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Equipment Finance Market Forecasting

By Blake Reuter

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TRAC Vehicle Leasing

By Edwin E. Huddleson

Terminal rental adjustment clause (TRAC) vehicle leasing is the most popular means of leasing cars and trucks to commercial end-users. Occasionally, criticism and litigation still challenge the true lease status of vehicle leases. This article summarizes the legal and public policy rationale for the TRAC/state laws and demonstrates that the majority of court decisions now recognize the true lease character of these transactions.

Equipment ABS Today: New, Improved!

By Stephen T. Whelan

Securitization of equipment leases and loans is on the upswing. Transaction volume has jumped over the last two calendar years. Moreover, delinquency performance has improved. Based on a recent Foundation study, this article evaluates some potential threats to continued growth of equipment asset-backed securitization.

Equipment Finance Market Forecasting

By Blake Reuter

It is often assumed, but has never really been confirmed, that capital equipment spending (capex) is a driver of equipment finance volume. This article helps validate that assumption and, furthermore, demonstrates that equipment finance volume can be forecasted over the short term using capex and statistical regression techniques.

The role of market intelligence and market research is to provide insights and awareness of trends impacting a company's external market. Understanding markets is critical to sound business planning and execution. This work includes a number of activities such as finding growth opportunities, identifying industry trends, analyzing share, and profiling competitors.

Market sizing is a significant component of market intelligence and is usually difficult to come by in the leasing world. Market sizing is critical because quantifiable market data is necessary to analyze growth and determine share in business planning activities. Of course the key to market sizing is the availability of market data and the use of analytics to gain an understanding of market implications suggested by the data. Projecting markets into the future is challenging, but where historical data is available, statistical forecasting can be used.

This article discusses market sizing in the equipment finance industry, provides insight regarding underlying relationships in the industry, and introduces a statistical forecasting model to project the equipment finance market into the short-term future. In this context *short-term* is defined to be two to four quarters into the future, depending on the frequency of the business planning cycle. The key relationship to be examined is the impact of capital equipment spending on the direction of the equipment finance market.

THE EQUIPMENT FINANCE MARKET

In 2014 U.S. businesses, nonprofits, and government agencies made capital expenditures of about $1.5 trillion in plant, equipment, and software. The equipment finance portion of the total capital expenditures excluding structures, referred to as capex, was about $1 trillion in 2014.[1] The equipment finance market is comprised of many transactions ranging from micro-ticket to large ticket, where the majority falls within the small-ticket and middle-ticket categories. These transactions include many equipment types with some of the most popular being agriculture equipment, construction machinery, computers, trucks, and industrial machinery.

About 62% of the $1.5 trillion, or approximately $900 billion, is financed through loans, leases, and lines of credit according to the Equipment Leasing and Finance Association (ELFA).[2] Although undocumented, capital equipment spending (capex) has been considered an indicator of equipment lease and loan market direction.

The parameter used to characterize equipment finance market growth is new business volume, which represents the dollar value of all lease and loan equipment transactions made in a specified period of time. Determining lease and loan equipment finance market direction requires the use of sample surveys along with estimating and analytical modeling. The equipment finance market is unlike the leveraged loan market, where actual industry transactions are available in an accessible database, which includes volume by individual competitor.

DATA SOURCES

The best data source for historical new business equipment volume is the Monthly Leasing and Finance Index (MLFI-25) data available at www.elfa-online.org. The MLFI data is submitted monthly by 25 equipment finance companies that provide equipment leases and loans. These companies represent a good cross section of the equipment finance industry and include banks, captives, and independents.

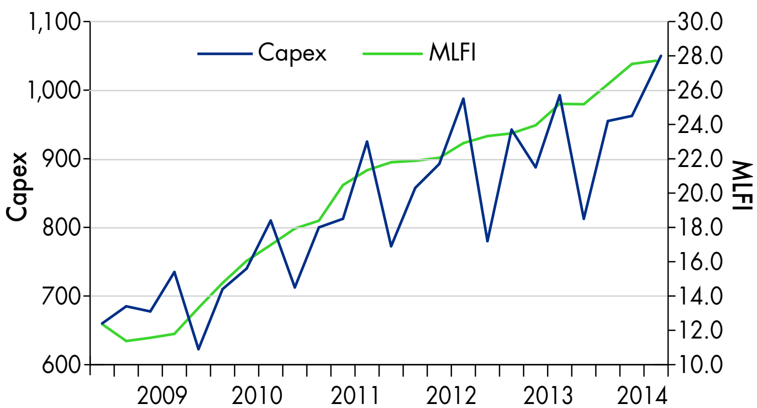
Quarterly capex data can be found on the U.S. Bureau of Economic Analysis (BEA) website[3] in Table 1.1.5, Gross Domestic Product (GDP). Capex is a component of GDP, and the GDP table of quarterly information including capex is refreshed every month, with the third month of the quarter being the most complete view. Also, BEA makes a comprehensive retroactive adjustment to the GDP table in its July report.

Figure 1 provides a graphical display comparing quarterly MLFI new business volume and quarterly capex spending.

A review of Figure 1 provides the following insights regarding the relationship between MLFI and capex:

- MLFI and capex show very similar trend lines from 2009 through 2014.
- MLFI volume growth is more volatile than capex growth, which is not too surprising due to the sheer size of equipment capex spending.
- MLFI data exhibits a consistent seasonality trend where the fourth quarter volume is always the highest, the first quarter volume is always the lowest, and the second and third quarters are in the middle and relatively close to one another.

Figure 1. Comparison of Quarterly MLFI Volume With Quarterly Capex Spending



Source: U.S. BEA, Table 1.1.5, Gross Domestic Product (June 2015) and ELFA MLFI data (June 2015).

These insights provide the basis for building a statistical forecasting model.

FORECASTING

Fitting a curve to data using statistical regression techniques provides a methodology to project a time series into the future. The forecasting model can take different forms, but the most common is a linear relationship between the variable being forecasted (i.e., the dependent variable) and the explanatory or independent variable(s). This forecasting methodology is known as causal forecasting. The steps in the methodology include the following:

- Plot the time series to look for relationships between dependent and potential independent variable(s) and compute correlations to evaluate relationships.
- Run statistical software with the dependent variable and potential independent variable(s) time series to explore possible regression equations.
- Evaluate potential independent variables using statistical measures and finalize the regression equation.
- Input forecasts of the independent variable(s) into the regression equation to calculate future values of the dependent variable.
- Test the model by backing off a sample of recent data points to see how well the model predicts the future.

In this application a multiple linear regression model is introduced with MLFI volume as the dependent variable, capex as one independent variable, and a seasonality factor as the other independent variable. (See Table 1 for complete time series data.)

Performance of the forecasting model can be measured in the following ways:

- Compare projections from the forecasting model with actuals and compute a forecasting error. (Table 2 shows model forecasting performance results, comparing actuals and forecasts from the model for the first quarter of 2015, using data from 2009 to 2014.)
- Compute statistical measures that determine the "goodness" of the fitted data, as shown in Table 3.

> The forecasting model can take different forms, but the most common is a linear relationship between the variable being forecasted (the dependent variable) and the explanatory or independent variables.

- Create a graphical display comparing the actual and fitted data. (See Figure 2.)

The small forecasting error in Table 2 helps validate the use of the model for forecasting purposes. Also, the linear regres-

Table 1. Time Series Data

Year/quarter	Dependent variable MLFI volume ($B)	Independent variables	
		Capex ($B)	Seasonality factor
2009:1	12.4	659.0	1
2009:2	13.4	634.4	2
2009:3	13.1	639.1	2
2009:4	15.4	644.8	3
2010:1	10.9	682.7	1
2010:2	14.4	719.0	2
2010:3	15.6	751.2	2
2010:4	18.4	774.4	3
2011:1	14.5	798.3	1
2011:2	18.0	809.7	2
2011:3	18.5	861.7	2
2011:4	23.0	883.3	3
2012:1	16.9	894.9	1
2012:2	20.3	897.1	2
2012:3	21.7	901.4	2
2012:4	25.5	922.8	3
2013:1	17.2	933.1	1
2013:2	23.7	937.0	2
2013:3	21.5	948.8	2
2013:4	25.7	980.0	3
2014:1	18.5	979.5	1
2014:2	24.2	1008.6	2
2014:3	24.5	1038.2	2
2014.4	28.0	1042.9	3
2015:1 Forecast	21.8	1053.1	1
2015:1 Actual	21.7		

Source: U.S. BEA (Report 1.1.5, June 2015) and ELFA MLFI data (June 2015)

Table 2. Comparison of Actual and Projected MLFI Volume ($B)

Category	Value
Actual	21.70
Forecast	21.82
% forecasting error	0.6%

Source: Model forecast, ELFA MLFI data (June 2015).

Table 3. Statistical Measures

Forecasting equation: MLFI = -11.9 +.0291 (Capex) + 3.07 (Seasonality factor)

Measure	Value	Description
R-squared / Adjusted R-squared	96.2 / 95.8	R-squared reflects the explained variation divided by the total variation due to the fitted model. A value close to 100 would be expected for "a "good" forecasting model. Adjusted R-squared also indicates how well terms fit a curve or line, but the statistic adjusts for the number of terms in a model. Adding additional terms will actually improve R-squared simply because of the addition of more independent variables.
s	0.98	s, the standard error of the estimate, is a measure of variability about the fitted regression function. The lower the s value, the better the fit.
t statistic		The t statistic is used to determine if the regression coefficients are statistically significant. A sizable value indicates statistical significance (In general, t > 2 or t < -2 where n > 30.)
– Constant	-8.58	
– Capex	18.67	
– Seasonality factor	10.73	
F statistic	264.1	The F statistic is used to test the overall significance of the regression model. A large F value suggests the model is statistically significant (In general, F > 4.)
Durbin-Watson statistic	1.91	The Durbin-Watson (D-W) statistic tests for auto correlation in the residuals of a fitted model. The statistic ranges from 0-4 and a value of 2 indicates no serial correlation.

Source: Author, using Minitab.

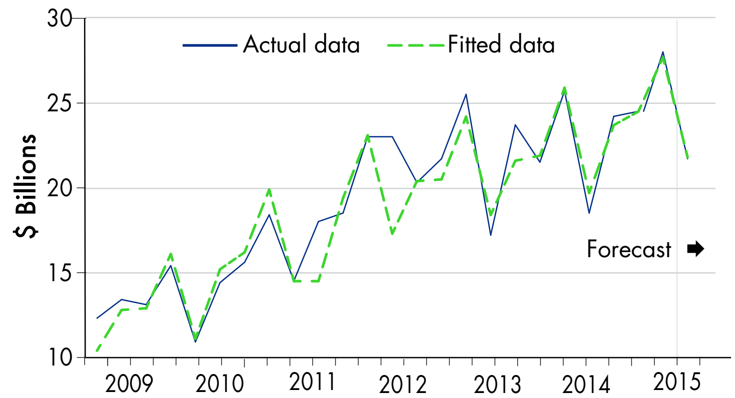
Note: In a perfect model a scatter diagram of residuals vs. fitted values shows a pattern of alternating positive and negative values with no autocorrelation. In this application there is a slight trace of autocorrelation.

sion statistical measures shown in Table 3 are equally impressive. For instance, the R-squared and adjusted R-squared statistics are 96.2 and 95.8, respectively.

The graphical display shown in Figure 2 best illustrates the effectiveness of the fitted curve to match the actual MLFI data. In forecasting parlance the capex variable picks up the overall MLFI trend, and the seasonality factor accounts for the seasonal

Figure 2. Actual Versus Fitted MLFI Volume

Forecasting model: (MLFI) = -11.9 + .0291 (Capex) + 3.07 (Seasonality factor)



Source: ELFA MLFI data (June 2015), fitted model with forecast.

Based on all these results, the forecasting model passes the test: the forecasting error is small, the statistical measures are solid, and the actual and fitted data are very much in sync.

variation around the trend. Figure 2 shows the forecasting equation, actual and fitted historical MLFI volume data, and the forecast of the first quarter of 2015.

Based on all these results, the forecasting model passes the test: the forecasting error is small, the statistical measures are solid, and the actual and fitted data are very much in sync. Also, the results suggest that capex, along with the seasonality factor, is a strong indicator of MLFI new business volume.

USING THE MODEL

In order to produce MLFI forecasts, the capex data must be forecasted. Such forecasts are available from companies that produce macroeconomic analysis and reports. The capex data is available quarterly and is based on the macroeconomic expertise of the supplier firm. If that data is not available, another class of forecasting models called exponential smoothing could be used to forecast capex. Also, the seasonality factor needs to be applied to complete the forecasting process. Details are shown in Table 4.

Table 4. Seasonality Factor

For both the historical and forecast periods, the seasonality factor is determined by assigning 1 to the first quarter, 2 to the second and third quarters, and 3 to the fourth quarter.

Quarter	Seasonality factor
First	1
Second	2
Third	2
Fourth	3

Source: Author.

An important consideration is the length of the forecasting period. In this application, with only 24 quarters of actual data, the forecasting period should be limited to between two to four quarters into the future, although there is no hard and fast rule in this regard. Of course the forecasting period can be expanded as additional historical data becomes available.

Equally important is that every year in the July report, BEA makes a complete retroactive adjustment to the GDP components, including capex. All the data used in this article reflects the capex time series prior to the July 2015 adjustment. In practice, if it fits in with a firm's annual planning cycle, the model should be refreshed at midyear, using the adjusted capex data from BEA.

CONCLUSION AND ADDITIONAL THOUGHTS

As part of the business planning process, it is important for a firm to know where its external market is heading. Sizing an external market is integral to business planning and strategy development. The sizing exercise provides an overall framework to lay out a growth strategy and develop tactical initiatives such as share analysis pricing, business development, and new product development.

Using a statistical-based approach provides consistent, systematic forecasts of the market. In this application, projected MLFI volume growth rates serve as a good indicator of overall equipment finance market growth. A company can compare its internal volume growth projections with the external equipment finance market projections.

A final question: could the same approach be used to predict an individual company's new business volume? Probably not, since individual company new business volume is generally even more volatile than the MLFI market volume.

However, a similar approach could be investigated. Resident within BEA's supplemental accounts is Table 5.5.5.U, Private Fixed Investment by Equipment Type. This table includes estimated quarterly capex associated with 25 equipment types such as computers and peripheral equipment; construction machinery, metalworking machinery, and medical equipment. An individual company could use the table to select equipment types within its target market and compare the resultant quarterly capex with its own quarterly new business volume associated with those same equipment types. Testing for correlation and building a forecasting model would follow to see whether the information could be used for forecasting individual company volume.

George Box, the famed statistician who produced pioneering work in time-series analysis, wrote that "essentially, all models are wrong, but some are useful."[4] Hopefully, the topics discussed in this article will prove useful to the equipment finance industry. In view of Box's comment, it is worthwhile to consider some additional aspects encountered in this forecasting application:

- In addition to capex, other macroeconomic variables, such as industrial production and durable goods orders, were evaluated as possible independent variables. However, none of these variables produced the strong forecasting performance of the capex and seasonality combination.
- A one-quarter lead-lag relationship between capex and MLFI volume was evaluated. Such an approach would

> With its economic stability, the 2009 through 2014 period does produce strong forecasting performance, which might not be the case with an expanded historical period, where capex becomes more volatile.

enable MLFI volume quarterly prediction from the last historical capex data point. Although there is some value in this approach, there was a decrease in statistical significance and forecasting accuracy. The coincident data approach was considered a better option.

- The capex data in this analysis is mostly monotonically increasing with time. It raises the question of whether time itself could be used as an independent variable instead of capex. The difficulty with the approach is in the forecasting period. Time can only increase, which forces the MLFI volume forecast to always increase, which is not the case with using capex as an independent variable. If the capex forecast decreases, the MLFI volume forecast will decrease.
- Because this model is designed for short-term forecasting, the time frame selected is 2009 through 2014. The thinking is that the more recent past is more representative of the short-term future than a longer time frame. In fact, this is the logic behind exponential smoothing models. However, for a longer look into the future, an expanded time frame would be appropriate, and this expansion would pick up the recession years. With its economic stability, the 2009 through 2014 period does produce strong forecasting performance, which might not be the case with an expanded historical period, where capex becomes more volatile.
- Building forecasting models based on percentage change is more difficult, due to data volatility, than building models which forecast levels, as was done in this article. Theoretically, if a percentage change model could be constructed, it would have the potential to predict turning points when the percentage change was forecasted to be less than zero. However, in practice some combination of explanatory variables, or perhaps a lead-lag relationship, would still be needed to predict a turning point. Note that the model based on forecasting levels presented in this article would show a turning point, if it is built into the capex forecast provided by economists.

Acknowledgments

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Endnotes

1. Technically, the term *capex* includes both equipment and structures. However, in this article it is defined to be equipment capex only.

2. See Equipment Leasing and Finance Association (ELFA) website, www.elfaonline.org.

3. See U.S. Bureau of Economic Analysis website, www.bea.com.

4. George E.P. Box and Norman Draper, *Empirical Model-Building and Response Surfaces* (New York: Wiley, 1987), 484.

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