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Research & Product Development

Impact of Economic Indicators on CME Group Markets

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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 to basic supply and demand indications in our markets as generally guiding price performance and market participation.

How do fundamental indicators of economic activity impact upon the performance of flagship CME Group products including Eurodollar and E-mini S&P 500 futures?

The "flagship" products offered by CME Group include Eurodollar (ticker: ED) and E-mini S&P 500 (ticker: ES) futures … representing primary benchmarks for interest rates and domestic equity values. 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.

Of course, there are many economic indicators released by a variety of U.S. government agencies and various private sources. Some are more and some are less closely followed than others. But some of the most significant and widely followed of economic indicators include Non-Farm Payrolls (NFPs), Retail Sales, the Institute for Supply Management (ISM) Index, the Consumer Price Index (CPI), Durable Goods Orders, the Philadelphia Fed Index and Gross Domestic Product (GDP).

This study focuses on seven key basic or fundamental economic indicators including … NFPs, Retail Sales, ISM Index, CPI, Durable Goods, Philly Fed Index and GDP. We focus on their impact on volume and volatility.

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 the form of volatility and trading volume.

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.

Significance is Era Specific - In today's marketplace, most analysts agree that the Bureau of Labor Statistics' (BLS) monthly Employment Report featuring Non-Farm Payroll (NFP) and Unemployment rate statistics 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. Further, it is released on the first Friday of each calendar month and therefore represents the first major release that speaks to activity in the prior month.

The significance of economic indicators is known to ebb and flow. In the early 1980s, the market focused keenly on money supply. Today, the focus is more closely fixed on the unemployment report including NFPs.

But in the 1980s 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, of course, 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. While the Fed continues to establish target ranges for M2 and M3 growth, these numbers mean little and the Fed is more likely to adjust its targets when it misses as to adjust monetary policy in any significant way.

We have selected the seven fundamental indicators by referencing "grades" depicting their significance as assigned by a popular online economic reporting service.

Grading the Indicators - While the popularity of various economic indicators may be dynamic, we had nonetheless consulting a popular economic calendar service in the form of Briefing.com to get an indication regarding the value of the various releases. Briefing.com offers ratings on a scale from A to F of the significance of each release. Note that NFPs were according the highest grade of an "A" … while Money Supply has fallen tremendously in significance down to the lowest possible grade of an "F."

For purposes of this study, we did nothing more scientific than simply select seven (7) of the most highly graded indicators including … NFPs, ISM Index, Retail Sales, CPI, Durable Orders, GDP and the Philadelphia Fed Index.

Grading Economic Indicators

Economic Indicator	Briefing.com Rating
Non-Farm Payrolls (NFP)	A
Institute for Supply Mgt (ISM) Index	A-
Retail Sales	A-
Consumer Price Index (CPI)	B+
Chicago Purchasing Managers Index (PMI)	B
Durable Orders	B
Gross Domestic Product (GDP)	B
Philadelphia Fed Index	B
Consumer Confidence	B-
Housing Starts and Building Permits	B-
Industrial Production	B-
Non-Manufacturing ISM Index	B-
Producer Price Index (PPI)	B-
Univ of Michigan Consumer Survey	B-
Initial Jobless Claims	C+
New Home Sales	C+
Personal Income & Spending	C+
Trade Balance	C+
Existing Home Sales	C
Auto & Truck Sales	C-
Business Inventories	C-
Leading Indicators	C-
Factory Orders	D+
Productivity & Unit Labor Costs	D+
Construction Spending	D
Export/Import Price	D
Treasury Budget	D
Consumer Credit	D-
Wholesale Trade	D-
Money Supply (M2)	F

Source: Briefing.com

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

An efficient market anticipates the release of economic indicators. Thus, we focus on the "surprise" factor or the difference in the actual level of the economic indicator relative to the market consensus regarding the number, *i.e*, the "forecast error."

But the marketplace generally anticipates the level of significant 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 … 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.

Average Forecast Error
(January 2001-August 2006)

	Average Absolute Forecast Error	Unit
Non-Farm Payrolls (NFP)	73.63	Change in Thousands
Retail Sales	0.73%	Monthly % Change
Inst Supply Mgt (ISM) Index	1.69	Index Points
Consumer Price Index (CPI)	0.10%	Monthly % Change
Durable Orders	2.10%	Monthly % Change
Philadelphia Fed	2.14	Index Points
Gross Domestic Product (GDP)	0.39%	Quarterly % Change

Some economic indicators may be more difficult to forecast with accuracy than others. For example, the average (absolute) forecast error observed between consensus expectations as reported by Briefing.com and the actual release of Non-Farm Payrolls (NFPs) over the period January 2001 through August 2006 was 73.63 thousand jobs. By contrast, the average (absolute) forecast error for the Consumer Price Index (CPI) was only 0.10%. While these indicators are reported in very different units of measurement, it is probably safe to conclude that CPI releases are a bit more predictable than are NFP releases.

Some figures are more predictable than others. Average (absolute) forecast errors tended to be rather large for figures such as NFPs and GDP. Forecast error for figures such as CPI tended to be relatively small.

This study is focused on the effect that these forecast errors have upon daily trading volume and volatility in E-mini S&P 500 (ES) and in Eurodollar (ED) futures. We utilize two simple measures of volatility for these purposes: the net change from close to close and the daily high-low range.

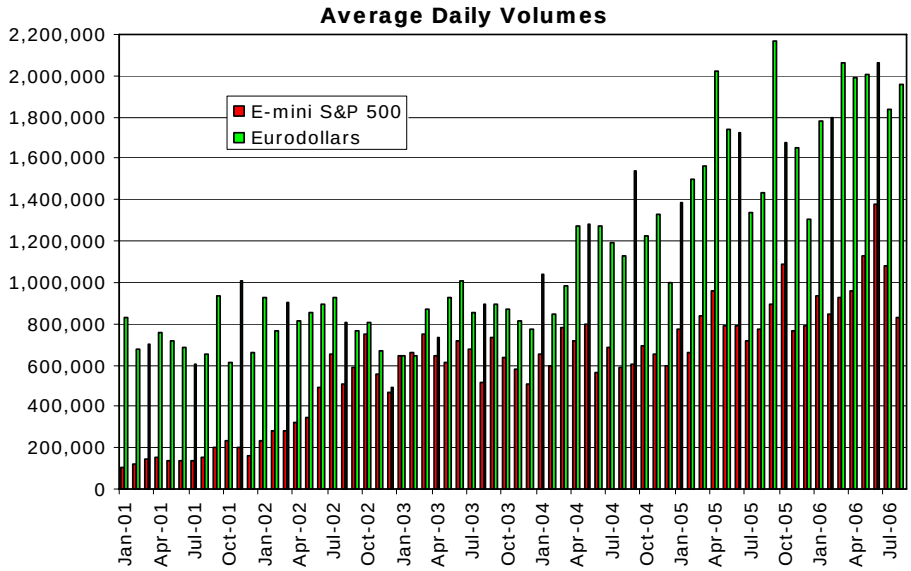
Trading Volumes

Just as the significance of various economic indicators is "era-specific" as discussed above, trading volumes likewise should not be assessed out of context. In other words, in order to differentiate "good" vs. "poor" volume for any single day, we must compare that daily volume to "typical" volume in the surrounding time period. Thus, we will reference daily volume in relationship to average daily volume during the entire calendar month during which an economic indicator is released.

Let's compare volumes in ES and ED futures on release dates relative to average monthly volumes, noting that volumes have generally been advancing sharply in both markets over recent years.

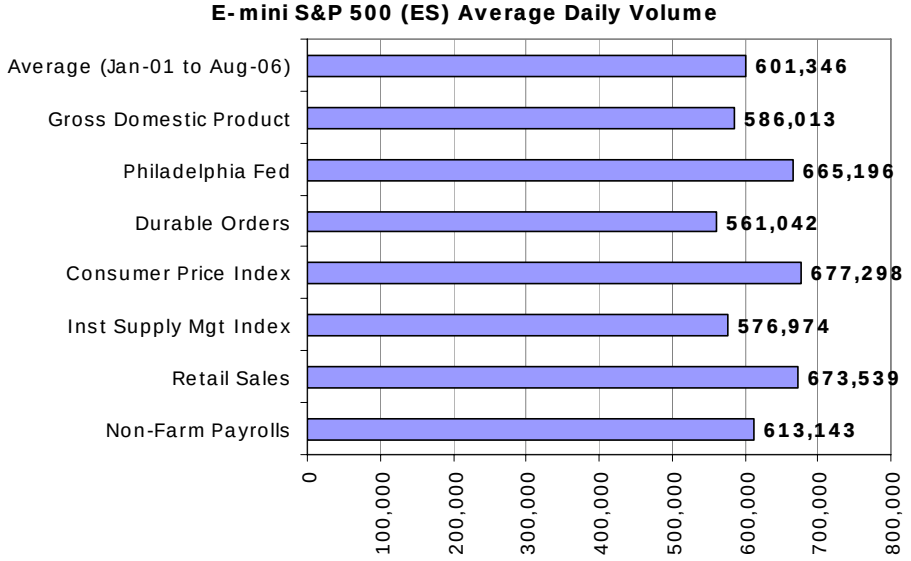
Note that volume in E-mini S&P 500 and Eurodollar futures have been increasing on a rather dramatic basis during the period January 2001 through August 2006. Average daily volume (ADV) in E-mini S&P 500 futures has advanced from below 200,000 to somewhere in the vicinity of 1,000,000 contracts per day. Similarly, Eurodollar futures volume

has advanced from near 800,000 to 2,000,000 contracts per day during the same five and a half years.



As a first pass, we may identify the average daily volume (ADV) on the release dates for our seven indicators vs. average daily volume. Over the entire period from January 2001 through August 2006, ADV in E-mini S&P 500 futures was 601,346. Leading the pack is ADV on release dates for CPI at 673,539, followed by Retail Sales, Philadelphia Fed and NFPs. Interestingly, ADVs on release dates for GDP, Durable Orders and the ISM Index are actually less than the overall ADV.

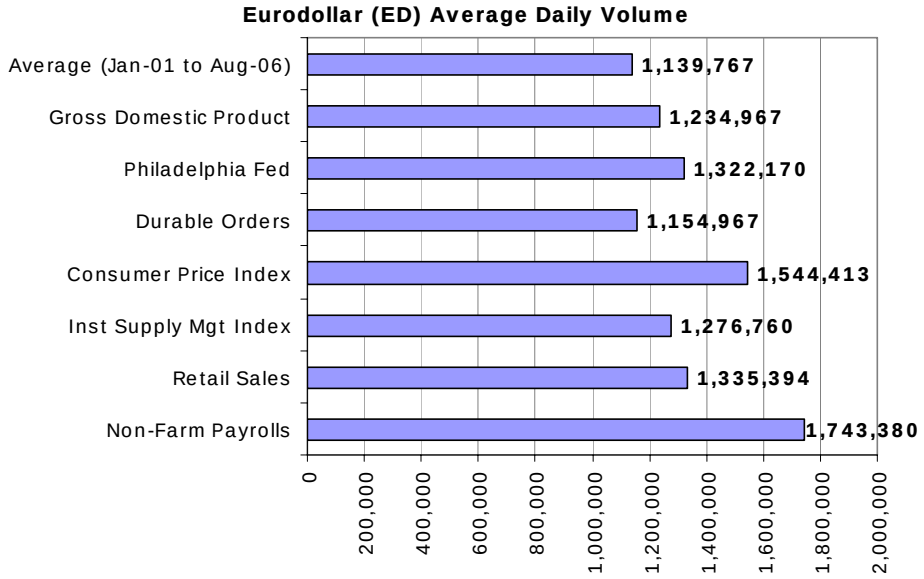
ES volumes seem to perk up on the release of CPI, retail sales and the Philly Fed Index. However, ES volumes have been below the average on the release of some indicators.



Our summary results are somewhat more decisive with respect to ADV in Eurodollar futures. ADVs over the entire January 2001 through August 2006 period were 1,139,767. ADV on the release dates for all seven of our indicators exceeded the overall average, often by a wide margin. NFP release dates lead the pack with 1,743,380, followed by

ED volumes on release dates are decidedly higher than average, particularly upon the release of NFP figures.

CPI, Retail Sales, Philadelphia Fed Index, ISM Index, GDP and Durable Orders.



This suggests that interest rate traders seem to take the release of economic indicators a bit more seriously in general than do equity traders. As such, we might expect that economic indicator releases may generate a greater impact upon the pricing and volatility of interest rate instruments than equity markets[1].

Daily close-to-close net change, or the absolute value of net change, is a simple yet useful measure of volatility.

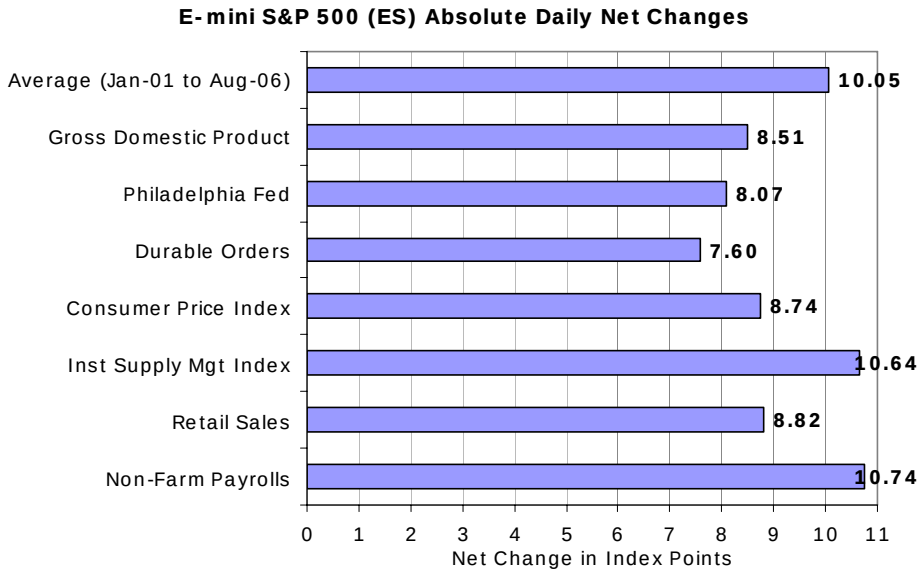
Volatility: Daily Net Change

One very simple measure of volatility may be found in the daily net change or price change from close-to-close. On average, the absolute value of the daily net change in E-mini S&P 500 futures from January 2001 through August 2006 was 10.05 index points.

Average absolute net changes for ES futures on release dates are not decidedly higher than average and are often enough lower.

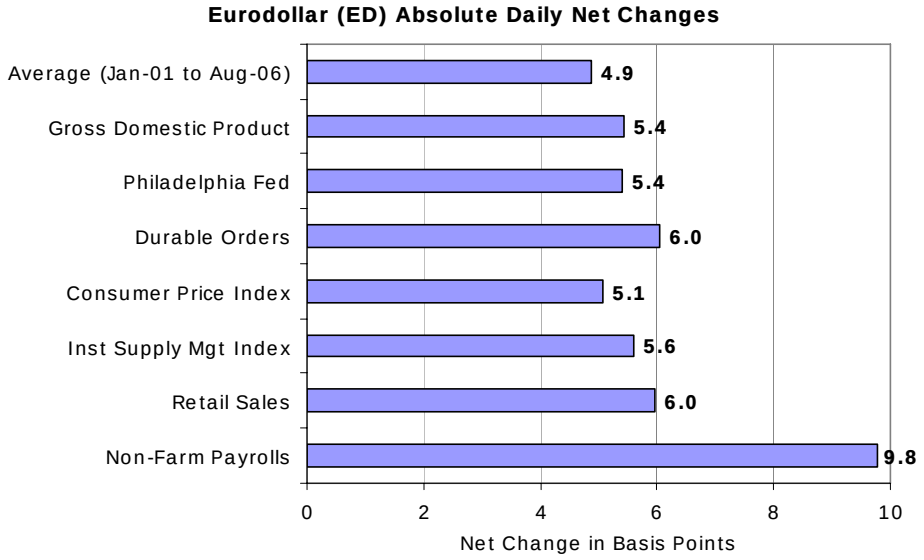
The economic indicator that exerted the greatest impact upon net change was NFPs with an average net change of 10.74 index points, followed by the ISM Index. Unexpectedly, all of our other economic indicators seemed to have little impact upon daily net changes in the equity market, averaging less than the overall total over the period January 2001 through August 2006.

[1] Most of the subject economic indicators are published at 8:30 a.m. Eastern time (7:30 a.m. Central time) during regular trading hours of Eurodollar futures but prior to the commencement of regular trading hours in E-mini S&P 500 futures. A possible conjecture is that the impact of these economic indicators manifests itself in Eurodollar futures through continuous trading while E-mini S&P 500 futures react at the opening of regular trading hours, thus absorbing the market impact. As such, volume in stock index futures may be less dramatically affected.



While E-mini S&P 500 futures appear rather insensitive to economic releases, Eurodollars performed much closer to our expectations. NFPs seem to exert the greatest impact upon market volatility with an average absolute net change of 9.8 basis points compared to the overall average of 4.9 basis points. NFP was far beyond any other indicator in this regard although all of our indicators inspired movement at least slightly in excess of the overall average.

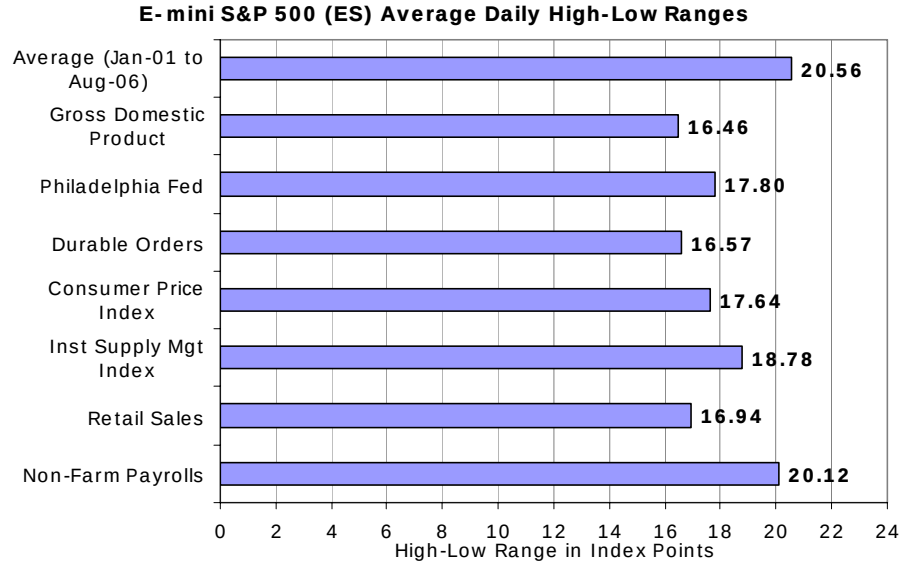
ED futures are much more reactive to economic releases. In particular, NFPs result in sizable market movements.



Volatility: Daily High-Low Range

Another simple measure of volatility is found in the daily high-low range. The average daily high-low range in E-mini S&P 500 futures during the period January 2001 through August 2006 was 20.56 index points. However, not a single one of our economic indicators could generate such a wide high-low range. Non-farm payrolls came close at

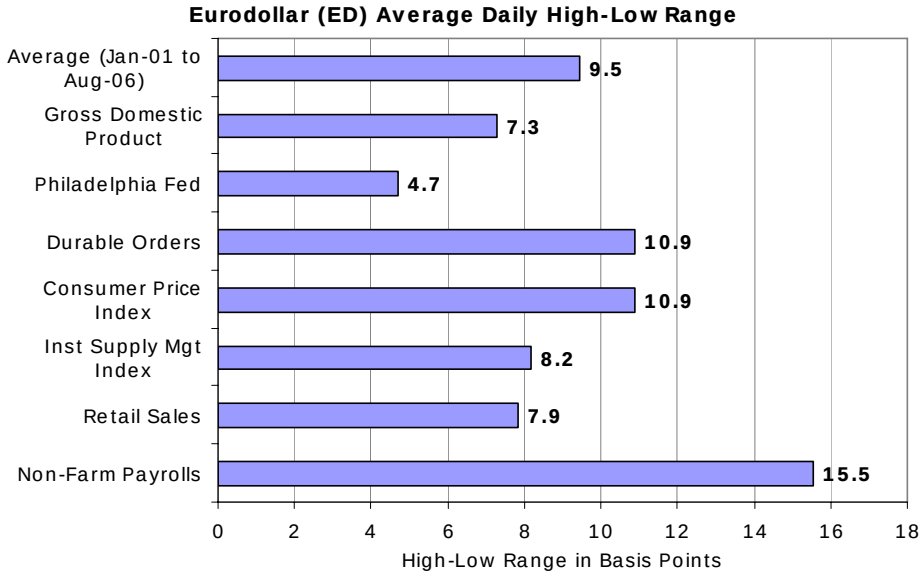
20.12 index points but ranges on the release of all our other indicators fell short, sometimes rather far short.



Just as the net changes in ES futures are not terribly reactive to economic releases, daily high-low ranges in ES futures do not seem to be terribly responsive as well.

The impact of economic indicator releases on the daily high-low range in Eurodollar futures was a bit more predictable with NFPs leading the way at 15.5 basis points relative to the overall average of 9.5 basis points. Still, only Durable Orders and CPI could exceed the overall average figure with ISM, Retail Sales, GDP and the Philadelphia Fed Index falling short.

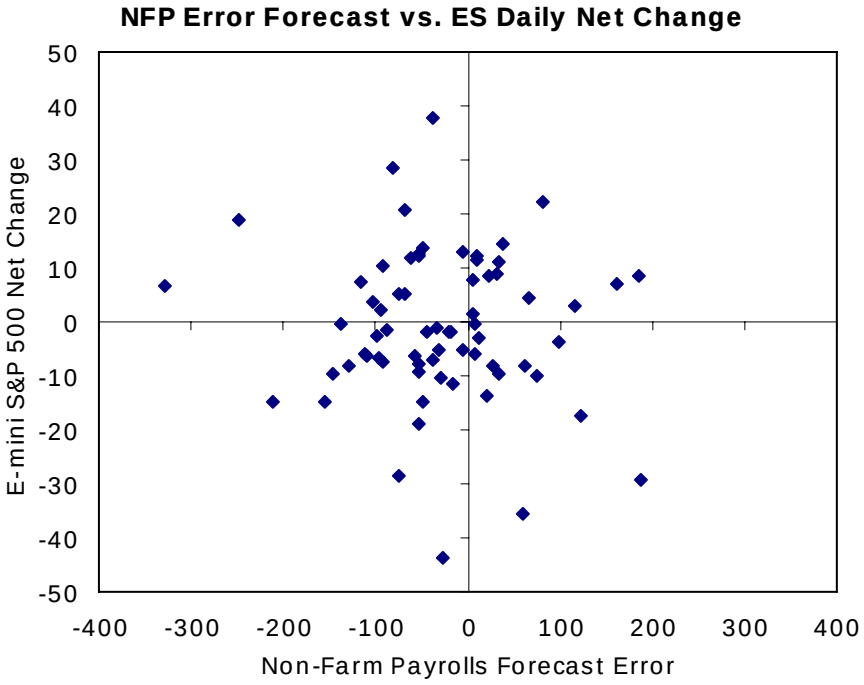
ED futures, however, tend to be much more reactive with NFPs exerting a sizable influence on the daily range.



Correlation and Significance

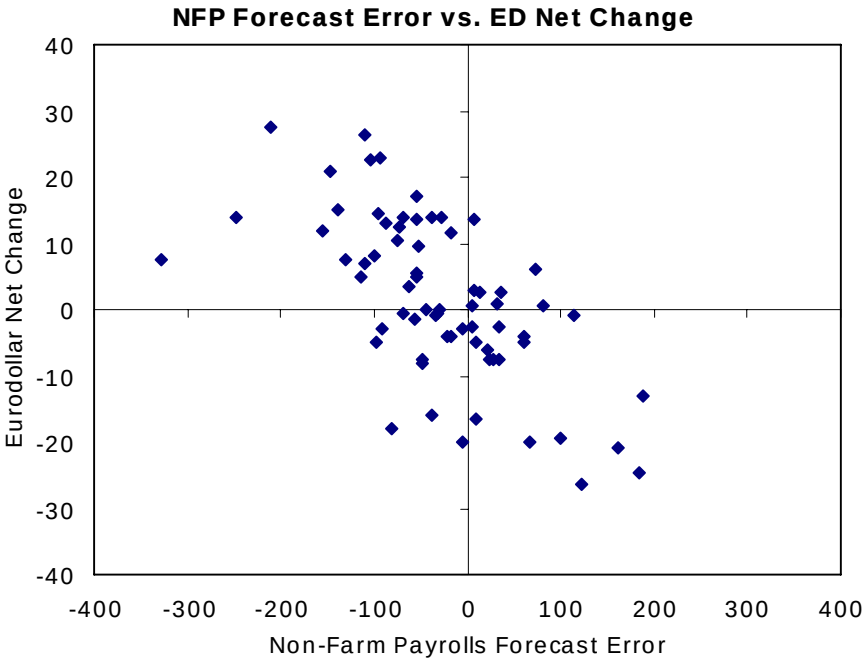
Finally, we apply a single variety ordinary least-squares or regression analysis to test correlations and significance of economic indicator forecast error on volume and volatility in E-mini S&P 500 and Eurodollar futures. We can gain an intuitive understanding of the relationship between forecast error and volume, volatility by inspecting a simple scatter diagrams. In particular, we focus on scatter diagrams

depicting forecast errors for NFPs vs. daily net changes in ES and ED futures.



A scatter diagram of NFP forecast errors vs. net changes in ES and ED futures provide an intuitive feel for correlation. Clearly, NFP forecast errors exert an observable influence on ED futures albeit with no consistent impact on ES futures.

We might expect that forecast errors greater than zero … indicative of stronger than expected economic conditions … would portend of stronger equity values and higher interest rates (lower fixed income instrument prices). Forecast errors less than zero … indicative of weaker than expected economic conditions … may portend of weaker equity values and lower interest rates (higher fixed income prices).



Regression results indicate several statistically significant relationships. Notable relationships are observed between NFP forecast and E-mini S&P 500 volume and ED volume and volatility. Other significant relationships exist between the ISM Index, Philly Fed Index and GDP and ED volatility.

This relationship appears evident in our scatter diagram for Eurodollar futures where positive forecast errors typically result in falling prices (rising rates); while negative forecast errors are more typically associated with rising prices (falling rates). However, the scatter diagram in the context of E-mini S&P 500 futures exhibits a pronounced shotgun effect with no particular causal relationship in evidence.

We further test the significance of any relationships by running a simple regression analysis, focusing on R^2 and the t-Stat associated with the coefficient for the single independent variable. The only relationship in the context of E-mini S&P 500 futures that rises to the level of statistical significance is that between (absolute) NFP forecast error and volume.

Regression Results vs. Economic Indicator Forecast Error

R^2 and (t-Stat)

	E-mini S&P 500 (ES)			Eurodollars (ED)		
	Volume	**Net Change**	**Range**	**Volume**	**Net Change**	**Range**
Non-Farm Payrolls (NFP)	0.074 (2.295) *	0.006 (-0.652)	0.000 (0.023)	0.149 (3.401) *	0.419 (-6.902) *	0.109 (2.836) *
Retail Sales	0.002 (-0.403)	0.001 (-0.308)	0.000 (-0.161)	0.011 (-0.872)	0.030 (-1.441)	0.000 (0.113)
Inst Supply Mgt (ISM) Index	0.003 (-0.410)	0.003 (0.481)	0.000 (0.069)	0.003 (0.458)	0.253 (-4.726) *	0.070 (2.223) *
Consumer Price Index (CPI)	0.011 (0.866)	0.033 (-1.509)	0.010 (-0.834)	0.019 (1.126)	0.002 (-0.389)	0.001 (0.204)
Durable Orders	0.001 (-0.230)	0.003 (0.463)	0.002 (0.359)	0.009 (-0.792)	0.004 (-0.492)	0.026 (1.326)
Philadelphia Fed	0.000 (-0.125)	0.014 (-0.982)	0.000 (-0.155)	0.000 (0.136)	0.280 (-5.062) *	0.080 (2.394) *
Gross Domestic Product (GDP)	0.006 (0.619)	0.004 (0.496)	0.030 (-1.436)	0.020 (1.163)	0.135 (-3.208) *	0.046 (1.781)

* Statistically significant result

The indicator that clearly exerts the most impact upon Eurodollar futures is NFPs. Note that there is a markedly significant relationship between absolute NFP forecast error and volume; NFP forecast error and net change; absolute NFP forecast error and range. There are further significant relationships between forecast errors for ISM, Philadelphia Fed Index and GDP vs. both net change and range.

Conclusions

Non-Farm Payrolls are clearly and predictably the most significant economic indicator that impacts upon the performance of CME Group flagship products in the form of E-mini S&P 500 and Eurodollar futures. Actually, the relationships between economic releases and ES futures

are rather tenuous.[2] These relationships are far stronger in the context of Eurodollar futures.

Consistent with our expectations, non-farm payrolls are clearly the most potent of economic indicators, particularly with respect to volumes and volatility in CME Eurodollar futures.

While NFPs may be the most significant of these indicators, Durable Orders appear to be the least significant of these indicators as a general rule. Finally, one may observe that while CPI releases tend to be accompanied by high volumes, the indicator's impact upon price movement is perhaps a bit muted, possibly attributed to the rather predicable nature of CPI and generally low forecast errors.

Appendix: Economic Indicator Descriptions

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

Non-Farm Payrolls – Non-Farm 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 … 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.

Retail Sales - The retail sales report is published by the Census Bureau of the Commerce Department. It is releases 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.

ISM Index - The Institute for Supply Management 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%),

[2] While it is difficult to argue that these economic indicators do not provide market moving information, perhaps their directional impact on CME E-mini S&P 500 futures is less certain than in CME Eurodollar futures where a direct monetary policy linkage is evident.

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.

Consumer Price Index – 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 and 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 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.

Durable Orders – Durable goods orders are released by the Census Bureau of the Commerce Department at 7:30 a.m. (CT) on or about the 26th of each month representing data from the prior month. This figure represents orders, shipments and unfilled orders of durable goods. A "durable good" is considered one which may last for three years or better. These figures are frequently distorted by large defense or aircraft orders. Still, durable orders are considered an important indicator of manufacturing activity.

Philadelphia Fed Index – The Index is released by the Philadelphia Federal Reserve Bank at 11:00 a.m. (CT) on the 3rd Thursday of the month. It is one of several manufacturing surveys generated by the regional branches of the Federal Reserve. However, the Philly Fed Index is considered a leading indicator in the sense that it is first to be released and represented activity for the month in which it is reported. The Index is similar to the ISM Index in that it varies from 0 to 100% with any figures in excess of 50% representing expansion from the prior month while figures less than 50% represent contraction from the prior month.

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.