

## **An Analysis of the Behavior of Alternative Employment Indicators: Was the Great Recession Different?**

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*From 2007-2009, the United States experienced its worst economic downturn since the Great Depression. Though economic growth experienced a significant decline, the labor market was particularly hard hit. Some economists expressed surprise as to the severity of job losses. Unlike traditional models, this study develops a model that estimates the responsiveness of the labor market to economic growth as well as a risk premium to account for the impact of the availability of credit on the labor market. Alternative employment indicators as well as economic growth are considered. Empirical findings indicate that the behavior of employment during the Great Recession fit the historical experience based on the model developed.*

### **INTRODUCTION**

There are many ways to gauge the performance of the job market. Each month, the government releases an assessment of the labor market based on two surveys – the household survey and the establishment survey. The household survey provides various estimates of the job market, with the two measures receiving the most attention being employment and the unemployment rate. The establishment survey also provides a variety of measures including nonfarm payrolls, private payrolls, and aggregate hours worked. Though they tend to move together over time, each measure provides a slightly different perspective as to the state of the labor market. When considering the number of jobs created, the most closely watched indicator has traditionally been nonfarm payrolls. In recent years, more attention has begun to be paid to the private sector job component of nonfarm payrolls, in order to assess the strength of the private sector in terms of economic recovery. Though the amount of net new jobs reported each month typically refers to the number from the establishment survey, the household survey also reports an estimate for net job creation. Though the results of the two reports tend to move together over time, they tend to differ somewhat in the short run. Some economists think the household survey is a more accurate gauge of a recovery in the job market (for example, see Meltzer 2003). However, most economists think the establishment survey is more reliable due in part to its larger sample size (440,000 establishments as opposed to 60,000 households). Just tallying the number of people employed may not be the most precise gauge of the labor market since to be considered employed one just needs to have a job, whether it's full time or part time. The index of aggregate hours worked, obtained from the establishment survey, measures employment in terms of hours instead of jobs, which makes it a more precise assessment of the job market, particularly when companies reduce hours, but hold onto workers as seen during the Great Recession.

Regardless of which measure of the job market is used, its performance during the Great Recession was the worst since the Great Depression. Many post-Depression records were set, including a 6.2% decline in nonfarm payroll employment (8.7 million jobs) as well as a 9.5% decline in aggregate hours worked.

Much has been written about the downturn in the job market relative to the decline in the overall economy. According to Elsby, et. al. (2010), the labor market performed similar to past recessions until early 2009, when the labor market dynamics began to change relative to past recessions. Some have considered the significant rise in unemployment while others focused on declines in employment. Uchitelle (2010) makes use of a version of Okun's Law to find that, if historical relationships had held true, the unemployment rate in 2009 should have risen from 7.4% in the beginning of the year to 9% by year end. Various economists have explored the weakness of the labor market during the last few years. Given the decline in GDP during the recession, Brad Delong (2009) concludes that the unemployment rate should have risen to about 8% instead of 10%. Among other findings, Arpaia and Curci (2010) detect a difference in the behavior of jobs from hours worked as some economies tend to rely on reducing the number of hours that employees work rather than laying off workers. Burda and Hunt (2011) also find a distinction between the behavior of hours worked compared to jobs when comparing the performance of the US and German labor markets during the Great Recession.

Some other economists have proposed that the relationship between employment and economic growth has changed or that augmentations to existing models may help to explain the behavior of the labor market during the Great Recession. Gordon (2010) suggests that Okun's Law broke down in 1986 as the cyclical behavior of productivity changed. Businesses became quicker to lay off workers than in prior times, resulting in a closer relationship between economic growth and employment. Instead of using the percent change in real GDP to measure economic growth, Wolfers (2010) uses the growth rate of real Gross Domestic Income (GDI). Results of his model indicate that it more accurately explains the steep rise in unemployment that took place in 2008-2009. Fatas and Mihov (2010) suggest that when one considers employment growth instead of the unemployment rate, 2009 stands out as an outlier, though 2007 and 2008 fit the historical pattern. They suggest that structural changes and/or access to credit may help explain the aberration. Nalewaik (2010) explores the differences in GDP and GDI and concludes that GDI better captures the business cycle fluctuations in true output growth. Furthermore, he finds that it is more highly correlated with other business cycle measures such as the unemployment rate and employment growth as measured by the household survey.

There's a body of literature that has explored employment elasticities – how much employment responds to a percent change in economic growth. High levels of employment elasticity suggest that the labor market is very sensitive to changes in economic growth. For example, given an equal decline in economic growth, a country with a relatively high employment elasticity would experience a more significant downturn in its labor market than one with a relatively low employment elasticity. Padalino and Vivarelli (1997) found employment elasticities close to zero for most G7 countries other than the US, which had an employment elasticity of 0.5. Using data from 1970-1998 for the EU and US, Walterskirchen (1999) found elasticities ranging from about 0.25 in Austria to 0.75 in Spain with the elasticity being about 0.5 in the US. Together this suggests that given the same decline in GDP, nations like Spain and the US would be expected to experience steeper declines in employment relative to other countries in the EU such as Austria. The experience of the Great Recession supports this finding as US unemployment peaked at just over 10% while Spanish unemployment rose past 20%. Meanwhile, unemployment in Austria did not rise past 5.5% despite it suffering a larger decline in GDP than the US. However, employment elasticities would not necessarily be static. For example, Pini (1997) found that the elasticity for the US didn't change from the period of 1960-79 compared to 1979-1995 while it did change in several other nations – rising in some while declining in others.

## DESCRIPTIVE STATISTICS

Quarterly data for all of the economic variables were obtained for the period from 1970 to 2009. Data for employment were obtained from the Bureau of Labor Statistics while the data for the growth rates of GDP, GDI, and Final Sales were obtained from the Bureau of Economic Analysis. All variables are reported in terms of seasonally-adjusted annualized rates. Descriptive statistics for the variables can be found in tables 1a-b.

**TABLE 1A**  
**DESCRIPTIVE STATISTICS OF THE GROWTH OF EMPLOYMENT INDICATORS**

|                    | Payroll<br>Employment | Private<br>Employment | Household<br>Employment | Aggregate<br>Hours Worked |
|--------------------|-----------------------|-----------------------|-------------------------|---------------------------|
| Mean               | 1.53%                 | 1.56%                 | 1.44%                   | 1.27%                     |
| Median             | 1.92%                 | 2.15%                 | 1.62%                   | 1.68%                     |
| Minimum            | -6.56%                | -8.86%                | -6.36%                  | -12.78%                   |
| Maximum            | 7.16%                 | 8.26%                 | 6.87%                   | 9.22%                     |
| Standard Deviation | 2.36                  | 2.81                  | 2.35                    | 3.79                      |

**TABLE 1B**  
**DESCRIPTIVE STATISTICS OF MEASURES OF GROWTH AND RISK PREMIUM**

|             | Growth Rate of GDP | Growth Rate of GDI | Final Sales | Risk Premium |
|-------------|--------------------|--------------------|-------------|--------------|
| Mean        | 2.89%              | 2.87%              | 2.88%       | 2.11%        |
| Median      | 3.05%              | 3.20%              | 3.05%       | 1.95%        |
| Minimum     | -7.9%              | -7.7%              | -7.6%       | 0.98%        |
| Maximum     | 16.7%              | 12.8%              | 16.8%       | 5.68%        |
| Stand. Dev. | 3.55               | 3.55               | 2.96        | 0.73         |

Nonfarm payrolls, estimated from the establishment survey, are the most widely followed measure of net job creation. Quarterly growth averaged 1.53% for the period, with a median growth rate of 1.92%. The largest decline, 6.56%, occurred in the first quarter of 2009 while the biggest increase in jobs, 7.16%, took place in the second quarter of 1978. Nonfarm payrolls grew about 78% of the time. Similarly, private employment rose by 1.56% on average, with a median growth rate of 2.15% per quarter. The steepest decline in employment, 8.86%, occurred in the fourth quarter of 1974 while the most rapid increase, 8.26%, was in the first quarter of 1978. Employment as measured by the household survey displayed mean and median growth rates of 1.44% and 1.62%, respectively. As with nonfarm payrolls, the largest drop occurred in the first quarter of 2009, a decline of 6.36%, with the biggest increase taking place in the second quarter of 1978 (6.87%). Household employment rose about 76% of the time.

Aggregate hours worked exhibited the lowest mean and median growth rates of 1.27% and 1.68%, respectively while growing about 71% of the time with zero growth 4% of the time. As expected, it experienced the most volatility with its sharpest decline of 12.8% in 1975Q1 and its largest gain was 9.2% in 1973Q1. This is to be expected since firms are more likely to adjust hours before adding or eliminating jobs. For example, firms may keep workers during the initial part of an economic downturn, but reduce their hours in order to maintain the worker once the economy begins to recover. Similarly, companies respond to the initial phase of an economic recovery by working existing workers longer hours before bringing on new workers. Hiring new workers involves the expense of a job search, incurring fringe benefits and job training while having existing employees work more avoids each of these expenses.

Economic growth, as measured by the percent change in real GDP, grew by 2.89% on average, with a median growth rate of 3.05%. The highest economic growth rate was 16.7% in the second quarter of 1978 while the economy plunged by 7.9% in the second quarter of 1980 (see figure 3 in appendix). The economy grew about 85% of the time. An alternative measure of economic growth, the percent increase in real gross domestic income, increased by 2.87% on average, with a median of 3.20%. The weakest quarter was a decline of 7.7% in the first quarter of 2009 while the strongest quarter was 12.8% in the second quarter of 1978 (see figure 4 in appendix). Real final sales grew at an average rate of 2.88% with a median growth rate of 3.05%. Growth in final sales reached a maximum of 16.8% in the second quarter of 1978 and experienced its steepest decline of 7.6% in the second quarter of 1980.

Estimates of confidence and risk can be subjectively measured using surveys, for example surveys of consumer and business confidence. However, a market-based estimate of risk exists in the form of credit spreads or risk premium. The risk premium is measured as the difference between the yield on a bond and a US Treasury bond of the same maturity. The US government is generally considered to be the least risky borrower (as evidenced by funds flowing to US Treasuries when there are “flights to safety”). The higher the yield on a bond relative to a comparable Treasury bond, the more return an investor is demanding to compensate for perceived risk. A common measure of the average risk premium for corporations is the yield on Baa corporate bonds, which are bonds rated as minimum investment grade by Moody’s. Yields on both corporate and Treasury bonds were obtained from the Alfred database maintained by the Saint Louis Federal Reserve. The risk premium averaged about 2% (a mean of 2.11% and median of 1.95%), reaching a low of 0.98% in the first quarter of 1979 and a high of 5.68% in the fourth quarter of 2008 (note: the risk premium exceeded 6% briefly in late 2008, but the quarterly average peaked at 5.68%). The risk premium was significantly higher during the financial crisis of 2008-2009 than any time since the early 1930s.

## **EMPIRICAL MODEL**

We seek to develop a model that explores the relationship between employment and economic growth in order to try to determine whether the relationship experienced during the Great Recession was consistent with prior periods. Three major measures of net job creation are considered: nonfarm payrolls, private sector employment (both from the establishment survey) and employment as estimated by the household survey. In addition, the index of aggregate hours worked is also considered. The first factor incorporated into the model involves the persistence of job creation. In other words, does job growth in one period tend to lead to job growth in the subsequent period? If so, how much persistence exists? Thus, lagged employment growth is included in the model.

When considering factors that affect job creation, growth in the overall economy clearly is an important factor. If the economy is growing, companies will hire more workers in order to increase production. Thus a positive relationship is expected, but the question is about the magnitude of the relationship. Does economic growth lead to slightly more jobs or a disproportionate increase in jobs? In addition to including economic growth, the change in economic growth is also included to account for acceleration or deceleration of economic growth. If economic growth is accelerating, firms are more likely to have confidence in the economic expansion and thus increase hiring. Besides the traditional measure of economic growth, the percent change in real GDP, real Gross Domestic Income (GDI) and real Final Sales are included in separate models to see whether they are superior predictors of growth in labor.

Many times, economists pay too little attention to the effects of financial markets on the overall economy. However, as shown by the financial crisis, credit availability has a direct impact on business. To capture the availability of credit (suggested by Fatas and Mihov, 2010), the risk premium is included - defined as the difference between the average interest rate on the ten-year corporate bond rated Baa by Moody’s and the comparable ten-year US Treasury bond. It should be noted that Baa bonds are investment-grade bonds and thus reflect the cost of credit for firms normally perceived as being relatively safe. Higher risk premiums are indicative of reduced access (or increased cost) of credit. In addition, the

risk premium can also be seen as a market-based measure of fear. When the risk premium is high, companies may become more cautious, resulting in increased layoffs and/or not hiring new workers. Thus, one would expect higher risk premiums to lead to less employment growth both due to tightness of credit and also more cautious business practices in terms of managing payrolls. As with economic growth, the model includes both the lagged risk premium and the change in the risk premium from the previous quarter. A high risk premium is a sign of tight credit and fear, thus having a negative effect on job growth. Meanwhile, an increase in the risk premium indicates deteriorating credit conditions and thus should also hinder job creation.

The model estimated can be described as follows:

**FIGURE 1**  
**MODEL OF EMPLOYMENT GROWTH**

$$EMP_t = B_0 + B_1EMP_{t-1} + B_2ECON_{t-1} + B_3\Delta ECON_t + B_4RP_{t-1} + B_5\Delta RP_t + e_t$$

where:

EMP = growth rate of employment

ECON = economic growth rate

RP = risk premium

Various versions of the model were estimated, using alternative measures of economic growth and employment indicators as described above. In each case, results were tested for standard econometric problems. The only problem detected was the existence of ARCH effects. The existence of ARCH effects is common when analyzing time series data due to the correlation of the variance over time (Kennedy, 2008). As a result, the model was re-estimated to correct for ARCH effects with the results reported in tables 2 to 5.

## **EMPIRICAL RESULTS**

In each case, the models displayed high explanatory power in terms of the adjusted R<sup>2</sup>. Both economic growth, regardless of how it was measured, and the risk premium were highly significant in explaining the behavior of labor, whether in terms of employment or hours worked. Next, we discuss the empirical results for each measure of labor.

### **Nonfarm Payroll Employment**

As seen in table 2, when considering nonfarm payrolls, all variables were significant, in most cases at the 1% level. The adjusted R-squared ranged from a low of 0.79 when using GDP to represent economic growth to a high of 0.83 when using GDI. A high degree of persistence in employment growth was detected as the coefficient on lagged employment growth was approximately 0.55 in each case. A one percent increase in economic growth (measured by GDP or GDI) results in about a 0.26% increase in employment in the following period while a one percentage point change in the rate of economic growth has impact of just under 0.25% on job creation. However, when final sales are used to proxy economic strength, the impacts of a one-percent increase in economic growth rises to about 0.34% increase in employment, implying an equivalent change in final sales has a larger impact on nonfarm payroll employment than either GDP or GDI. The size of the risk premium in the prior period has a coefficient ranging from about -0.36 to -0.39, implying that a higher level of perceived risk has a negative impact on job creation. However, the change in the risk premium has a higher coefficient and tends to be more significant, ranging from about -0.7 to -0.94, indicating that changes in the perception of risk have a larger impact on the labor market.

**TABLE 2**  
**MODELS OF NONFARM PAYROLLS**

|                           | GDP                 | GDI                 | Final Sales         |
|---------------------------|---------------------|---------------------|---------------------|
| Constant                  | 0.663**<br>(2.06)   | 0.616<br>(1.51)     | 0.435<br>(1.21)     |
| Lagged employment growth  | 0.564***<br>(8.33)  | 0.553***<br>(7.42)  | 0.546***<br>(8.42)  |
| Lagged risk premium       | -0.393***<br>(3.12) | -0.359**<br>(2.25)  | -0.365***<br>(2.67) |
| Change in risk premium    | -0.861***<br>(4.80) | -0.708***<br>(3.16) | -0.939***<br>(5.60) |
| Lagged economic growth    | 0.265***<br>(6.75)  | 0.260***<br>(6.21)  | 0.339***<br>(8.47)  |
| Change in economic growth | 0.213***<br>(8.03)  | 0.244***<br>(9.82)  | 0.245***<br>(8.55)  |
| Adjusted R <sup>2</sup>   | 0.79                | 0.83                | 0.81                |
| Variance Equation         |                     |                     |                     |
| constant                  | 0.007<br>(1.48)     | 0.011*<br>(1.87)    | 0.005<br>(1.07)     |
| ARCH                      | -0.038***<br>(5.58) | -0.050*<br>(1.79)   | -0.030***<br>(4.12) |
| GARCH                     | 1.017***<br>(18.85) | 1.020***<br>(44.45) | 1.013***<br>(12.28) |

Note: z-statistics in parentheses; \*\*\* significant at 1% level, \*\*5% level, \*10% level

### Private Employment

Similar to nonfarm payrolls, private employment displayed persistence, with coefficients close to 0.55 (see table 3). Economic growth, regardless of how it was measured, had a comparable effect on private-sector jobs as it did to nonfarm payrolls, being more sensitive to final sales than either GDP or GDI. Private employment growth was highly related to changes in the risk premium as evidenced by both a higher magnitude and significance of the coefficient on the change in the risk premium relative to that found for nonfarm payrolls, with coefficient ranging from almost -1 to nearly -1.25. Though not as high as for nonfarm payrolls, the R<sup>2</sup> was still quite high, ranging from 0.67 to 0.73 with the highest value occurring when economic growth was measured by final sales.

**TABLE 3**  
**MODELS OF PRIVATE EMPLOYMENT**

|                          | GDP                 | GDI                 | Final Sales         |
|--------------------------|---------------------|---------------------|---------------------|
| Constant                 | 0.785*<br>(1.71)    | 0.567<br>(1.40)     | 0.307<br>(0.65)     |
| Lagged employment growth | 0.526***<br>(6.61)  | 0.550***<br>(7.14)  | 0.551***<br>(8.62)  |
| Lagged risk premium      | -0.456**<br>(2.45)  | -0.343**<br>(2.09)  | -0.327*<br>(1.80)   |
| Change in risk premium   | -1.232***<br>(4.85) | -0.966***<br>(3.72) | -1.232***<br>(4.65) |
| Lagged economic growth   | 0.286***<br>(4.38)  | 0.263***<br>(4.15)  | 0.353***<br>(5.40)  |

|                           |                                 |                                  |                                 |
|---------------------------|---------------------------------|----------------------------------|---------------------------------|
| Change in economic growth | 0.213 <sup>***</sup><br>(5.32)  | 0.245 <sup>***</sup><br>(6.08)   | 0.263 <sup>***</sup><br>(7.69)  |
| Adjusted R <sup>2</sup>   | 0.67                            | 0.70                             | 0.73                            |
| Variance Equation         |                                 |                                  |                                 |
| constant                  | 0.017<br>(1.32)                 | 0.009<br>(1.48)                  | 0.019<br>(1.37)                 |
| ARCH                      | 0.033<br>(1.09)                 | -0.037 <sup>***</sup><br>(23.89) | 0.024<br>(1.04)                 |
| GARCH                     | 0.939 <sup>***</sup><br>(28.33) | 1.018 <sup>***</sup><br>(72.25)  | 0.947 <sup>***</sup><br>(31.92) |

Note: z-statistics in parentheses; \*\*\* significant at 1% level, \*\*5% level, \*10% level

### Household Employment

Employment as estimated from the household survey revealed little persistence, insignificant when using GDP or GDI and less than 0.15 when using final sales. Economic growth (in terms of GDP or GDI) of one percent led to a corresponding increase of about 0.4% employment growth while a one percentage point increase in the rate of economic growth led to about a 0.3% increase in employment. When using final sales, both economic growth and the change in economic growth had slightly larger effects on jobs. Employment from the household survey is quite sensitive to the risk premium with the coefficient on the risk premium from the prior period of between -0.57 and -0.84 and that on the change in the risk premium being between -0.87 and -1.2.

**TABLE 4**  
**MODELS OF HOUSEHOLD SURVEY**

|                           | GDP                             | GDI                             | Final Sales                     |
|---------------------------|---------------------------------|---------------------------------|---------------------------------|
| Constant                  | 1.940 <sup>**</sup><br>(3.80)   | 1.253 <sup>**</sup><br>(2.32)   | 1.323 <sup>**</sup><br>(2.37)   |
| Lagged employment growth  | 0.025<br>(0.29)                 | 0.050<br>(0.57)                 | 0.135 <sup>**</sup><br>(2.00)   |
| Lagged risk premium       | -0.837 <sup>***</sup><br>(4.32) | -0.572 <sup>***</sup><br>(2.72) | -0.699 <sup>***</sup><br>(3.33) |
| Change in risk premium    | -1.193 <sup>***</sup><br>(3.88) | -0.867 <sup>**</sup><br>(2.40)  | -1.087 <sup>***</sup><br>(3.68) |
| Lagged economic growth    | 0.406 <sup>***</sup><br>(6.43)  | 0.445 <sup>***</sup><br>(7.45)  | 0.479 <sup>***</sup><br>(7.84)  |
| Change in economic growth | 0.286 <sup>***</sup><br>(7.10)  | 0.307 <sup>***</sup><br>(7.27)  | 0.353 <sup>***</sup><br>(6.86)  |
| Adjusted R <sup>2</sup>   | 0.52                            | 0.57                            | 0.53                            |
| Variance Equation         |                                 |                                 |                                 |
| constant                  | 0.169<br>(0.91)                 | 0.489<br>(0.73)                 | 4.013<br>(3.55)                 |
| ARCH                      | 0.053<br>(0.72)                 | 0.101<br>(0.99)                 | -0.105 <sup>**</sup><br>(1.95)  |
| GARCH                     | 0.874 <sup>***</sup><br>(7.36)  | 0.681 <sup>**</sup><br>(1.96)   | -0.581 <sup>*</sup><br>(1.62)   |

Note: z-statistics in parentheses; \*\*\* significant at 1% level, \*\*5% level, \*10% level

## Aggregate Hours Worked

Though higher than that displayed by the household survey, when significant, aggregate hours worked displayed a low level of persistence (between 0.17 and 0.27), considerably less than what was found for nonfarm payrolls and private employment. Hours worked was more sensitive to economic growth than the other measures of the labor market, with coefficients on lagged economic growth somewhat above or below 0.7 and those on the change in economic growth of about 0.5. As with economic growth, aggregate hours worked was highly sensitive to the risk premium, with a change in the risk premium of one percentage point leading to just under a two percentage point decline in hours worked in two of the models (and about 1.7 decline in the case of GDI). The risk premium from the prior period also had a sizeable negative effect on hours worked as well, with a one-percent higher risk premium leading to between a 0.8% to 1.1% decline in employment growth, much higher than found for other labor market measures.

**TABLE 5**  
**MODELS OF AGGREGATE HOURS WORKED**

|                           | GDP                             | GDI                             | Final Sales                     |
|---------------------------|---------------------------------|---------------------------------|---------------------------------|
| Constant                  | 1.624 <sup>***</sup><br>(2.60)  | 1.060<br>(1.28)                 | 0.533<br>(0.76)                 |
| Lagged employment growth  | 0.173 <sup>**</sup><br>(2.40)   | 0.153 <sup>*</sup><br>(1.80)    | 0.271 <sup>***</sup><br>(3.52)  |
| Lagged risk premium       | -1.121 <sup>***</sup><br>(4.18) | -0.894 <sup>***</sup><br>(2.72) | -0.796 <sup>***</sup><br>(2.89) |
| Change in risk premium    | -1.927 <sup>***</sup><br>(5.54) | -1.673 <sup>***</sup><br>(3.76) | -1.912 <sup>***</sup><br>(5.26) |
| Lagged economic growth    | 0.632 <sup>***</sup><br>(7.25)  | 0.670 <sup>***</sup><br>(6.93)  | 0.732 <sup>***</sup><br>(7.56)  |
| Change in economic growth | 0.487 <sup>***</sup><br>(7.13)  | 0.524 <sup>***</sup><br>(7.64)  | 0.532 <sup>***</sup><br>(8.14)  |
| Adjusted R <sup>2</sup>   | 0.66                            | 0.70                            | 0.68                            |
| Variance Equation         |                                 |                                 |                                 |
| constant                  | 0.085 <sup>*</sup><br>(1.93)    | 0.098 <sup>*</sup><br>(1.65)    | 0.047<br>(1.04)                 |
| ARCH                      | -0.049<br>(1.53)                | -0.056<br>(1.54)                | -0.042<br>(1.12)                |
| GARCH                     | 1.015 <sup>***</sup><br>(37.51) | 1.021 <sup>***</sup><br>(34.71) | 1.022 <sup>***</sup><br>(29.26) |

Note: z-statistics in parentheses; \*\*\* significant at 1% level, \*\*5% level, \*10% level

## SUMMARY AND CONCLUSIONS

Using GDI or final sales marginally improved the explanatory power of the respective models, with adjusted R<sup>2</sup> rising regardless of what measure of employment is considered. Coefficients were highly significant, at the 1% level in most cases. A high degree of employment persistence was found when considering nonfarm payrolls or private employment while a lower degree of persistence was detected for aggregate hours worked (no persistence was found for employment based on the household survey). Thus, the labor market as measured by the establishment survey (nonfarm payrolls and private sector employment) display some momentum, whether to the upside or to the downside. Economic growth, from the previous period as well as the change in economic growth positively affected employment growth. Final sales had a marginally higher effect on employment than GDP or GDI.



Despite receiving scant attention from many economists, the risk premium had a very significant effect on the growth in employment, both in terms of the lagged risk premium as well as the change in the risk premium from the preceding period. Whether due to tight credit for investment-grade corporations or as a measure of fear, high risk premiums significantly hindered job growth with the change in the risk premium having a particularly large effect. Given the record-high risk premiums in late 2008 and early 2009, this helps to explain why those who didn't account for this effect may have missed the subsequent deterioration in the labor market.

Though the Great Recession ended in the summer of 2009, the lingering effects are still being felt years later, particularly in the labor market as it tries to recover from a loss of 8.7 million jobs. Some economists, based on traditional models, expressed surprise as to the dramatic loss of jobs that took place during the recession. In this study, a model was developed to account for the average risk premium on investment-grade (Baa) corporate bonds in addition to more traditional factors such as the effects of economic growth, changes in economic growth, and the persistence in employment growth. Economic growth, had the expected impact on employment growth, but doesn't fully explain the behavior of the labor market. As suggested by Wolfers (2010), using gross domestic income instead of gross domestic product improved the explanatory power of the model, but only marginally. Employment was even more sensitive to final sales than GDI (or GDP). Though credit is affected somewhat during most recessions, the freezing of credit markets during the financial crisis of 2007-2009 appeared to have a powerful effect on the job market, as suggested by Fatas and Mihov (2010). The empirical results reveal that the dramatic rise in the risk premium during late 2008 and early 2009 helps to explain the huge decline in employment during the depths of the recession. Though economic growth is an important factor in understanding the behavior of employment growth, the risk premium, whether seen as a measure of credit availability or as a market-based measure of fear, is critical in understanding the behavior of the labor market during the Great Recession.

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## DATA SOURCES

### Bureau of Labor Statistics

- Aggregate Hours Worked: <http://www.bls.gov/webapps/legacy/cesbtab4.htm>
- Employment (Household survey): <http://www.bls.gov/webapps/legacy/cpsatab1.htm>
- Nonfarm payrolls: <http://www.bls.gov/webapps/legacy/cesbtab1.htm>
- Private Employment: <http://www.bls.gov/webapps/legacy/cesbtab1.htm>

### Bureau of Economic Analysis, National Economic Accounts

- GDP (Table 1.1.1): <http://www.bea.gov/national/nipaweb/SelectTable.asp?Selected=Y>
- GDI (Table 1.7.1): <http://www.bea.gov/national/nipaweb/SelectTable.asp?Selected=Y>
- Final Sales (Table 1.2.1): <http://www.bea.gov/national/nipaweb/SelectTable.asp?Selected=Y>

### Archival Federal Reserve Economic Data

- Risk Premium (Baa) = ten year Baa corporate bond yield – ten year Treasury bond yield
  - Baa corporate bond: <http://alfred.stlouisfed.org/series?seid=BAA&cid=119>
  - U.S. Treasury bond: <http://alfred.stlouisfed.org/series?seid=GS10&cid=115>