CME Group

Impact of Economic Indicators

JULY 9, 2013

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Many factors impact upon the price performance and level of participation in any marketplace. But the most fundamental of factors may be found in the fundamentals! In other words, we may look towards basic supply and demand indications in our markets as generally guiding price performance and market participation.

For purposes of this study, we focus on the impact of various economic indicators upon the performance of "flagship" CME Group products. Specific products of interest include E-mini S&P 500 futures ("ES"), Eurodollar futures ("ED") and 10-year Treasury note futures ("TY"). These products represent primary benchmarks for domestic equity values, short- and long-term interest rates, respectively. The kinds of fundamental market indicators that drive these benchmark products may be found in a variety of economic indicators that describe the ebbs and flows of our economy.

There are, of course, many economic indicators released by a variety of U.S. government agencies and private sources. Each measure varies in popularity in the public view. The most significant and widely followed of economic indicators include Non-Farm Payrolls (NFPs), Gross Domestic Product (GDP), Housing Starts, the Institute for Supply Management (ISM) Index, Retail Sales, Industrial Production and the Core Consumer Price Index (CPI) excluding food and energy prices.

The purpose of this study is to achieve an understanding of the impact that these most significant of economic indicators have had on CME Group flagship products. In particular, we examine the impact upon trading volume, volatility and directional price movement.

Why These Indicators?

There are many indicators on which this study could have focused. The degree to which the marketplace focuses on one or another indicator is subject to change over time and as a function of monetary and fiscal policy.

In today's marketplace, most analysts agree that the Bureau of Labor Statistics' (BLS) monthly release of NFPs stands out as the single most significant economic release. NFP is anxiously anticipated because it is followed closely by the Federal Open Market Committee (FOMC) which attempts to balance inflationary pressures against economic growth. It is released on the first Friday of each calendar month and, therefore, represents a timely release that speaks to activity in the prior month.

But in the 1980's when Paul Volcker served as Fed Chairman, the most anxiously anticipated economic indicator was the monthly release of money supply figures, notably in the form of M1. Mr. Volcker will be remembered for directing the Fed and the nation through an extremely difficult period when inflation had soared into double digit figures. Money supply targeting, as measured by M1, became the prime tool in the Fed's fight to control inflation.

Grading the Indicators

In order to obtain a rough appreciation for the significance of various economic indicators, we consulted internet. One internet blog site rank ordered the significance of economic data as indicated in the table below.

Each indictor is accorded a grade ranging from A to D. We selected seven widely followed economic indicators that generally dominated the top of the list as highlighted in our table.

Forecast Error

The financial marketplace studies all of the subject indicators closely to determine likely implications for the state of the economy and impact upon equity values and interest rates. As a general rule, a robust number that portends of a strong economy may cause equity values to advance; and, interest rates to advance (fixed income instrument prices to decline). On the other hand, one would expect that an economic release that portends of a weaker economy may cause equity values to decline; and, interest rates to decline (prices to advance).

But the marketplace generally anticipates economic indicators and acts accordingly in advance of the actual release. Frequently, a consensus or forecast figure is reported that indicates the general expectation regarding the level of an impending release.

Thus, it is the divergence between that forecasted figure and the actual release - or the "forecast error" or the "surprise" - that may be most important in causing the marketplace to react by bidding market prices upwards or offering them downwards.

Grading Economic Indicators

Economic Indictor	Rating
Non-Farm Payrolls (NFP)	A
GDP	A
New Home Sales	B
Housing Starts	B
ISM Index	B
Retail Sales	B
Personal Income and Outlays	B
Industrial Production	B
Core CPI	B
Weekly Initial Unemployment Claims	B
Philly Fed Index	C
NY Fed Empire State Manufacturing Index	C
Chicago PMI	C
Durable Goods	C
ISM Non-Manufacturing Index	C
Case Shiller Housing Prices	C
NAR Existing Home Sales	C
NAHB Housing Market Index	C
Trade Balance	C
MBA Mortgage Delinquency Data	C
LPS Mortgage Delinquency Data	C
CoreLogic Negative Equity Report	C
AIA Architecture Billings Index	C
Reis Office, Mall Apartment Vacancies	C
NMHC Apartment Survey	C
Reuters/Univ of Mich Consumer Confidence	D
MBA Mortgage Purchase Applications Index	D
BLS Job Openings and Labor Turnover	D
Construction Spending	D
Housng Vacancy Survey	D
Senior Loan Officer Survey	D
AAR Rail Traffic	D
ATA Trucking	D
Ceridian-UCLA Disel Fuel Index	D
NFIB Small Busienss Survey	D
Fed Flow of Funds	D
STR Hotel Occupancy	D
CRE Prices	D
Manufacturers Light Vehicle Sales	D
NRA Restaurant Performance Index	D
Fed Consumer Credit	D
DOT Vehicle Miles Driven	D
LA Port Traffic	D
BLS Producer Price Index	D
ADP Employment Report	D
Conference Board Confidence Index	D
NAR Pending Home Sales	D

Source: www.calculatedriskblog.com

E.g., the www.briefing.com website published a "consensus" value for April 2013 NFPs, released on May 3, 2013 at +155,000 jobs. The reported or actual figure was at 165,000 jobs. Thus, the forecast error was 10,000 jobs.

Comparing the actual reports to the consensus figure as reported by www.briefing.com, we may identify the average absolute forecast error from January 2007 through May 2013 per the following table.

Absolute Average Forecast Error
(Jan-07 thru May-13)

	Average Absolute Forecast Error	Unit
NFP	51.7	Change in Thousands
GDP	0.297%	Quarterly % Change
Housing Starts	44.1	Thousand Units
ISM Index	1.562%	Index Points
Retail Sales	0.405%	Monthly % Change
Industrial Production	0.336%	Monthly % Change
Core CPI	0.065%	Monthly % Change

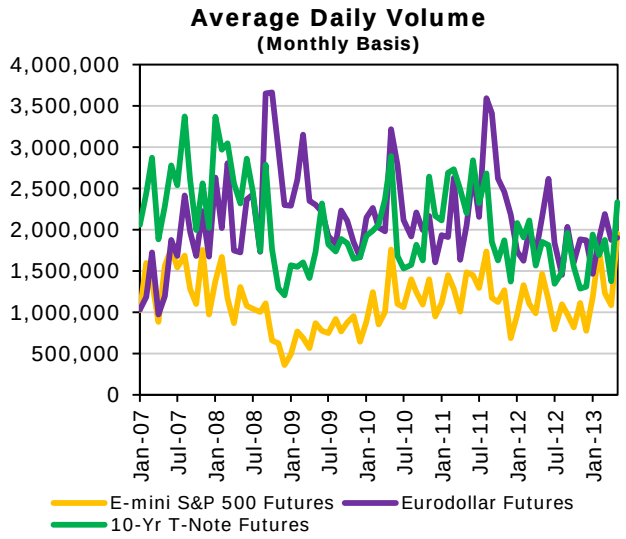
This study is focused on the effect that these forecast errors have upon daily trading volume; volatility as measured by the daily high-low range; and, market direction as measured by the close-to-close price movement in the context of E-mini S&P 500 futures, Eurodollar futures and 10-year Treasury note futures.

Trading Volumes

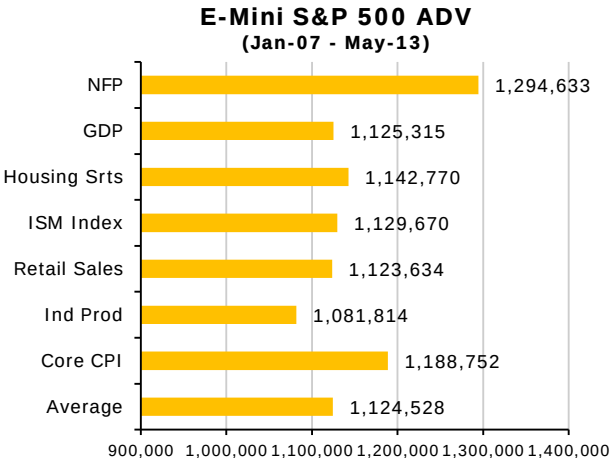
Just as the significance of various economic indicators is "era-specific" as discussed above, trading volumes likewise should be assessed in context of current trends and conditions. *I.e.,* in order to differentiate extraordinary from average volume during the course of any particular trading session, we might compare that daily volume to "typical" volume in the surrounding time period.

Thus, we will reference daily volume in contrast to average daily volume observed during the entire calendar month during which an economic indicator is released. Note that volume in the three markets has fluctuated rather sharply from January 2007 through May 2013 as indicated in our graphic.

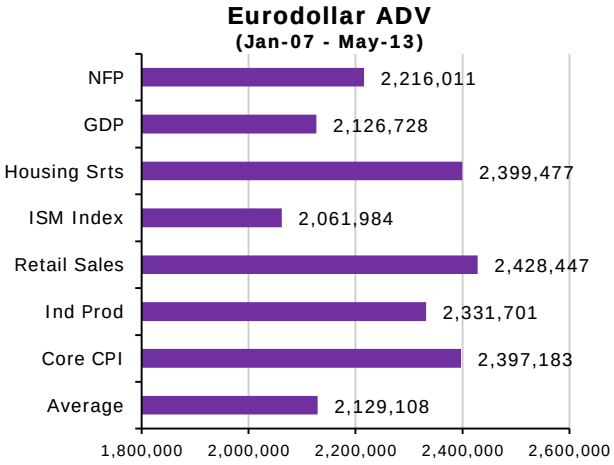
As a first pass, we may identify the average daily volume (ADV) on the release dates for our seven indicators vs. average daily volume during the calendar month in which the indicator was released. E-mini S&P 500 futures ADV is seen at 1,124,528 during the entire period from January 2007 through May 2013.



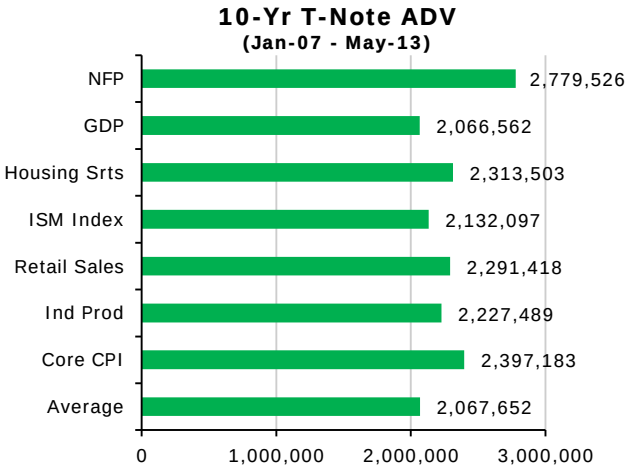
By comparison, we see that volume on NFP release dates averaged 1,294,633. This is followed by volume on the release of Core CPI, Housing Starts, the ISM Index, GDP, Retail Sales and Industrial Production. Interestingly, volume on Retail Sales and Industrial Production release dates actually averaged less than overall average volumes.



Unexpectedly, NFPs seemed to exert less impact on Eurodollar volumes. Eurodollar volume averaged 2,129,108 per day from January 2007 through May 2013. But the average volume on NFP release dates was just a bit higher at 2,216,001. Of greater apparent significance was Retail Sales, followed by Housing Starts, Core CPI and Industrial Production. Of less apparent significance was GDP and the ISM Index.

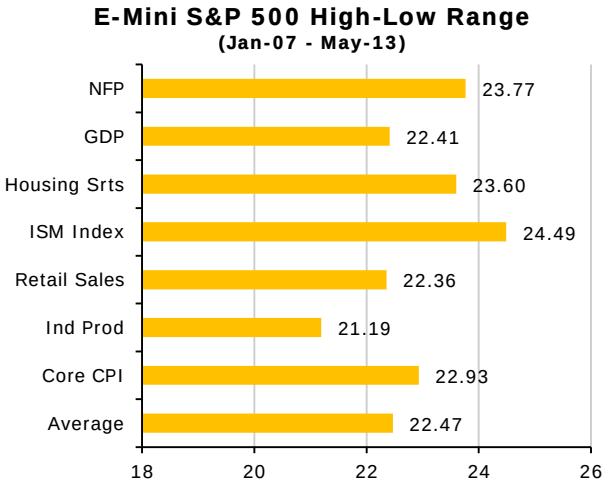


Our results for 10-year Treasury note futures were somewhat more in line with expectations. Volume on NFP release dates averaged 2,779,526 contracts, compared to average volume of 2,067,652. Trailing behind NFPs were Core CPI, Housing Starts, Retail Sales, Industrial Production, the ISM Index and GDP.



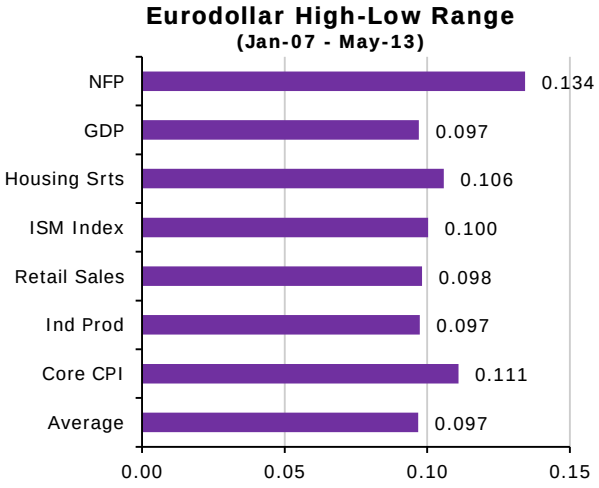
We might explain the apparent lack of responsiveness and uneven results in the context of Eurodollar futures to prevailing conditions during the time period in question. In particular, the Fed has held the target Fed Funds rate at 0-25 basis points since 2008. Further, the Fed has generally made it clear that further economic recovery is still required before they will consider tightening monetary policy.

To the extent that the short-end of the yield curve is generally anchored by Fed monetary policy, the periodic release of economic data points may exert little impact upon market expectations of Fed policy. By contrast, the long-end of the yield curve, as an historic matter, is said to be driven by market expectations regarding economic growth and inflation. Thus, 10-year Treasury notes may be much more reactive to economic releases, certainly in more recent years since the Fed pushed the target Fed Funds rate down to near zero.



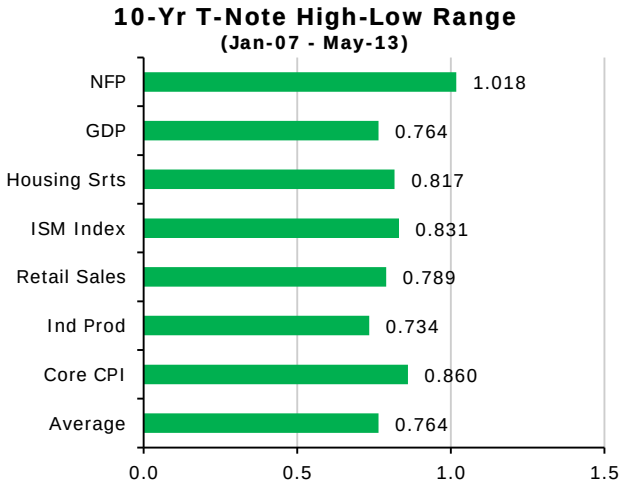
High-Low Range

A simple and intuitive measure of volatility is found in the daily high-low range. We might compare the average high-low ranges observed in each marketplace of interest to the average high-low range over the entire period under study to assess the impact of our economic indicators.



The average daily high-low range in E-mini S&P 500 futures during the period January 2007 through August 2013 was 22.47 index points. Volatility seems to be most dramatically impacted by the release of the ISM Index, followed by NFPs, Housing Starts and Core CPI. Volatility on the release of GDP, Retail Sales and Industrial Production was actually less pronounced than the observed average.

Eurodollar volatility was most heavily impacted by the release of NFPs, followed by Core CPI, Housing Starts, the ISM Index, Retail Sales, GDP and Industrial Production. [1]



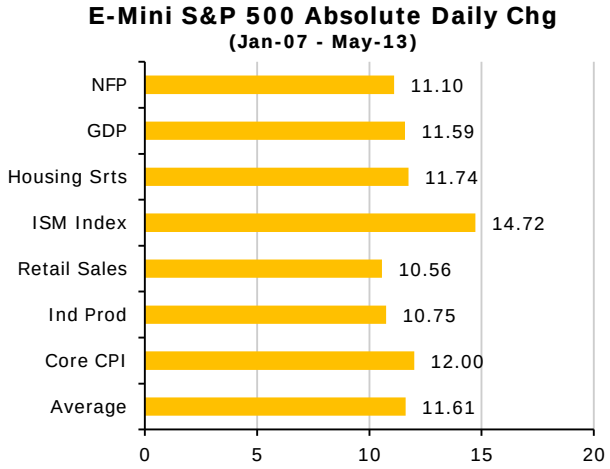
Volatility in 10-year Treasury note futures was most heavily influenced by the release of NFPs, Core CPI, the ISM Index, Housing Starts, Retail Sales and GDP. Volatility upon the release of Industrial Production figures fell slightly below the average.

Absolute Daily Change as Volatility Measure

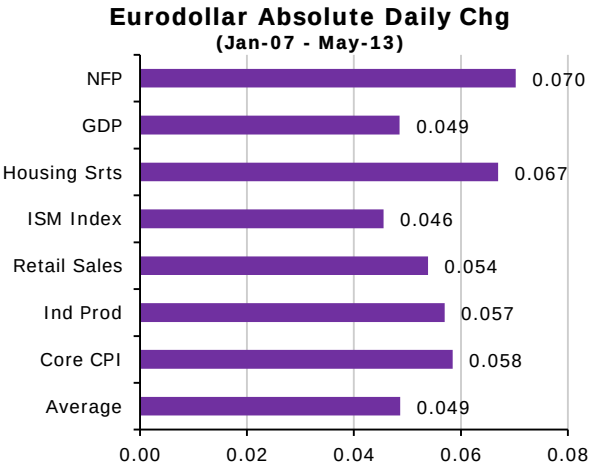
Volume is referenced as a general indication of trading interest while the high-low range may be

[1] We reference high-low ranges and price action in the 5th quarterly Eurodollar futures contract while we reference the 1st nearby futures contract in E-mini S&P 500 futures and 10-year Treasury note futures. Eurodollars attract significant activity in deferred contracts and are listed 10 years into the future. To the extent that Fed policy anchors the short-end of the yield curve where Eurodollars generally reside, one might look out to deferred contract months rather than nearby contract months to see any significant price movement in a generally static monetary policy environment. But most futures including stock indexes and longer-term interest rate futures trade most activity in nearby months.

used as a general indication of volatility. We further reference the absolute close-to-close price movement as another indication of volatility. Finally, outright close-to-close price movement is considered as an indication of directional price reaction to the release of economic indicators.



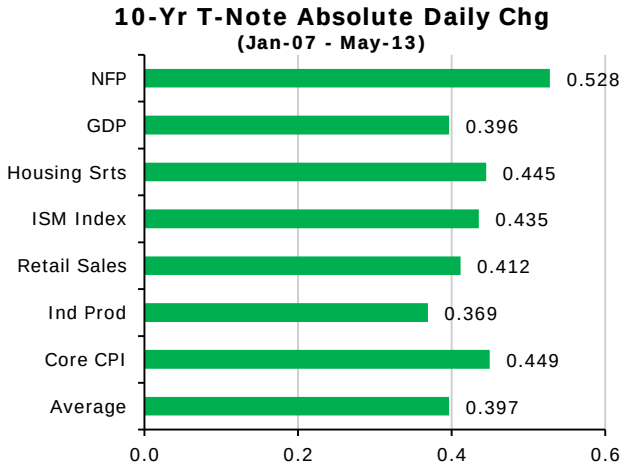
Referencing the absolute daily change in price from close-to-close as a volatility indicator, we see that the ISM Index, Core CPI and Housing Starts seemed to exert the most influence upon volatility in E-mini S&P 500 futures. Absolute close-to-close price movements fell below average on the release of GDP, NFPs, Industrial Production and Retail Sales. Eurodollars were most sensitive to the release of NFPs followed by Housing Starts, Core CPI, Industrial Production, Retail Sales and GDP.



10-Year T-note futures reacted most sharply to the release of NFPs, Core CPI, Housing Starts, ISM Index and Retail Sales.

Daily Change as Directional Indicator

In order to assess the impact of our economic indicators upon price direction, we examined the outright forecast error in each indicator and compared that to the outright close-to-close price movement in each market. We apply a single variant ordinary least-squares or regression analysis to test correlations and significance of economic indicator forecast error on directional price movement.



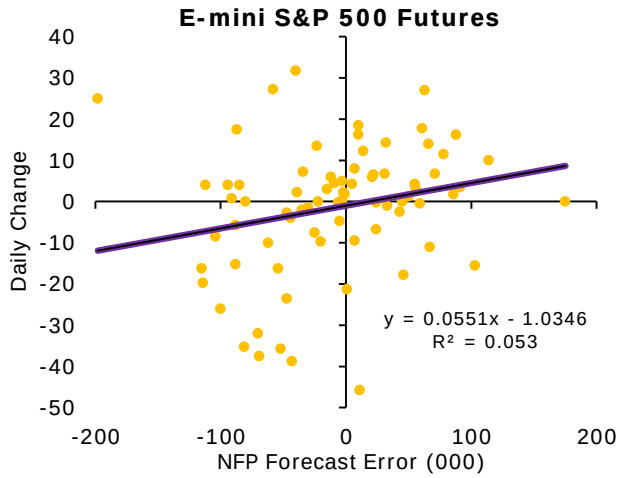
Focusing on the impact of NFPs on E-mini S&P 500, Eurodollar and 10-year T-note futures, we may construct simple scatter diagrams as shown in our graphics.

As suggested above, we expect that positive forecast errors, *i.e.,* situations where the release is stronger than expected, might generally result in rising equity values and rising interest rates (falling prices). Similarly, we expect that negative forecast errors, i.e., where the release is weaker than expected, will result in declining equity values and declining interest rates (rising prices).

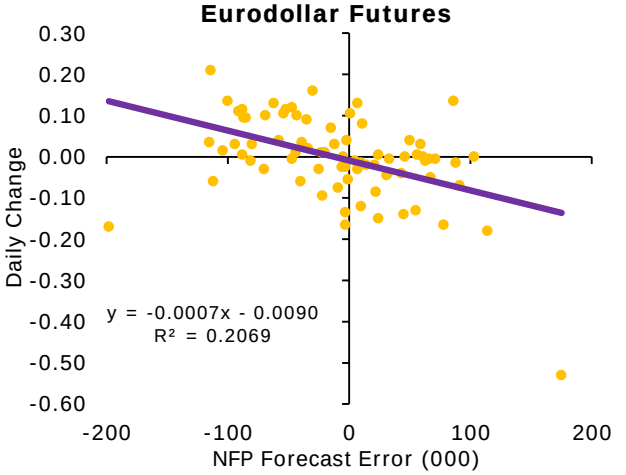
These expectations are confirmed when we examine the scatter diagrams. Note that the slope (or beta) of the regression conducted in the context of E-mini S&P 500 futures is positive. Slopes of the regressions, conducted in the context of Eurodollar and 10-year Treasury note futures, are negative.

R^2 and T-Stats

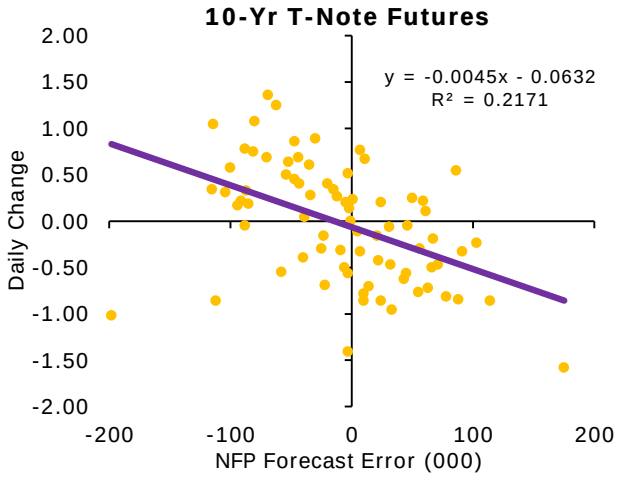
We extend our study to examine the R^2 and T-stats that are by-products of regression analysis. Specifically, we regress (1) deviation of volume on release dates vs. average volume during the month of the release vs. forecast errors in each economic indicator; (2) deviation of high-low range on release dates relative to average high-low ranges during the release month vs. forecast errors; and (3) outright net close-to-close price changes on release dates vs. forecast errors. T-stats provide an indication of statistical significance and are depicted in the table below.



NFPs consistently rise to the level of statistical significance and, therefore, must be considered the economic indicator of greatest importance. This conclusion holds regardless of whether we consider the indicator's impact upon trading activity, volatility or directional price movement.



Housing Starts and Retail Sales are also worthy of honorable mention in this regard, noting that they frequently, albeit not uniformly, rise to the level of statistical significance. Housing starts may be quite significant to the extent that they represent the state of the housing market, noting that the subprime mortgage crisis had a particularly deleterious impact upon domestic housing markets. Retail sales are a direct indicator of the strength of the American consumer, which had long been regarded as a bellwether of global economic growth.



Conclusion

Nonfarm Payrolls are clearly the most significant economic indicator that impacts upon the performance of CME Group flagship products. This observation holds regardless whether we are examining general activity levels in the form of volume, volatility or directional price movement.

Still, NFPs have exerted somewhat less impact on Eurodollar futures than one might have expected in recent years. We may attribute this to static monetary policy in the post subprime mortgage crisis era to date.

Regression Results vs. Economic Indicator Forecast Error

R^2 and (t-Stat)

	E-mini S&P 500 Futures			Eurodollar Futures			10-Year Treasury Note Futures		
	Volume	High-Low Range	Net Change	Volume	High-Low Range	Net Change	Volume	High-Low Range	Net Change
NFP	0.041 (1.792)	0.060 (2.182) *	0.129 (3.334) *	0.130 (3.347) *	0.184 (4.114) *	0.068 (2.345) *	0.053 (2.050) *	0.207 (4.423) *	0.217 (-4.561) *
GDP	0.010 (-0.876)	0.030 (1.518)	0.006 (0.674)	0.017 (1.137)	0.000 (0.161)	0.000 (0.083)	0.004 (0.517)	0.022 (-1.278)	0.000 (-0.166)
Housing Starts	0.002 (0.415)	0.006 (0.675)	0.000 (0.050)	0.013 (0.980)	0.101 (2.890) *	0.152 (3.647) *	0.059 (2.155) *	0.027 (-1.441)	0.000 (-0.101)
ISM Index	0.007 (0.735)	0.029 (-1.496)	0.000 (-0.008)	0.102 (-2.899) *	0.010 (0.864)	0.001 (0.258)	0.029 (1.485)	0.023 (-1.316)	0.032 (-1.562)
Retail Sales	0.003 (0.443)	0.008 (-0.769)	0.003 (-0.475)	0.003 (-0.443)	0.006 (-0.655)	0.002 (0.367)	0.119 (3.167) *	0.080 (-2.541) *	0.094 (-2.776) *
Industrial Production	0.001 (0.327)	0.067 (2.301) *	0.018 (1.171)	0.000 (-0.143)	0.010 (0.875)	0.000 (-0.166)	0.011 (-0.890)	0.087 (-2.656) *	0.013 (-0.975)
Core CPI	0.002 (0.354)	0.009 (0.824)	0.007 (0.726)	0.015 (1.055)	0.005 (0.624)	0.009 (0.841)	0.000 (0.126)	0.021 (-1.272)	0.001 (0.309)

* Statistically significant result

Appendix: Economic Indicator Descriptions

This appendix provides a description of the seven economic indicators that are the subject of this study.

Nonfarm Payrolls

Nonfarm Payrolls (NFPs) are released by the Bureau of Labor Statistics (BLS) at 7:30 a.m. (CT) on the first Friday of each month along with a battery of other employment information. Actually, there are two distinct reports generated from separate surveys including a survey of approximately 375,000 businesses which is used to generate NFPs and a survey of approximately 60,000 households used to generate the unemployment rate.

The unemployment report is the first major economic release of the month that depicts economic activity in the prior month. The Federal Reserve typically focuses keenly on the employment report including NFPs, the unemployment rate, average workweek, overtime and average hourly earnings.

Gross Domestic Product

Gross Domestic Product (GDP) is compiled by the Bureau of Economic Analysis (BEA), an arm of the U.S. Commerce Department, and is the broadest measure of economic activity. The figures represent activity in a previous calendar quarter.

Actually, the figures are reported in stages. There is an "advance" announcement in the first month of each calendar quarter representing activity in the prior calendar quarter; revised by a "preliminary" release during the middle month of the quarter; capped by a "final" revision during the last month of each calendar quarter. Revisions can be significant and may impact upon figures reflecting activity several years in the past.

GDP is often quoted as an annualized percent change basis. The most significant components of GDP include consumption, investment, net exports, government purchases and inventories. Consumption is the single most important of these components.

The BEA further published GDP deflators or measurements of the change in prices of GDP components and is considered a key indicator of inflationary pressures. The GDP deflator might be considered a bit more useful than CPI in the sense that it is not tied to a fixed basket of goods and services but rather represents the actual mix of goods and services produced.

Housing Starts

The U.S. Census Bureau along with the U.S. Department of Housing and Urban Development (HUD) releases its New Residential Construction Report on a monthly basis. This report includes Building Permits, Housing Starts and Home Completions, all of which figures are generally highly correlated. These figures are typically quoted in terms of thousands of homes.

The former two figures are considered useful leading indicators as construction activity generally grows strongly near the beginning of the business cycle. Activity in the residential housing sector is of further interest in recent years to the extent that the subprime mortgage crisis was driven by problems in this sector and recovery in this context may be key to a general economic recovery.

ISM Index

The Institute for Supply Management (ISM) releases its ISM Index at 9:00 a.m. (CT) on the first business day of the month, representing the prior calendar month. The ISM Index is generated from a nationwide poll of purchasing managers. The Index is weighted to incorporate new orders (30%), production (25%), employment (20%), deliveries (15%), and inventories (10%).

An Index in excess of 50% suggests economic expansion relative to the prior month; an Index less than 50% is indicative of economic contraction relative to the prior month. The ISM Index is perhaps the most significant privately generated economic report.

Retail Sales

The retail sales report is published by the Census Bureau of the Commerce Department. It is released at 7:30 a.m. (CT) on or about the 13th of the month and represents data for the prior calendar month. It is a measure of the total receipts of retail stores. The figure is closely monitored as a useful indication of consumer spending.

Analysts frequently study the report on an "ex-autos" basis, noting potentially dramatic advances and declines in auto sales driven by discounting tactics on the part of the auto makers. Food and energy components of the index are likewise often discounted as volatile, but not necessarily always sustainable drivers. Note that services are not included in retail sales and that the figures may be volatile and subject to wide revisions.

Industrial Production

The Industrial Production Index is released on a monthly basis by the Federal Reserve Board. It represents output from various sectors including manufacturing, mining, electric and gas industries. The Index is pegged to 100 as of the year 2002.

Production data is generally sampled directly from the Bureau of Labor Statistics as well as a variety of trade associations.

Core CPI

Core CPI is compiled by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor and released at 7:30 a.m. (CT) on or about the 13th of the month. CPI measures prices of a fixed market basket of goods and services purchased by consumers. It is widely used to determine cost of living adjustments (COLAs) in the context of public and private labor agreements.

Analysts often study CPI excluding volatile food and energy prices (Core CPI) which are often seasonal or cyclical in nature, leaving one with a reading of "core" inflation. These figures may tend to exaggerate the true impact of inflation in the sense that the astute consumers will tend to find substitutes for overly inflated goods and services, patterns which are not recognized per the statistic.