Appendix A — Fundamental Analysis

In order to be valuable, any data series or indicator, company data or economic series, must be:
* Timely
* Accurate
* Predictive

There are several issues that complicate use of fundamental economic or company data for trading.

* *Timeliness related to reporting granularity*. Fundamental data is reported annually, quarterly, monthly, or weekly. Trading decisions are made monthly, weekly, daily, or intra-day. If the stock price is reported and acted upon more frequently than the economic indicator is reported, there will be many time periods (data bars) where there is no new data for the economic indicator. In order to have a value to use in calculations, the latest value that does exist will be copied forward until a new value is received. Useful patterns are based on changes in data series. The only time that value can change is on those days when a new report is received.

* *Timeliness related to revision*. Economic indicators, and other fundamental data, are reported, then revised at later dates. When the historical data is retrieved from the data provider, it will usually be a series that consists of only the final revision data. In order to maintain consistency, the data value associated with a given time period cannot be used in the trading system until after the date and time its final revision is published. See Figure A.1, a chart showing the dates associated with the US government GDP report. The GDP report covers the months January, February, and March. The *advance* report is issued at the end of April, the month following the quarter, followed by the *preliminary* report one month later, and the *final* report two months later. In July, the series is *rebased*, adjusting

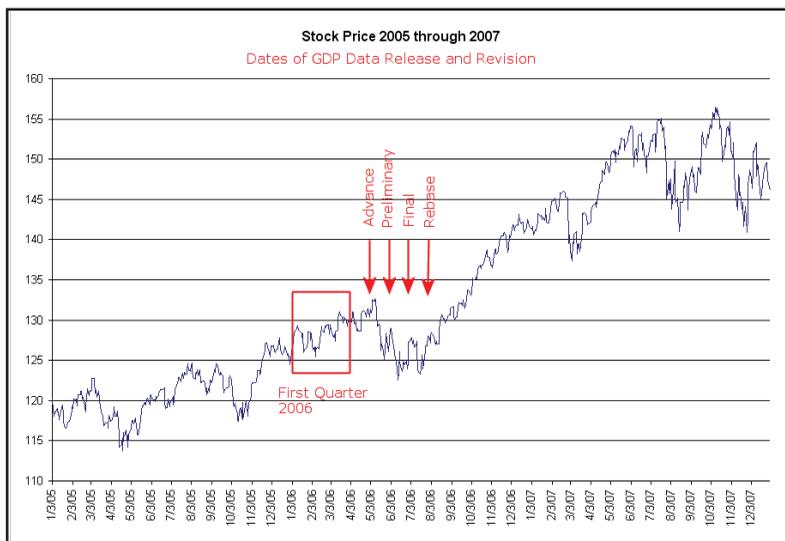and changing all previously reported values.

Figure A.1 Revision history of fundamental data

An alternative is to use a series that consists solely of data initially released, with no revisions or adjustments applied. The trading system would then be based on initial release data rather than final release data. For some series, this is workable. For others, not even the signs of the values published in the preliminary and final reports agree.

- *Accuracy related to revision*. Government statistical series are regularly given annual adjustments, are re-based, and re-benchmarked. Re-basing sets a new date for the base of the index (the date it has a value of, say, 100) and adjusts all data in the series accordingly. Re-benchmarking recalculates the relationship between indicator series, adjusting those that depend on others. Any of these operations result in a revised historical data series, potentially changing patterns and signals.

Corporate data has similar problems:

*   Before about 1980 revisions and restatements of corporate data were unusual — about 3 of the S&P 500 companies each year. Since 1995, and particularly since 2000, revisions have become much more common — about 80 of the S&P 500 in 2002, and more broadly an average of more than one per company per year.[1]

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1   Giroux, Gary, *Business Scandals, Corruption, and Reform: An Encyclopedia*, Greenwood, 2013

* There is the regular use of one-time entries that seriously distort data.
* Corporate reorganization causes data to be revised.

- *Accuracy related to bias*. There is a bias to any reported data. That bias is unknown, and unknowable, to users of the data. Whether the report is unintentionally biased due to an innocent data preparation error or omission, or intentionally misleading, outsiders probably cannot detect the bias, its amount, or its reason. They have little alternative but to accept and use the data as reported. Bias introduces a systematic error into the reported statistic that lasts as long as that particular bias persists.
- *Accuracy related to measurement.* The fundamental statistic reported is the result of subjective interpretation of reports, questionnaires, and interviews. Preparers of these reports must be careful to avoid confusing precision with accuracy. Measurement introduces a random error into the reported statistic.
- *Degrees of freedom*. There are hundreds of series of economic data that could be chosen. Each series has a limited number of data points. Choosing a series risks selection bias. Fitting rules to the few data points risks overfitting.
- *Predictive*. Whether the fundamental data is predictive depends on the strength of the relationship, the efficiency with which the market assimilates the information, and the insight and skill of the developer of the trading system. Remember to follow good modeling and validation practices. Keep enough data reserved for out-of-sample testing. In-sample results are always good and have no value in predicting the profitability of a system when traded on unseen data.

For all of these reasons, it is difficult to incorporate the fundamental data series with the daily, or even weekly, price series representing the trading prices. An alternative is to find surrogate data series such as indexes, ETFs, stocks, or mutual funds that:
- Reflect changes in the fundamental data.
- Represent transactions made in public and reported through a clearing agency.
- Are reported on the same time schedule as the price series being traded.
- Are never revised.

Inclusion of intermarket data, such as interest rates, can be used for broad market timing, or to create filters to permit or block equity trades.

Surrogate data, primarily in the form of sector indexes defined and maintained by financial services companies, can be useful in active trading systems.