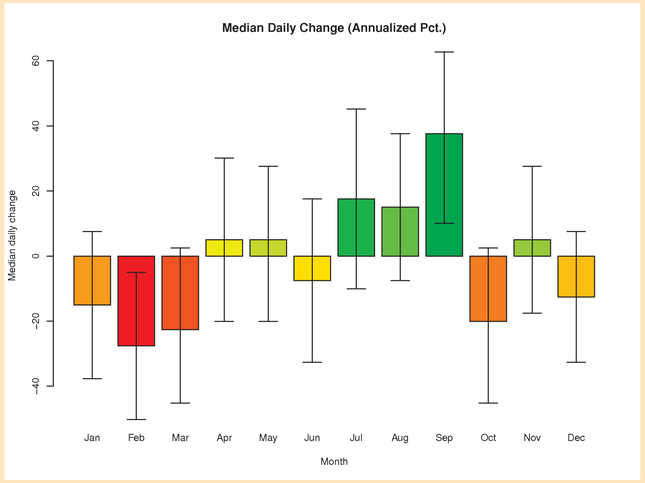
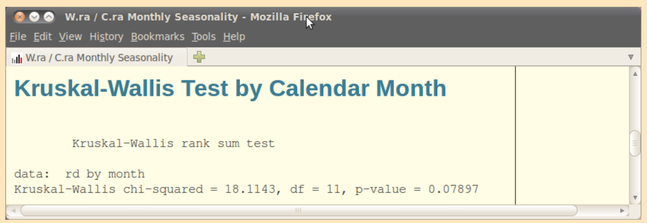
R Analytics for Spread Trading

A *spread* is the difference between the prices of two securities. The statistical properties of some spreads are more predictable than those of the underlying securities. That predictability creates opportunities to trade spreads profitably.

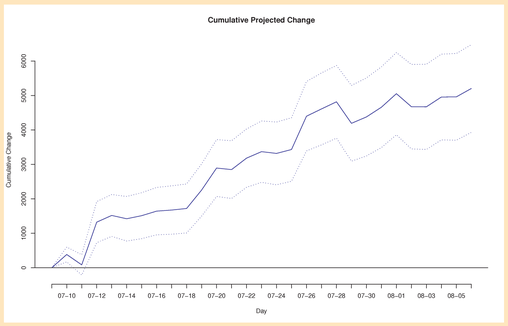
Finding Seasonal Spreads

Some spreads show *seasonal patterns*. Spreads between agricultural products, for example, are affected by annual cycles of planting and harvesting. This box plot, below, is for the spread between wheat and corn prices. It illustrates the median daily change, by month, for the past 20 years. It reveals a clear difference among months, which is confirmed by the non-parametric Kruskal-Wallis test.



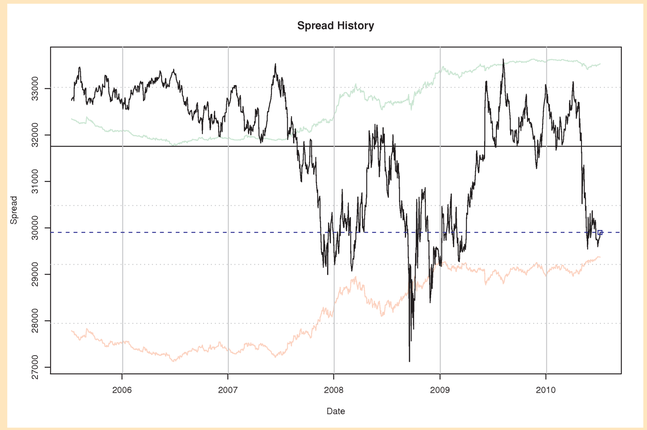


By combining seasonal patterns and recent market data, a linear regression can make a reasonable near-term market forecast, such as this.

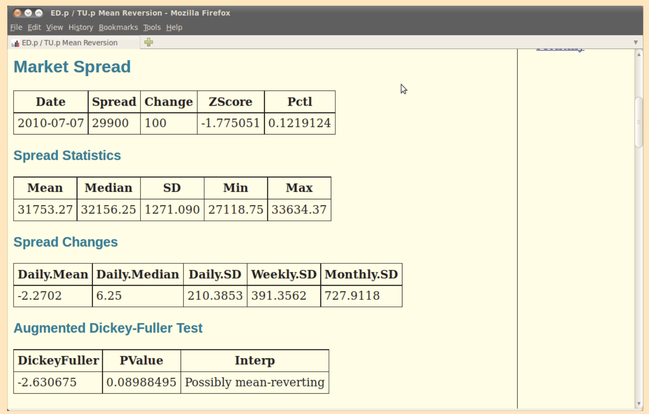


Exploiting Mean Reversion

Some spreads exhibit *mean reversion*, meaning they will likely return to their mean value over time. This creates trading opportunities. When the spread strays too far from its mean, we know the spread's likely direction. This chart shows the history of the ED/TU spread, between Eurodollar futures (a short-term commercial rate) and two-year Treasury note futures. Historically, this is a mean-reverting spread. From the chart, it appears likely to rise soon.

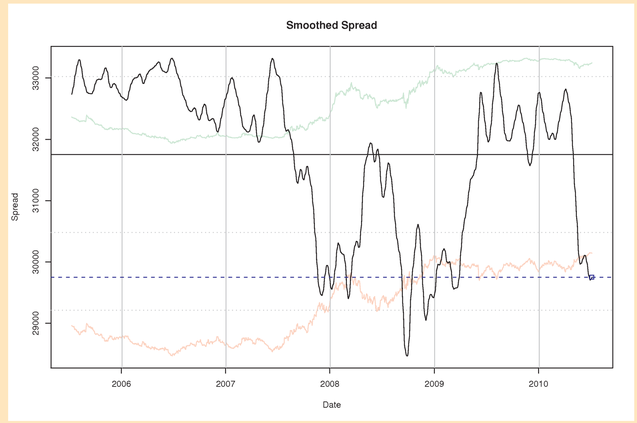


We can confirm the historical mean reversion by applying the Augmented Dickey Fuller test, whose null hypothesis is that the spread is not mean reverting. Here, we reject the null with an attained significance of about 9% for the ED/TU spread.

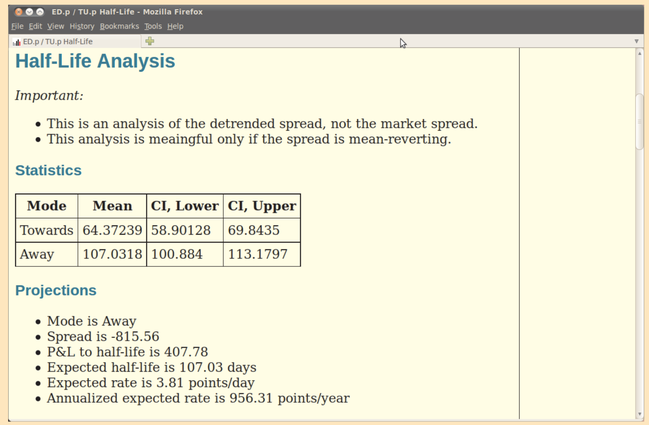


Smoothing & Half-Life Estimation

Market data is quite "noisy." This smoothed data, obtained by kernel smoothing via local polynomials, reveals the market trend, which is useful for making trading decisions.



For mean-reversion trades, a shorter half-life translates into a higher rate of profit. The analysis shown below estimates the half-life from historical data, which is useful for evaluating new trades.



Software infrastructure:

- *R for analytics & graphics*
- *MySQL Database*
- *Apache web server*
- *Perl middleware*

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