for 1998 exceeded actual OCC prices by significant amounts, enough to make the thirty-one month average forecast price exceed actual by over \$10, more than 10%.

Finally, forecasted prices for mixed paper were within a reasonable range of actual, averaging \$23.32, just over \$4 below the actual average price of \$27.50 attained during the period between January 1997 and the present. The surge in mixed paper prices in June and July of this year explains almost a third of the \$4 variance between forecast and actual.

## About The UnEconomist

This monthly online newsletter intends to provide insight and analysis on the economics of recycling and the unpriced or underpriced environmental benefits of reducing waste disposal and replacing virgin-content products with products manufactured from recycled materials. Reader feedback is encouraged via email to [info@ZeroWaste.com](mailto:info@ZeroWaste.com), and substantive comments will be published whenever they add to our understanding of recycling.

The UnEconomist will also analyze recycling market prices in the Northwest and Northeast for the eight or nine recyclables tracked by the graphs available online at [www.SoundResource.com](http://www.SoundResource.com).

In addition, The UnEconomist will from time to time report on the accuracy of the five-year, annually-updated recycling price forecasts that are provided on each recycling market price history graph.

Users of the price history graphs should be aware that the data depicted on each graph represent average monthly prices, FOB loading dock, received at large-scale

MRF's in the Northwest and the Northeast for recycled materials processed and packaged to end-use manufacturer specifications. Price averages include both spot market and contract sales.

Subscribers will notice that price histories on our website graphs show more month-to-month price fluctuation than is often reported in trade journal price data. At least one reason for this is that price data reported on Sound Resource Management's website reflect a multitude of actual transactions consummated throughout each month, rather than survey prices obtained from relatively few buyers and/or sellers. Thus, our price data mirror the small but incessant day-to-day changes in recycling market prices, as well as the ever changing contractual agreements between buyers and sellers in recycling markets.

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<sup>1</sup> Charts that appear in the UnEconomist are available in full size, downloadable format in the subscriber section of Sound Resource Management's website at [www.SoundResource.com](http://www.SoundResource.com).

<sup>2</sup> See Bill Moore, "The Paper Trail," *Waste Age*, August 1999, pp. 22-23.