State of Oregon: 2023 Non-Farm Payroll Forecast

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Introduction:

Over the past two years, we have seen much uncertainty. The emergence of COVID-19 was heartbreaking from the lives it took to all the undue hardship foisted upon parents, workers, children, and those with disabilities. In the face of initial lockdowns and paralysis of many industry sectors, employment faced a sharp decline, however, in a positive light, the subsequent recovery in employment has been very fast compared to the recovery following the 2008 Great Recession. This brief on Non-Farm Payroll will serve to forecast the variable into the future and evaluate how the current economic circumstances put pressure on the expected path. COVID is still affecting the economy and while many people are quick to advocate that we are back to normal, there was a clearly overoptimistic attitude before both the two previous variant outbreaks. The last Omicron saw record cases and only small temporary affects, so each COVID development is unique and hard to foresee, therefore we will take the general effects from the virus as granted and deal with the current trends. With that said, the State of Oregon is committed to adjusting to the situation as needed.

The Labor market overall is considerably strong. Unemployment is at 4.3% and our state's natural rate is a small amount above the national average[1]. In other words, 4.3% for our state is about as tight as 3.8% in the United States. According to the Economic Outlook from Oregon.gov[2], the current composition of the labor force is such that firms are trying to rehire their previous level of workers. The level of job vacancies has grown, and desired employment is now back on pre-pandemic trend. While earlier in the pandemic, real wages had grown, the Economic Outlook forecasts that real wages will remain stagnant for the next couple years based on expected inflation. Job growth should continue for as long as wages run hot. Even if real wages decline, the overall level is above pre-pandemic trend.

On the other side of good news, lays a potential downside pressure. Inflation is expected to stay above the Federal Reserve's target rate of 2%, therefore, the Federal Reserve is expected to continue raising interest rates. We will use a vector autoregression to assess if a federal funds rate hike will gather a response from non-farm payroll. While Powell has indicated that the Fed sees a space where employment won't be impacted, there is a downside risk to our forecast because of this possible rate hike cycle. Just last week, the FOMC announced at 25 basis point

[1] https://www.bls.gov/eag/eag.or.htm
[2] https://www.oregon.gov/das/OEA/Documents/economic%20forecast.pdf

rate hike which markets saw as a step to curb inflation. Long-run expectation and actual inflation seem to go together, which is why a strong Federal Reserve response and maintaining open communication and a high level of credibility is considered key to being able to steer inflation.

The Federal Reserve has two mandates and they come into tension with one another. Because of the inflation that has been observed throughout the economy, the Fed has felt it necessary to act. According to the Wall Street Journal, there is an expectation around multiple rate increases throughout this year, however, there is uncertainty around how harsh the Fed feels it needs to raise rates[3]. The bond market seemed mix off the Fed's announcement, partially because overall opinions throughout the economy are mixed about how sticky inflation will turn out to be.

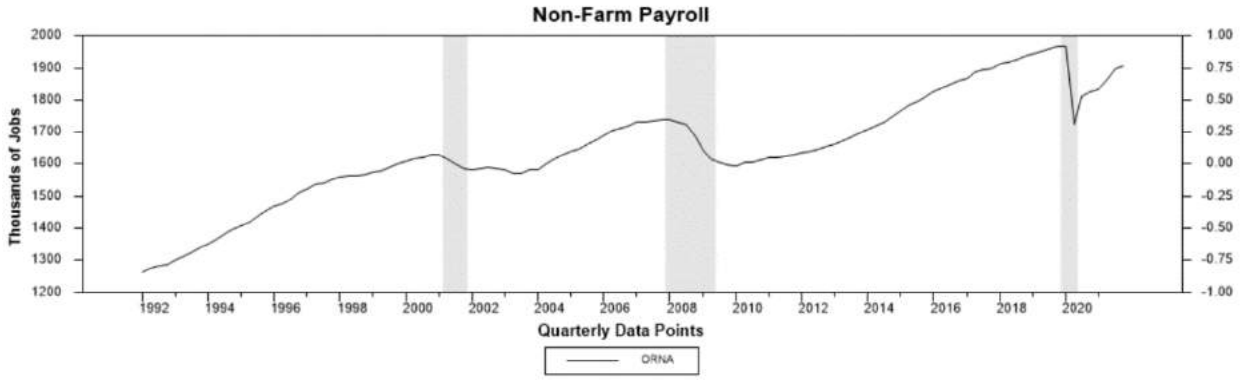
With these facts in mind, we will forecast job growth through 2023 and evaluate the potential risks to the upside and downside. We are expecting a further increase in the number of jobs, however, the timing of the response from jobs to a possible Fed funds rate must be evaluated to see if the effects will change 2023's outlook.

Methodology:

To forecast non-farm payroll for the State of Oregon, we will need to decide which model to use. We could use either an ARMA or ARIMA, and depending on if we look at causality with other variables, a VAR. For this series alone, we will first evaluate how we want to transform the data. We will test for a unit root and then decide whether to use an ARMA or look at first/ (and possibly) second difference stationarity. This choice will give us the most reliable forecast possible. We then must use a vector autoregression (VAR) to look at the relationship between non-farm payrolls and the federal funds rate. This brief will conclude with the risks to both sides of the forecast.

[3] https://www.wsj.com/articles/treasury-yields-waver-ahead-of-fed-decision-11647444061

Results:

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Dickey-Fuller Unit Root Test, Series DRNA
Regression Run From 1992:02 to 2021:04
Observations        120
With intercept and trend
With 0 lags chosen from 3 by AIC
Null is unit root. Reject in left tail.

Sig Level    Crit Value
1%(**)         -4.03670
5%(*)          -3.44750
10%            -3.14858

T-Statistic    -2.47637
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Dickey-Fuller Unit Root Test, Series DRNA
Regression Run From 2016:02 to 2021:04
Observations         24
With intercept and trend
With 0 lags chosen from 2 by AIC
Null is unit root. Reject in left tail.

Sig Level    Crit Value
1%(**)         -4.39420
5%(*)          -3.61185
10%            -3.24181

T-Statistic    -2.53564
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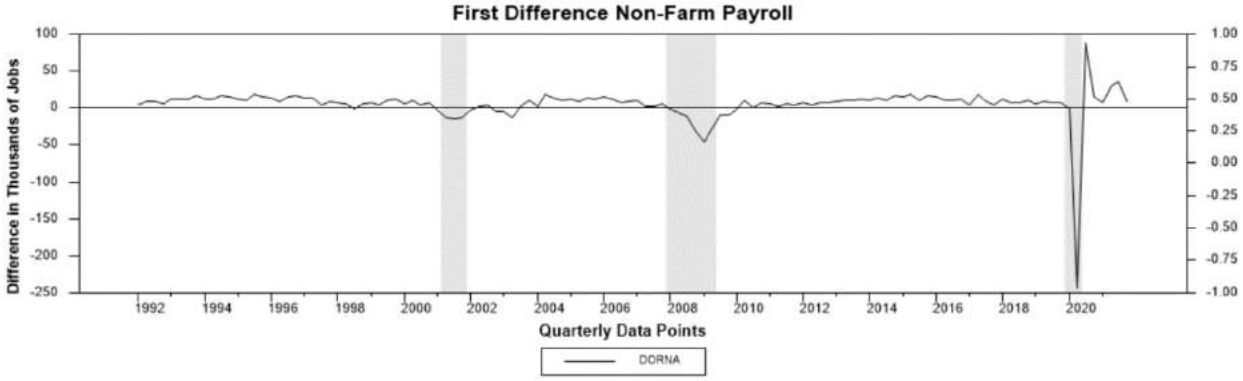
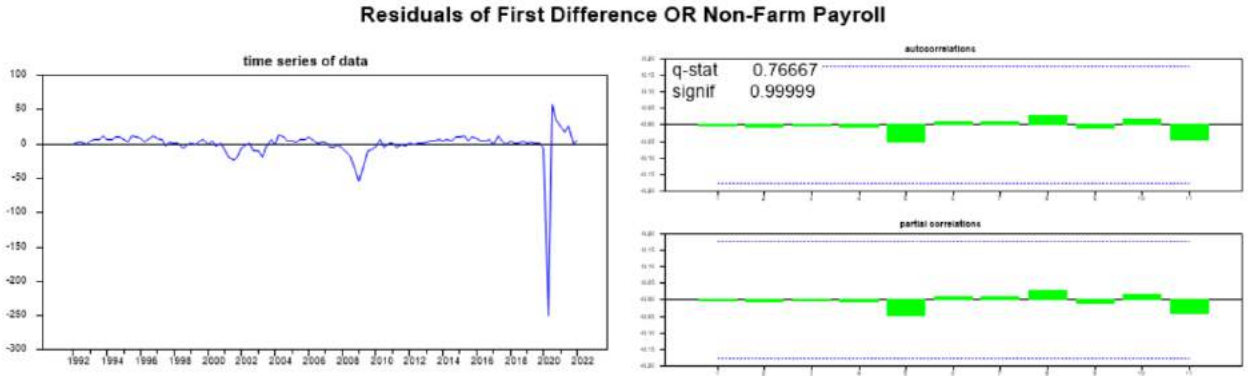
As seen above, the Dicky-Fuller test confirms that there is a unit root in the data series within both time frames of the whole and of the partial (last trend at around 2016- and post-COVID). Because of this, an ARMA model would yield a forecast off the true trend. The solution is to see if we can use a covariate stationary first difference (the "I" in "ARIMA), to take out the unit root and accurately model the series via an ARIMA.

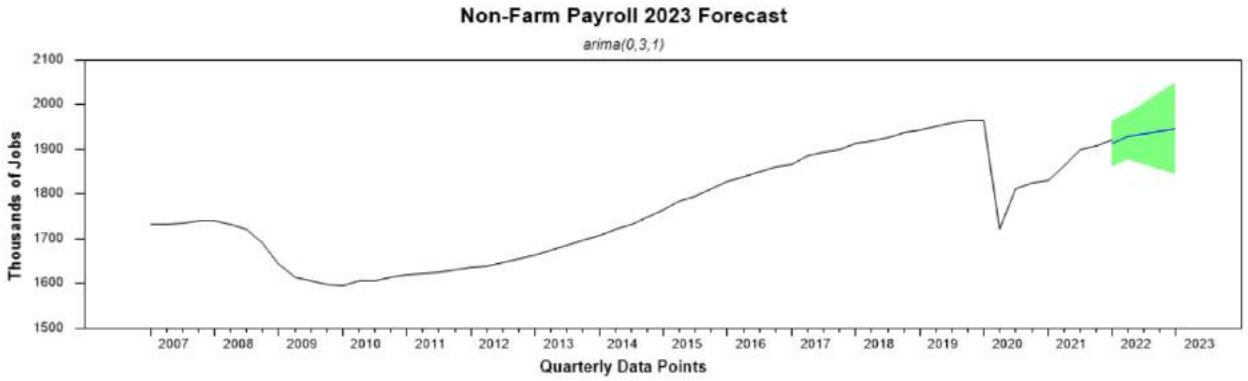


The first difference looks to be stationary around some constant right above 0. Sure enough, when we test the unit root, we find that the null is rejected, and it successfully eliminated our prospective modeling problem.

The first step in fitting an ARIMA is running a Box-Jenkins autofit function on the first difference to fit the optimal AR and MA components. Using an AR=0, MA=3 model, we get the following residuals from the ARIMA.



We fail to reject the null hypothesis that there is no time dependency and can conclude that our model is covariate stationary. This allows for an unbiased forecast. Using that equation for our forecast, we get the below result.



According to our forecast, we should expect about 30,000 jobs to be added in the next year from this data series. Our confidence interval puts the likely scenario before the state that total jobs will be between 1850 and 2050 thousands of jobs.

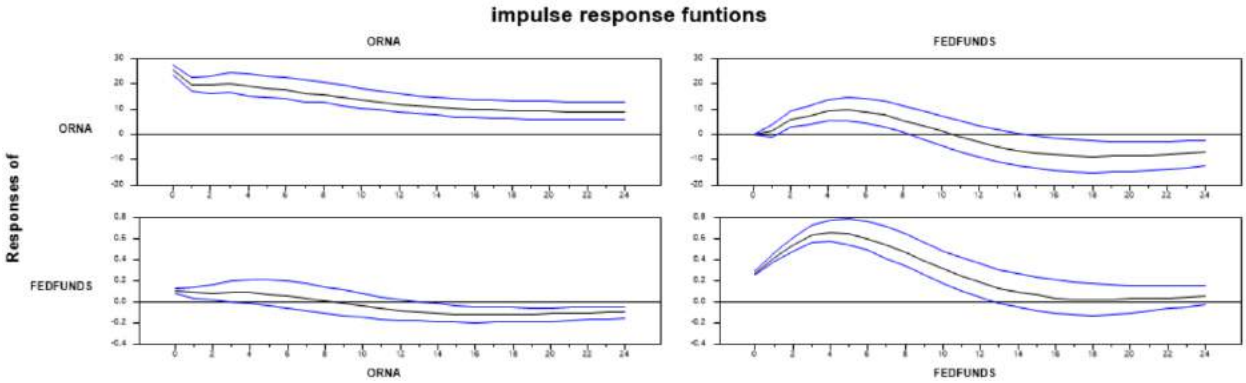
There are two theoretical pressures that will possibly affect this forecast. Non-farm payroll is a calculation of (population-farm workers) *(labor force participation) *(1-unemployment rate). According to the Oregon Economic Outlook, the State finds that .6% of persons are not participating in the labor market due to COVID and that overall participation is on the rise. On one hand we have a possible upward pressure from labor force participation, on the other hand, we are expecting the Federal Reserve to act on multiple rate hikes which theoretically increase unemployment. We will evaluate a response of non-farm payroll to a shock in either of these variables.

By setting up a VAR model, I test for causality between the labor force participation (lfp) in Oregon and the number of payroll and find that lfp does not affect the latter.

F-Tests, Dependent Variable ORNA

Variable	F-Statistic	Signif
ORNA	302.7973	0.0000000
LFP	1.5456	0.1816151

Doing the same for the Fed Funds rate indicates that the rate does have a causal effect on the number of jobs and both variables have a causal relationship to themselves. Running an impulse response function yields the below chart.



It is not hard to see those periods of hot job growth only start smoothly decreasing to a still positive asymptote after multiple periods. A shock to job growth doesn't statistically cause a response from the Fed, however, when wages are running hot and inflations starts picking up, the Fed starts from behind the curve. We can see how ORNA is still increasing after a Fed shock has occurred. In the same shape as the increase in jobs, the Fed acts disproportionate and then eventually job growth declines. This also explains why a shock to the rate is followed by delayed but severe increase in the rate, thus causing itself. This is consistent with the FED point of view of waiting to see when a development is already being unraveled and then acting disproportionate the other way to counter its previous disproportionate leniency.

Overall, with continued expected job growth, we can see there may still be upside potential through 2023, however, we should start considering the current fed funds rate's impact on 2024/2025.

Conclusion:

The most likely path for non-farm payroll is positive in the upcoming year. Using the ARIMA model that yields a valid forecast (without unit root), we can get a good gage of where job growth will go in the upcoming year. The model gives a forecast that projects the most likely path of 30,000 job gains, with a range between about 65 thousand job losses and 135 thousand gains. According to the cumulative distribution function, the probability that jobs will move in a positive direction is 59.8%

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probability that job growth is positive       0.59829
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According to our impulse response function, now that we can expect or have started seeing a shock to the Fed Funds rate, we should expect more future cuts, however, it seems as if the Federal Reserve is behind the rate cycle. Therefore, it seems likely that rate hikes will ensue multiple times, but the labor market is most likely going to keep running hot and react to these rate hikes with a lag. There is significant downside risk if the Fed must move more aggressively than expected, however, overall, I concur that job growth will almost certainly be positive, aside from a major COVID outbreak which could only be speculative.