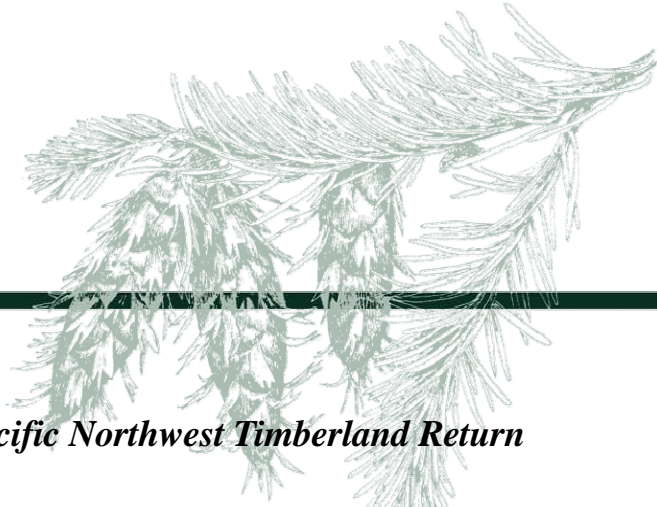


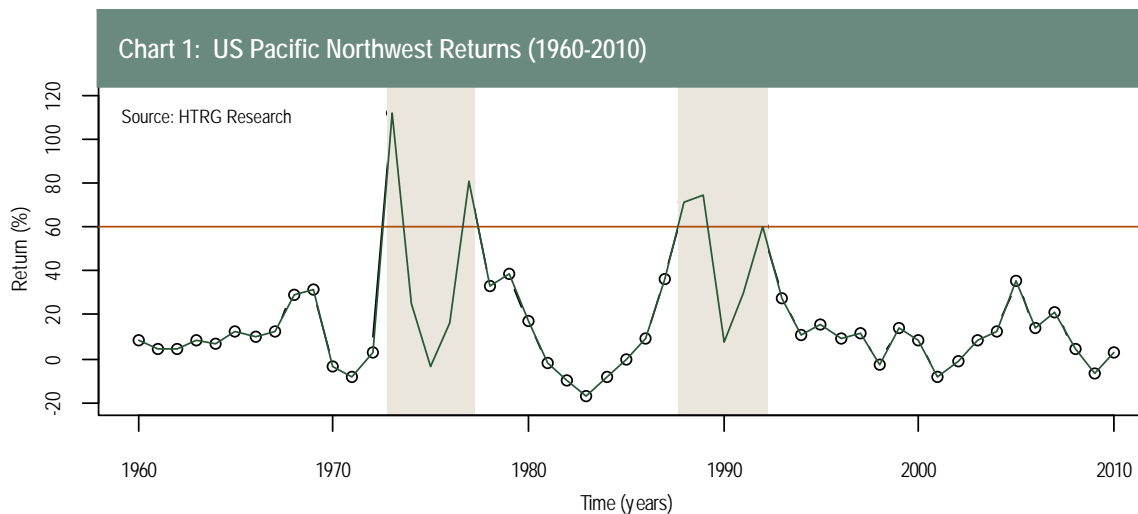
# Hancock Timber RESEARCH *Brief*



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## *Robust Analysis of Positive Outliers in the US Pacific Northwest Timberland Return*

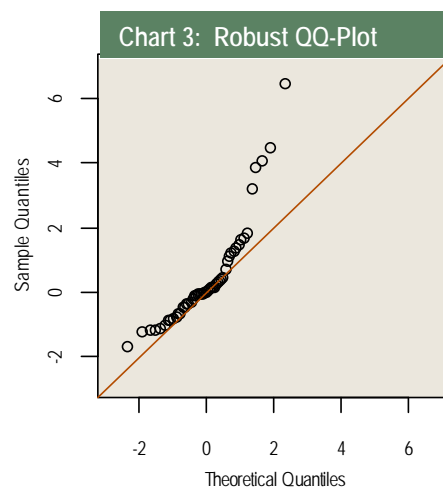
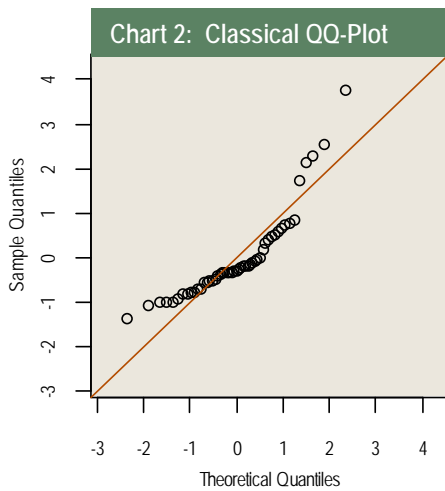
The timberland return series in the U.S. Pacific Northwest shows two periods of returns exceeding 60 percent per year (see Chart 1.) In both instances, the return outliers were caused by unusual, abrupt changes in government policy. In the mid 1970s, anti-inflationary measures by the Fed and optimistic timber demand forecasts by the Forest Service produced a bubble in the Douglas-fir stumpage markets. During the late 1980s and early 1990s, large tracts of public timberland were removed from available supply to protect the northern spotted owl. The reduction in the supply from public lands pushed up timber prices and returns to private timberland owners. With the outliers down-weighted or removed, returns in the U.S. Pacific Northwest are similar to the normally distributed returns in the adjacent British Columbia.



Statistic	Mean	Std. Deviation	Excess Kurtosis	Skewness	Medcouple <sup>1</sup>
Full Dataset	16.99	25.18	6.42	1.78	0.38
Reduced Dataset	10.16	13.61	2.51	0.36	0.14

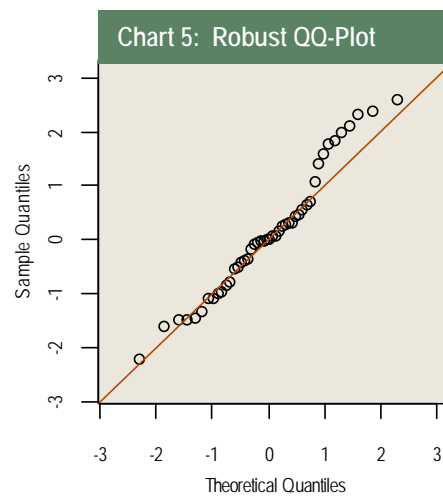
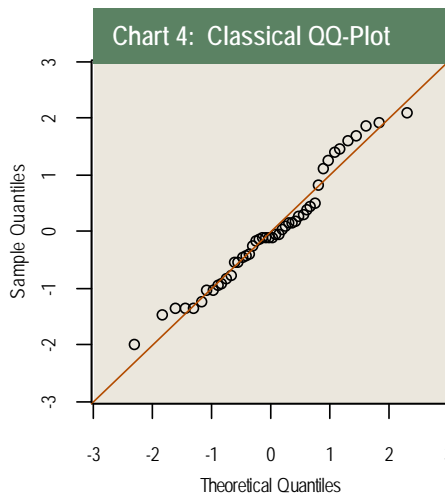
<sup>1</sup>Medcouple is a robust measure of skewness introduced by Brys et al. (2004).

The quantile-quantile (QQ) plots of the full Northwest returns series in Charts 2 and 3 indicate that the dataset is not normally distributed and support the results of classical and robust Jarque-Bera hypothesis tests given in the first row of Table 2.



Charts 2 and 3 : The robust quantile-quantile plot of the complete data provides a more informative visualization of non-normality in the return series.

The QQ-plots in Charts 4 and 5 show that the reduced dataset is nearly normally distributed when outlier returns are excluded. The robust QQ-plot further indicates a slight departure from normality in the right tail of the return distribution. The results of formal tests in the second row of Table 2 show that this departure is not statistically significant, and the hypothesis of normally distributed returns cannot be rejected for the reduced dataset.



Charts 4 and 5: Classical and robust quantile-quantile plots of the returns dataset show that non-normality is nearly removed when the five largest return values are excluded, though the robust QQ plot indicates slight positive skewness.

Table 2: Results of Classical & Robust Tests for Normality		
Test	Classical Jarque-Bera Test	Robust Jarque-Bera Test
Full Dataset p-value	6.155e-12	< 2.2e-16
Reduced Dataset p-value	0.4803	0.5376

References:

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