Idaho Economic Forecast

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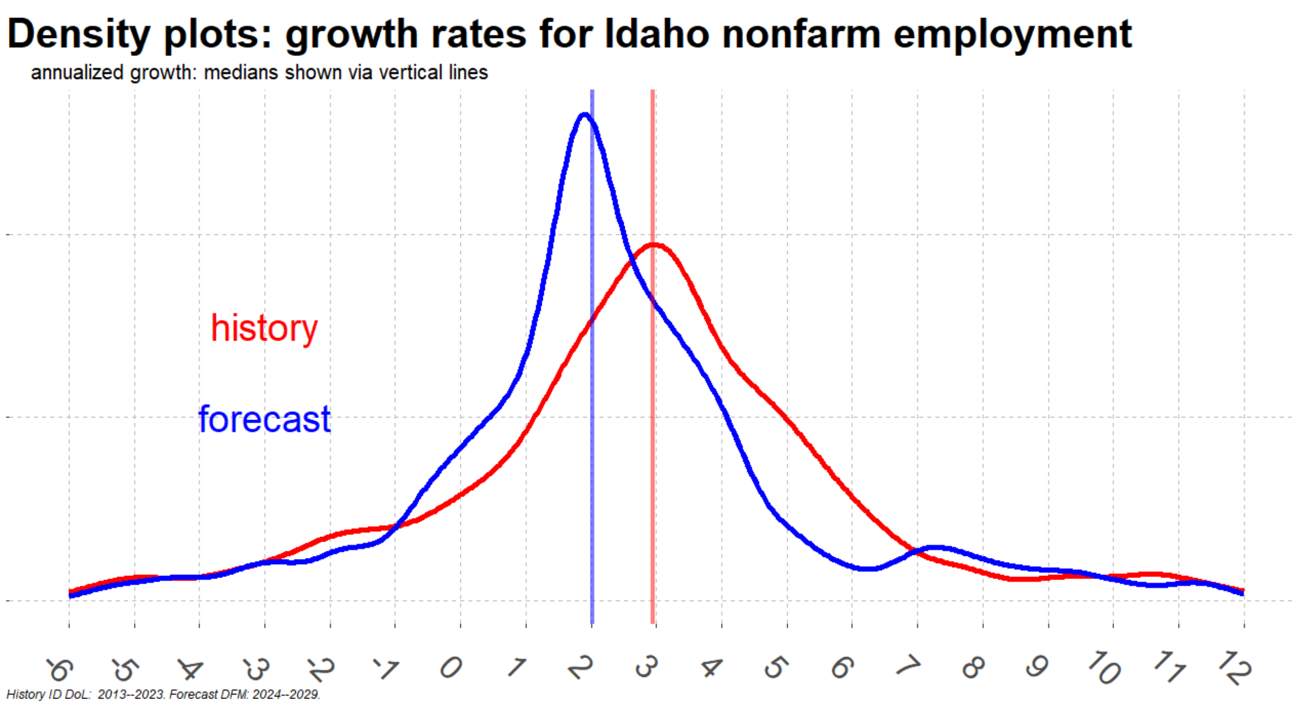
- **Forecast begins the first quarter of 2024**
- **New model description**



Idaho Economic Forecast 2024–2029

State of Idaho
BRAD LITTLE
Governor

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Introduction

This document summarizes Idaho's economic forecast for 2024 through 2029. The primary national forecast in this report is the April baseline forecast for the US economy by Moody's Analytics. The Idaho economic model takes the national forecast as an input.

Idaho Department of Labor provides monthly historical employment data. New to this report, employment data is now used at the monthly frequency, and seasonal adjustment is not performed perfunctory. Data is complete through 2023m12. Wage data is also supplied by the Idaho Department of Labor. This data is only collected at the quarterly frequency. This is adjusted by DFM to monthly data consistent at the quarterly level.

Historical and forecast data for Idaho are available. These are now provided via this link. The linked xlsx file includes data for broad sectors of the Idaho economy at the monthly frequency, and data for narrower sectors of the Idaho economy at the half-year frequency.

Cover: density plot. The cover graph is an illustration of typical annualized growth of the nonfarm jobs count in Idaho.

The historical density[1] shows that the majority of expected annualized growth rates are somewhere in the range of $[-2\%, 7\%]$, with rarer occurrences of growth either $< -2\%$ or $> 7\%$. The graphical indication that these are rarer growth rates is that the historical graph is substantially closer to the horizontal axis in those more extreme cases. The most typical historical growth rate has been about 3%. That is both the median observed historical growth rate,[2] as well as the modal historical growth rate.[3]

The forecast density shows that the median growth rate in the forecast of Idaho's nonfarm job count, at about 2% annualized growth, is expected to be slower than has historically been observed. It also shows that there is more expectation that annualized growth above 7% is possible than the historical density would suggest.

The relative heights of the two graphs indicate that their concentration of annualized growth rates are different. More annualized growth rates are expected to be observed very near 2% in the forecast than would be expected to be found very near 3% if history was our only guide. Said another way, there is greater dispersion in annualized growth rates across history than is expected across the forecast.

Both graphs use computation of annualized growth rates by comparing not only a month to its predecessor, but also by comparing a month to two months ago, three months ago, . . . , all the way back to comparing a month to twenty-four months ago. Thus, 2020m1 gives rise to twenty-four observations of annualized growth rates, as does every other month in history. Using time periods spanning at least a year is helpful for understanding growth using data that has not been seasonally adjusted, something that the interior of this report will discuss further. It also means that the associated densities are quite smooth, so easing their interpretation.

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[1] The coding generating these density plots was pioneered by our summer intern, Sean Murphy, of Grinnell College in Grinnell, IA. Sean is a graduate of Skyview HS in Nampa.

[2] meaning that half of the observed growth rates are above and half are below

[3] meaning that is the growth rate showing the highest likelihood of occurrence which is reflected by that being the horizontal measure associated with the peak of the historical curve

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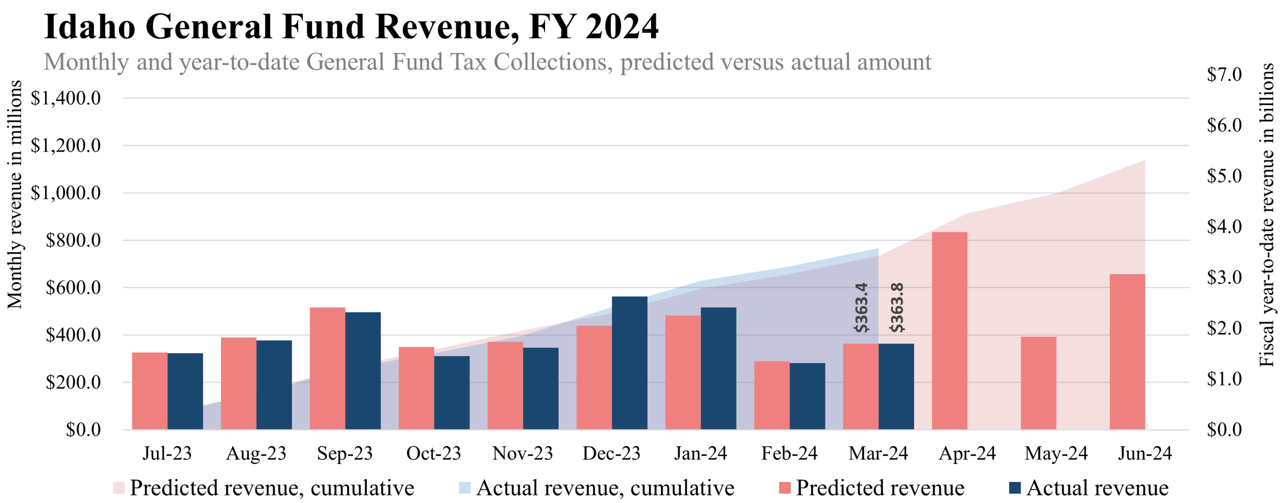
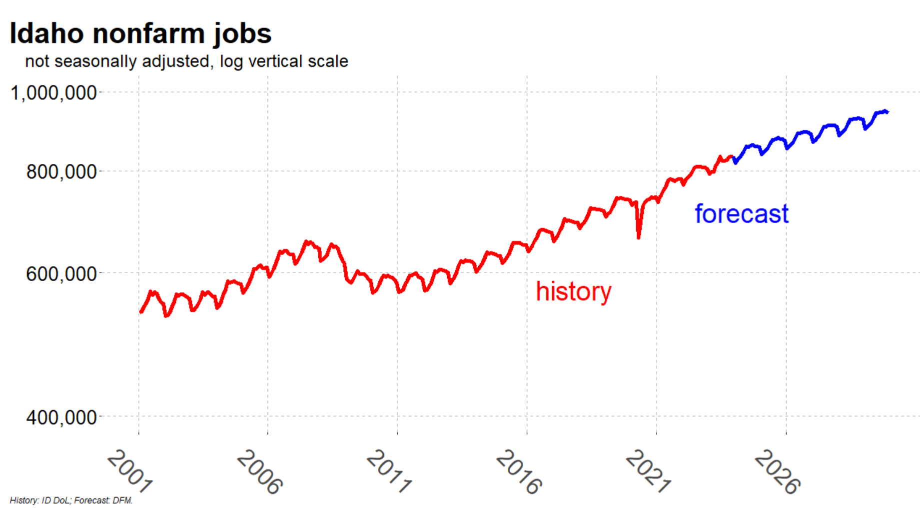
Overview

The primary task of the Economic Analysis Bureau is to prepare a forecast of revenue for the General Fund. This revenue is not generated in a seasonally adjusted manner, as evidenced by the vertical bars in the graph. Seasonally adjusted data tends to appear more like the smoother, cumulative growth shown in the background of this graph.



There is, though, a pattern that tends to play out in terms of monthly revenue. This is most easily recognized via income taxes. There is a season in which they, via annual filing, are due; typically this occurs mid-April. There are also some typical patterns for other revenue types, including sales tax. These patterns are not static across decades. The introduction by the retailer Amazon of its Prime Day sale has been one of the more recent and easy to describe disruptions to those underlying patterns. Unlike Black Friday, the retailer's newly introduced holiday has not yet been fixed within the calendar (or the historical record.)

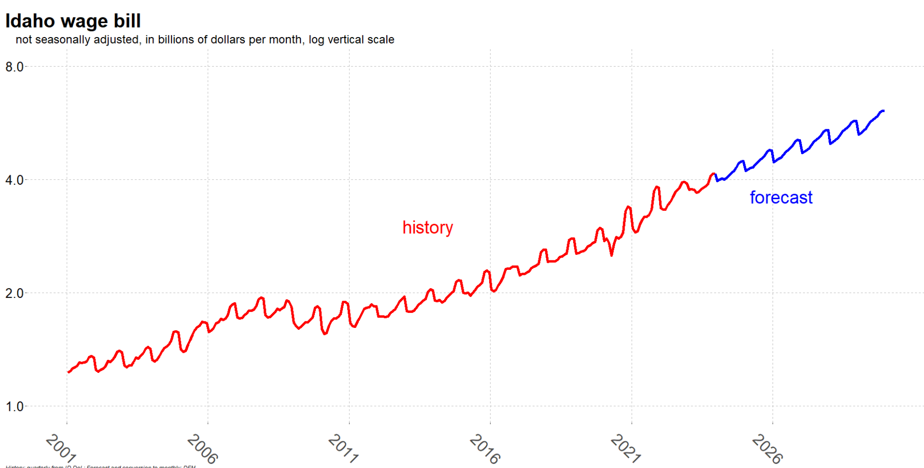
Modeling. Other data also has historical patterns. Here is a graph of total nonfarm employment in Idaho across history and the forecast. It is clear that there are seasons of employment in the state. A few sectors for which it is easier to understand seasonality in employment include education, the construction sector, and in the logging industry. They do not all exhibit the same seasonal pattern, as we shall see, but their individual patterns combined with



their relative weights in terms of employment counts do generally produce a fairly stable pattern across time for total nonfarm jobs within Idaho.

Note that some months would regularly record a contraction rather than what we typically call "annualized growth." That is visible in the regularly reoccurring short downward segments within both the history and the forecast. Indeed, the first month of forecast reflects an expected contraction in employment relative to the final month of historical data. In this case, holiday hiring is largely unwound across January, the first month of the forecast period.

Note that the graph here does reflect growing employment in Idaho on average, both across history and across the forecast. Overall, the graph rises towards the right. It is also reflected in the density graph on the cover of this publication by the median growths being positive (2% for the forecast and 3% for history).[4] While considering the trajectory of the graph here, and indeed most graphs with labeled vertical axes within this publication, notice that the vertical axis is presented at the logarithmic scale. This means that exponential growth will appear as a straight line. The overall trajectory of nonfarm jobs in Idaho since 2013 has reasonably been approximated by a straight line[5] (which should be visibly apparent to you when looking at the graph). That the forecast bends a bit away (lower) from this line is an indication of slightly slower growth expected across the forecast. That is another way of saying that the typical growth rate of 2% across the forecast is a bit slower than the 3% we have regularly observed since 2013.



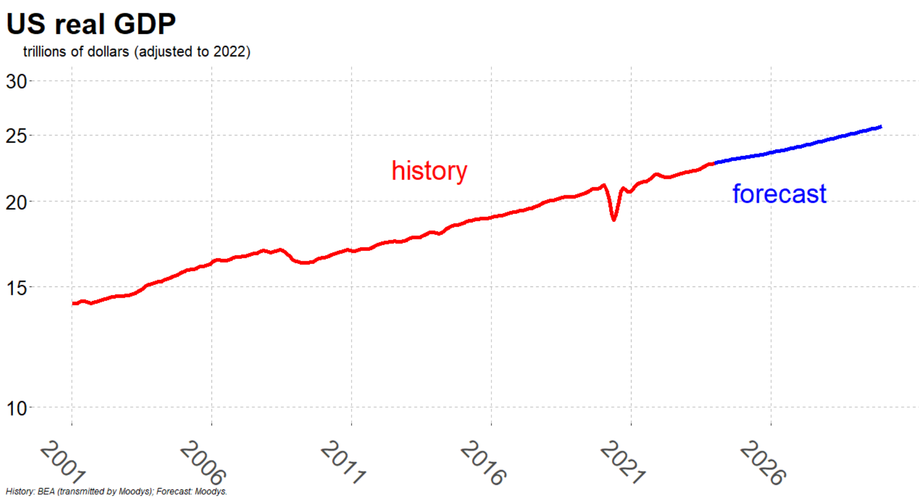
Employment is rather well-behaved in terms of its seasonal pattern. Wage bills, that is, total wages paid, are less uniform in their seasonality. Here the pattern reflects a composite of effects. At one level, the seasonality of employment guarantees some unevenness in the total wage bills. More people on payrolls would tend to create larger payrolls. However, there are more effects. There are changes in the composition of employment which occurs via seasons. For example, during tax preparation season, accounting offices not only hire, but they also run at full speed, with lots of extra hours, and perhaps overtime pay. Several industries within Idaho regularly have seasons for bonuses, though the sizes of those bonuses and the spread of them are unlikely to be uniform. Data at the industry level suggests that this last factor is helping to change the observed seasonal pattern; that change, however it originates, is visible within the historical portion of the graph, and it is reflected within the forecast portion

[4] Further discussion of the cover graph, which is a density plot, is provide on page 6, and an example using an Idaho employment sector of the ideas behind density plots is later discussed; see page 26.

[5] The exception being the few months in 2020 for the pandemic.

in that the pattern of the forecast is slightly different from what you might have expected if only you had seen just the historical data. Greater felicity in producing these forecasts may ameliorate this deficiency, but the compound nature of this pattern make it much more difficult to achieve than for the employment counts just discussed.

Of note, the disruption during the pandemic of the wage bill was much less visible than the disruption in employment. This reflects both the federal assistance which flooded the US economy at that time, but also the variability already present within wage bills due to the factors just discussed. The reversal in observed wage payments in early-2020 was roughly as large, though in the opposite direction, as the observed bump in wage payments towards the end of the 2019 calendar year. That bump in 2019 reflected the usual expansion of employment for holiday hiring, extra hours, and bonus activity.



It is important in this first report using data that has not been seasonally adjusted to convey that the modeling of Idaho's economy is still performed relative to a US forecast. This forecast is due to Moody's Analytics. The US forecast is for modest growth going forward. Largely this reflects demographic trends. The US is reaching its peak number of individuals turning 65. This means that retirements are constraining the labor market. It also means that a bulk of expertise is exiting the workforce. As younger workers fill those jobs, productivity will likely come, but with a lag. Moody's forecasts real GDP growth to follow the trajectory displayed in the graph. Note that the vertical axis is presented at log scale, so that exponential growth in real GDP would appear as a straight line.[6] This rather smooth graph[7] indicates that the period of rapid growth coming out of the pandemic slump is expected to have passed and that growth, though tepid, is expected across the five-year forecast horizon. Note that the trajectory is not expected to be steeper than the recovery across 2013–2019.

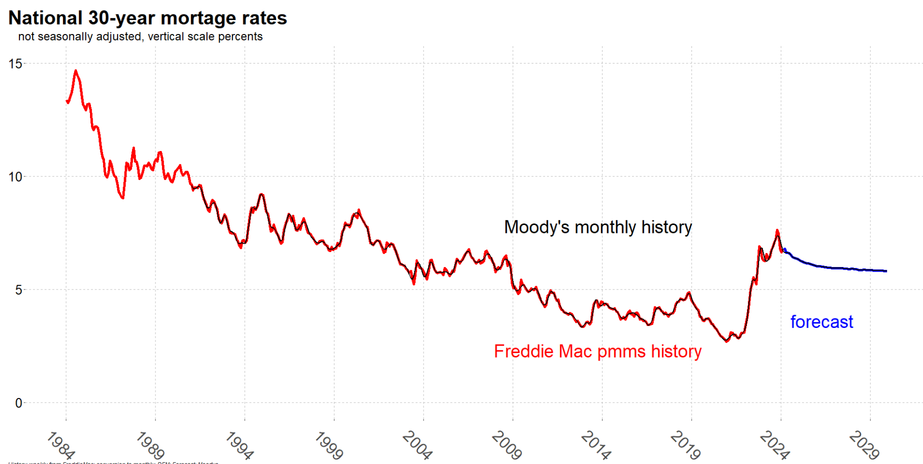
Inputs from Moody's, such as this GDP trajectory, inform the slower-growth trajectory expected for the Idaho economy in comparison with recent Idaho history. Idaho's growth, measured in rates, is still expected to exceed the growth rates forecast for the US economy both for jobs and total wages earned, and this rests on the expected expansion of Idaho's population. There remains the

[6] For a numeric example of this exponential-to-straight-line feature, see page 25.

[7] The US Bureau of Economic Analysis does not provide monthly GDP data; only quarterly estimates are produced. Documentation of this is probably most easily digested at Fred: St. Louis Federal Reserve Bank. Consequently Moody's uses an interpolation to produce its monthly series of real GDP.

ability of people to move here and find housing (which has been a difficulty recently because of the popularity of the move) and jobs (which have been plentiful recently). Elements of Moody's forecast are expected to aid domestic migration into Idaho, and one of those is the anticipated path of mortgage rates. More immediately, the recent history of local, multi-family housing starts should be transitioning into completions, awaiting owners or tennants. We have repeatedly observed that domestic migration, which fuels Idaho's population, remains easier to achieve than international migration, which would perform the same role for the US economy as a whole.

Discussing mortgage rates allows us the opportunity to illustrate one more aspect of the newer modeling that we are using to study the Idaho economy. Mortgage rates are expected to gradually retreat from the recent run-up they have seen; that run-up is a consequence of the US Federal Reserve fighting to bring inflation back down towards its 2% goal. The tameness of the Moody's forecast for mortgages across the next five years reflects that the firm judges that the Federal Reserve has largely won that battle.



Moodys provides data at the monthly frequency, though the firm primarily works at the quarterly frequency. That provision occurs via automated computations.[8] Consequently, where we are able to obtain raw monthly data, we do so, and merge that history with Moody's Analytics' monthly forecast. An example that is certainly relevant for Idaho's economy is the monthly mortgage rates. This data is available from Freddie Mac[9], a quasi-governmental agency, at weekly frequency. Here is an example graph showing that merging.

There are qualitative difference in the historical record and the forecast. The pattern seen in history is not a seasonal one; if the pattern were seasonal, there would be reliable advice that is well known about when to apply for a mortgage within a month or within the week, and there is not such reliable advice. Said another way, the jaggedness of this historical record is not possible to reliably predict across the forecast period, and hence Moody's has produced a smooth forecast, and we at DFM have not imposed any pattern to that smooth forecast.

* * *

[8] You can see that Moody's mortgage data has some smoothing built-in over the raw data.
[9] freddiemac.com/pmms

Summary. There are two aims to the publication of this report:[10] one is to introduce the changes to the modeling procedure and the methods we use to assess that model; the other is to serve as a historical record against which we will judge future forecasts. The discussion of the graphs is for the first aim. For the second, we include some data-tables and the surrounding discussions, but we also emphasize the link to the xlsx data provided in the introduction on page 6.

US	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
inflation, CPI measure	1.3	4.7	8.0	4.1	2.9	2.4	2.3	2.2	2.2	2.2
real GDP growth	-2.2	5.8	1.9	2.5	2.6	1.6	1.9	2.2	2.3	2.3
Federal Funds rate	2.2	0.4	0.1	1.7	5.0	5.2	4.3	3.3	2.9	2.8
mortgage rates	3.9	3.1	3.0	5.3	6.8	6.5	6.2	6.0	5.9	5.9
employment growth	-5.8	2.9	4.3	2.3	1.6	0.6	0.3	0.3	0.3	0.3

A particular focus in the new modeling is on housing. Housing has also been a main story throughout the pandemic, but even before. The output for Idaho is summarized here and examining the table can provide some context for those stories. The data is recording "thousands of units" per year, and the measure record activity from July of the prior year until July of the named year; that is the way the Census studies housing.

ID housing units	2003	2004	2005	2006	2007	2008	2009	2010	2011
permits	13.9	15.8	19.4	20.6	14.8	9.8	5.2	5.6	3.7
starts	12.5	14.6	18.0	20.3	15.9	10.9	6.3	5.5	4.1
completions	11.6	14.2	16.7	19.9	17.1	13.1	8.4	6.3	4.6
Census: stock change	14.3	16.0	18.9	21.9	17.2	12.4	6.8	5.1	4.1
IEM: stock change	12.9	14.6	16.5	19.9	20.9	16.4	11.1	6.6	4.8

ID housing units	2012	2013	2014	2015	2016	2017	2018	2019	2020
permits	5.5	7.5	9.1	9.2	10.5	11.8	14.6	14.5	16.6
starts	4.8	6.8	8.4	8.6	9.6	10.9	13.5	14.0	15.5
completions	4.5	6.0	7.6	8.3	9.5	10.6	12.4	14.1	14.4
Census: stock change	3.9	6.2	8.5	8.5	9.7	11.8	13.9	15.6	5.1
IEM: stock change	3.9	4.4	6.7	8.4	8.7	10.1	12.2	14.5	12.8

ID housing units	2021	2022	2023	2024	2025	2026	2027	2028	2029
permits	19.0	21.2	15.3	19.5	20.7	22.7	24.4	25.9	27.1
starts	17.2	19.3	15.8	17.7	18.9	20.5	22.3	23.6	24.8
completions	17.3	17.7	17.4	16.9	17.2	18.6	20.1	21.5	22.8
Census: stock change	18.8	21.6	18.6						
IEM: stock change	8.8	19.3	20.9	17.7	17.9	19.5	21.1	22.6	24.0

[10] which is being produced November 12, 2024, much later than the "April" edition it is slotted to fill

Economic outlook

The Idaho economic forecast is built in the context of a national forecast from Moody's Analytics. This forecast expects continued growth in the US economy, but it expects tempered growth. The expectation for nonfarm jobs is for modest expansion quite often below 0.5 percent per year in not-too-distant future, in fact mirroring the expected expansion of the US population. Job growth in 2024 is still expected to exceed population growth. Roughly, though, that would be unusual in the 2026–2029 portion of the forecast.

US growth rates	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
US nonfarm jobs	-5.8	2.9	4.3	2.3	1.6	0.6	0.3	0.3	0.3	0.3
US population	0.3	0.2	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.3
Total personal income	6.9	9.1	2.0	5.2	4.9	4.2	4.3	4.4	4.6	4.5
... inflation adjusted ...	5.8	4.8	-4.2	1.4	2.5	2.0	2.1	2.3	2.4	2.3
Wage & salary payments	1.5	8.9	7.8	6.3	5.5	4.5	4.0	4.0	4.0	3.9
... average US wage ...	7.9	5.8	3.4	3.9	3.9	3.9	3.6	3.7	3.7	3.6

Personal income growth is predicted consistently above 4%. Wage and salary payments expand just a bit more slowly in the Moody's forecast. Personal income benefits from dividends, interest, and rent, as well as from transfer payments. Comparing the total personal income line with the inflation adjusted one, we see that inflation is expected to be much more benign across the forecast than it has been, particularly when comparing with 2022. The average wage forecast in Moody's modeling is not expected to lead to inflation.

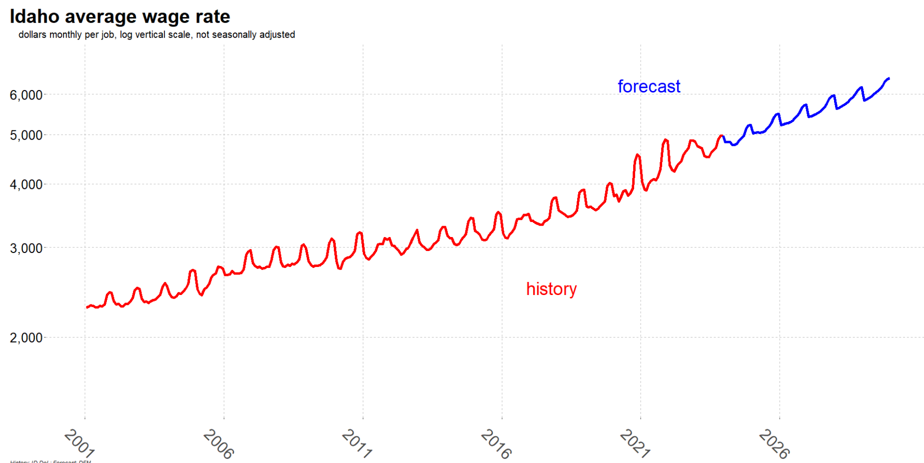
A moment's reflection of this summary of Moody's April forecast for the US economy indicates that this is a middle-of-the-road type forecast. The buffeting which the economy has withstood since late 2019 is not expected to persist.

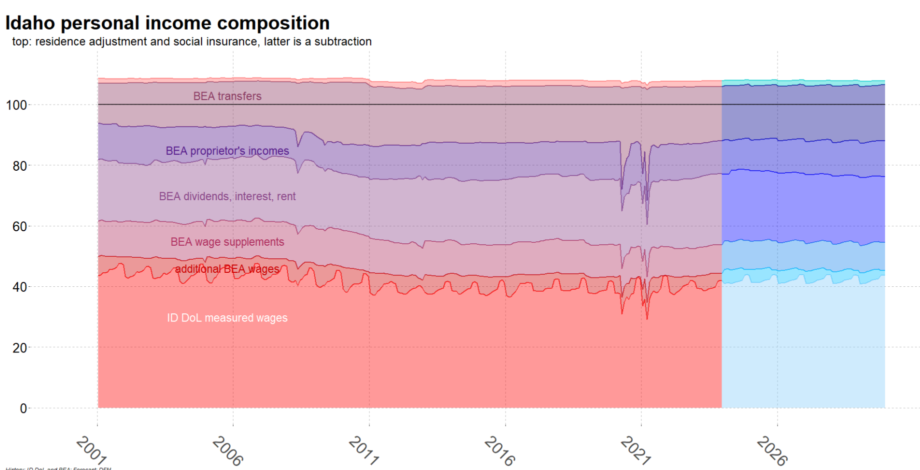
In that national context, we see that Idaho's economic expansion is expected to continue to be fueled by population expansion. Idaho's growth trajectory persists and differs from the US trajectory. This should enable employers to find employees and it should sustain a reasonable expansion of total personal income in the state.

ID growth rates	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
ID nonfarm jobs	-0.6	5.8	4.0	2.5	3.5	2.0	1.8	1.9	1.9	1.9
ID population	3.4	3.0	1.8	1.3	1.4	1.3	1.3	1.3	1.4	1.4
Total personal income	10.7	12.3	6.4	5.7	2.9	6.6	5.9	5.5	5.6	5.7
... inflation adjusted ...	9.5	7.9	-0.2	1.9	0.5	4.3	3.7	3.3	3.5	3.5
Wage & salary payments	7.2	12.6	11.1	6.4	8.3	6.9	5.5	5.0	4.8	5.0
... average ID wage ...	7.7	6.4	6.9	3.8	4.6	4.8	3.6	3.1	2.8	3.1

Recent history has seen nonfarm jobs expand in Idaho at a faster clip than the population overall. This is expected to continue, but to eventually settle into a more modest gap between the two rates. The higher rate of job gains certainly helps sustain the faster expansion of personal income expected in Idaho, and that is visible in the total wage and salary payments forecast.

For individual Idahoans, the accompanying graph illustrates what is likely one the most important feature of the Idaho economy in their lives. Pay is increasing, and that is forecast to persist. However, the graph illustrates that pay is not uniform; there are months when bonuses occur, when overtime is regular, and there are months when work is slim. In this regard to see the permanence of the increase, focus upon the yearly low points. Across time, these drift upwards to the right. Average monthly wages crossed above $3,000 in the mid-2010s, and above $4,000 in the early-2020s. Average wages are approaching $5,000 per month per job in Idaho, but that is unlikely to be sustainably achieved this calendar year. It is likely to occur in 2025, though.



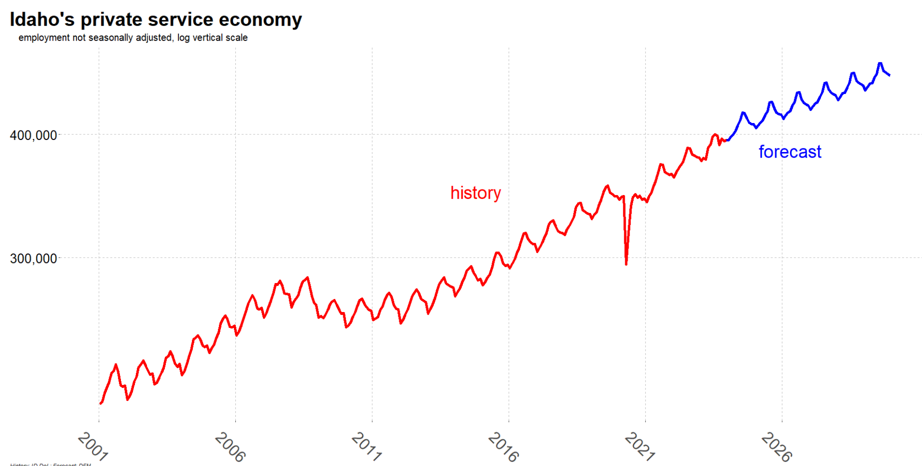


Wages drive a lot of personal income. Supplements, things like employer offered insurance, are tied to them. Transfers include payments through the social security program to retirees. Proprietors' incomes are dominated by those not in the farm sector. Dividends, interest, and rent remains a sizeable portion of Idaho personal income. The BEA reports wages at the quarterly frequency, seasonally adjusted. The Department of Labor data we have on wages is also quarterly, but not seasonally adjusted, and it represents a large portion fo the workforce, particularly those participating in the unemployment insurance program. We forecast the seasonal gap between the two measures. As is visibly apparent, that is at least as consequential as the residence adjustment, which the BEA performs to attribute wages to residents in the state, rather than jobs in the state.

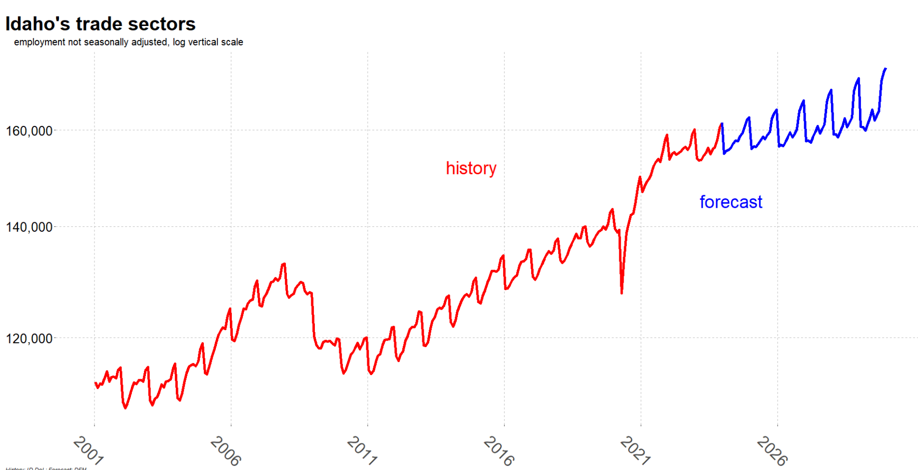
We now turn to the labor market and focus on employment trends.

Not seasonally adjusted. Private services represent the NAICS[11] codes 51–56, 71–72, and 81, encompassing information, finance, real-estate, management and business services, accommodations and food-services, arts and entertainment, and other service industries. This is the bulk of private enterprise jobs in the state.

Our outlook for this supersector is for growth similar to that observed in the 2013–2015 era. The accompanying graph illustrates that the seasonal pattern of employment in this large portion of Idaho's economy is well established. Looking at recent history, this has expanded by about 1/3 across 9 years, from about 300,000 to just about 400,000 jobs in that time.



Before moving on to another portion of Idaho's labor market, consider the employment in the private service sector around 2016. Notice that the unwinding of some jobs in the sector is not abrupt; the dashed vertical line indicating 2016 is preceded for a few months by declining private service employment. The trough of private service is then a couple of months subsequent to that 2016 vertical dashed line.



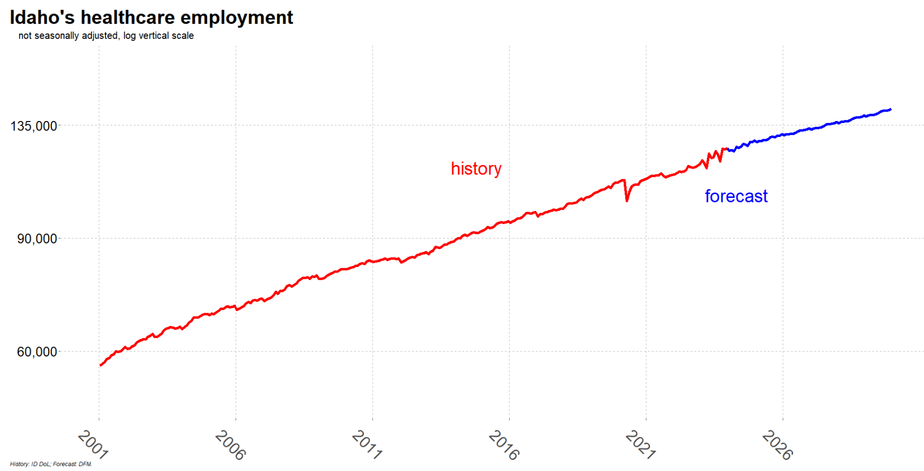
Now that this feature has been noticed, looking at the next graph, for trade, we can see that the seasonal pattern for trade is distinct from that for private services. There is an abrupt change in trade employment as the 2016 vertical dashed line is crossed. The trough in trade employment occurs essentially that next month. This seasonal pattern is highly influenced by holiday shopping and delivery.

Trade includes retail and wholesale trade as well as the transportation industry which supports the two. Seasonality is even more pronounced in this sector than in private services. It is also

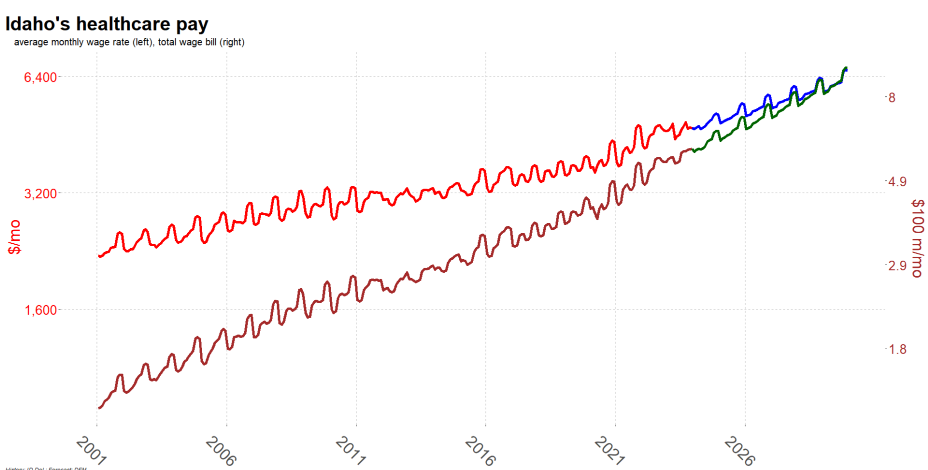
[11] North American Industrial Classification System, the US organizational method for job classification

worth noting how distinct is the jobs path in this industry compared to private services during the height of the pandemic. Rather than bounce back to the prior level, this sector overshot its prior level and has continued to expand, at least during peak employment months.

The national forecast for trade is fairly subdued in the retail sector. Our outlook is being pulled along by the wholesale and transportation portions. Trade employment could be, particularly in a few years, affected by the outcome of the proposed merger between Albertsons and Kroger (which owns Fred Meyer stores).

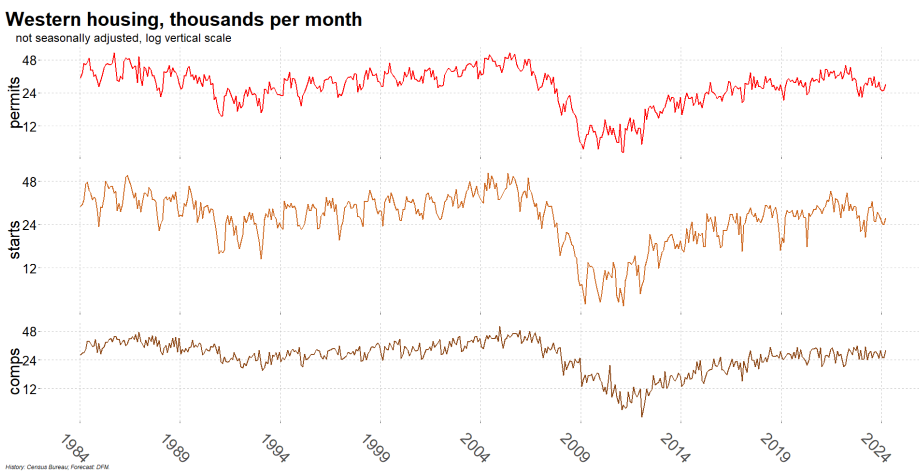


Healthcare is a a good sector for realizing the advantage of logarithmic vertical axes when the data represents a substantial range. Healthcare has increased from near 60 thousand employees at the close of 2001 to above 90 thousand employees by 2014; that is a 50 percent increase in 13 years. Another 50 percent increase is forecast in about the same amount of time, perhaps taking 14 years this time. Again, exponential growth appears as a straight line when graphed under a logarithmic vertical scale; here the growth rate is 50 percent in about a baker's-dozen years.



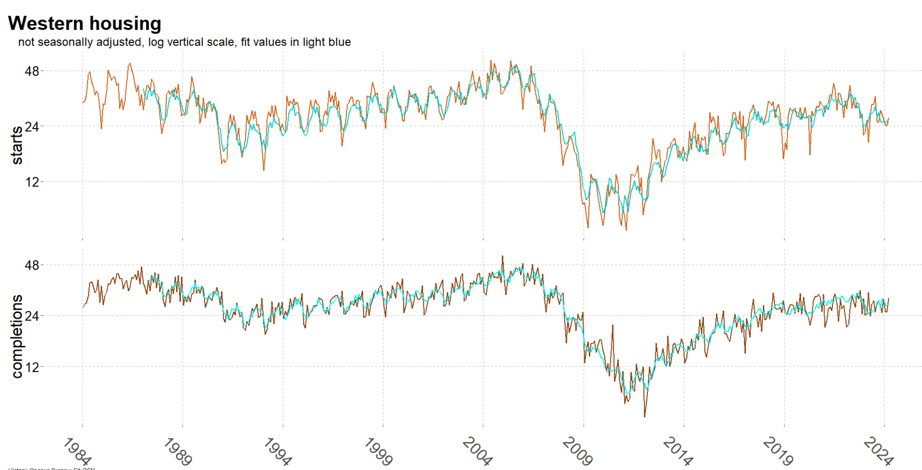
The seasonality present in private services or in trade is essentially absent in healthcare work. The majority of this employment is private employer based. The VA is an example of federal healthcare workers in the state, and the health districts are example of local government employment in the healthcare space. The expansion of healthcare in the state is supported by the expansion of the population and the aging of the population. Aside from newborns and toddlers, the bulk of healthcare is delivered to older adults.

While there is little seasonality in healthcare employment, there is substantial seasonality in healthcare wage bills, that is total wages paid in the sector. Partly this reflects differing hours across seasons; partly it reflects bonus payments. That seasonality then translates into seasonality for the average monthly wage rates. While the scale on the right-hand axis seems small, total wages paid per month increase from about \$125 m per month to over \$800 m per month in the displayed time-frame. That factor is aided by the more than doubling of the workforce, but as we see, there is also an increase in the average pay per month as well.

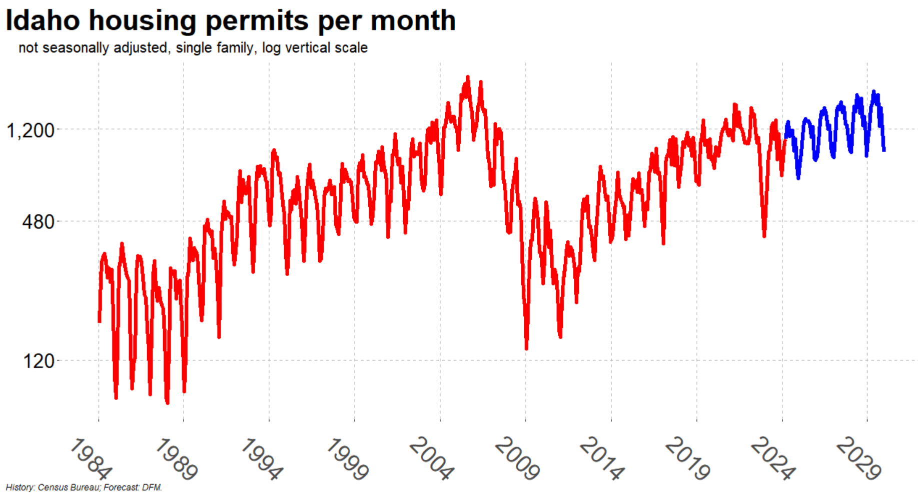


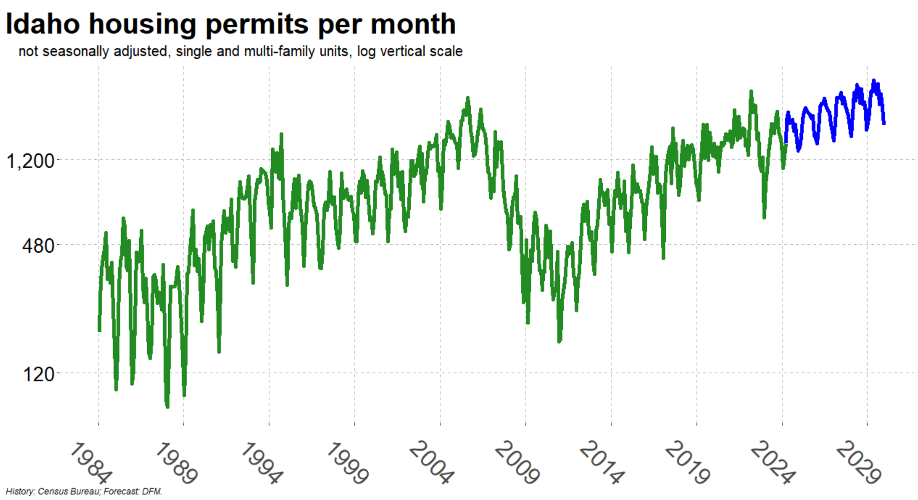
Housing starts and construction. Besides moving towards using not seasonally adjusted data, another change in the modeling of the Idaho economy is an attempt to more closely tie housing permits to variables which are measured. The primary one we use is the annual estimate of housing stock in the state. This is provided for each July 1 in history by the Census Bureau.

They also collects data on Idaho housing permits, but the closest geography on which it releases data for starts and completions in the western US. Consequently we model Idaho's transition from permits to starts, and from starts to completions, on this western US data. Typically most permits actually become starts, usually within one year. Starts are not as successful at becoming completions. For the western US there is typically a 8–10 percent attrition of units. Further, the lags with which completions are computed based upon starts varies across time.

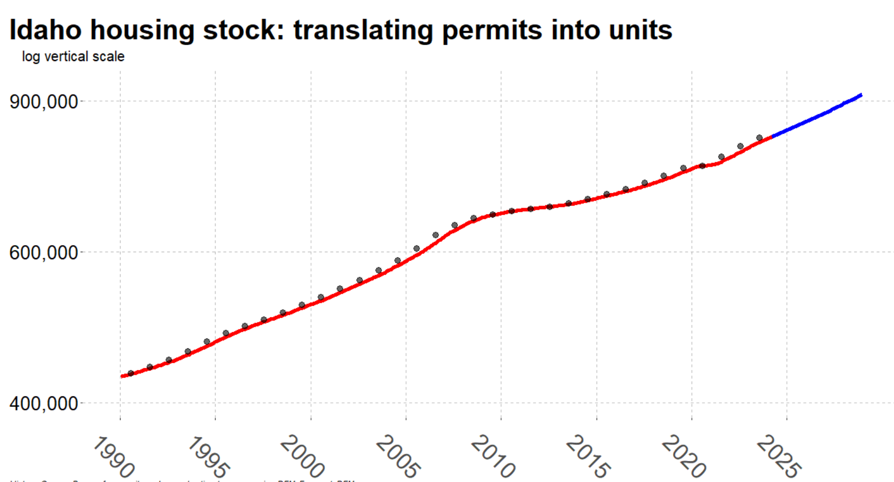


In the accompanying graph showing starts and completions, the fit data is shown superimposed on the Census data for the western US. Starts are modeled only on permits in order to obtain that fit curve (the light blue). Completions are then modeled only on starts. In both instances, the modeling is required to use positive coefficients. Those coefficients sum to ≤ 1, meaning that non-permitted starts are not forecast, nor are non-started completions. If the coefficients do sum to 1, then there is 100% translation of the prior step to the next, i.e., there is no attrition. That occurs for starts, but does not occur for completions.



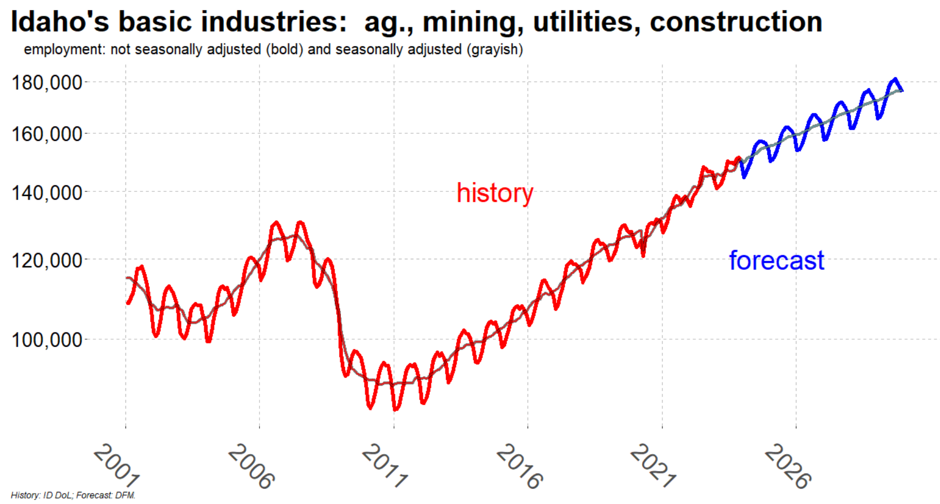


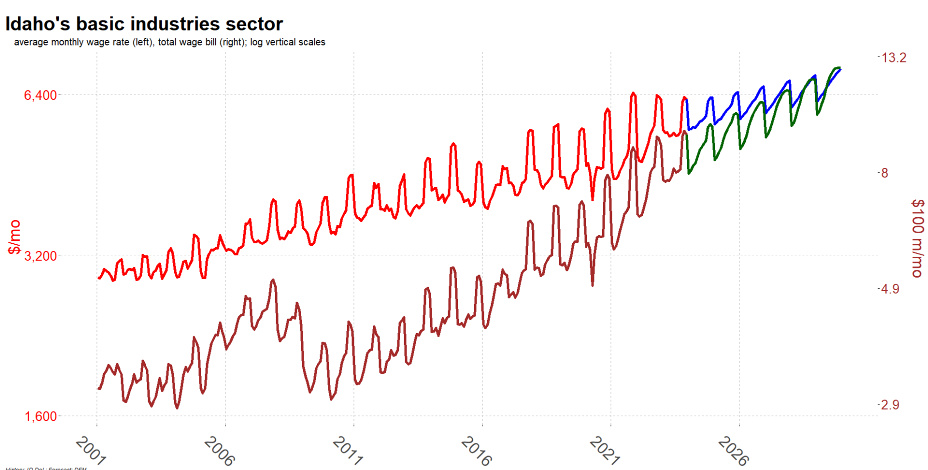
It can be difficult to assess the reasonableness of the forecast of permits. Across history, there is great variability even if there is substantial seasonality. We present both the permits for single-family units and then the permits for all units, both single-family and multi-family. It will take some attention to recognize the difference in graphs besides the colors chosen; looking at the levels forecast (in blue) shows that multi-family permits are expected to bring total permits above the 1,200 units per month across the forecast horizon. Note the differences in 1984–1989 period as well as right around the Great Recession. Multi-family permits kept the total permits up (relative to the 120 units per month line) during those leaner times.



We have found that the translation from permits, to starts, to completions, provides a reasonable, though certainly far-from-perfect fit for housing stock. Indeed, the yearly estimate from the Census Bureau fit well with our completions across several segments of history, but there are instances where it appears that completions either occur with less attrition from starts or else they occur more rapidly than expected. This may be possible to ameliorate in our modeling by varying the starts-to-completions estimates across time, a development that future editions of this publication will investigate.

Seasonal adjustment. Providing accommodations for people has been a challenge during the 2001–2024 period. Both recessions in the interim have had housing implications. The basic industries' growth has been dominated by the path for construction employment in the state. The Great Recession[12] changed the workforce in Idaho. Many construction workers left for other industries because the recovery was too long coming. The more recent and short recession[13] did not alter the workforce in this way. Partly this reflects Idaho's choice to keep construction ongoing as an essential part of the economy. Given the demand for housing in Idaho and the increasing demands upon our transportation infrastructure due to the growth in population, this is likely part of the reason Idaho's economy bounced back from the pandemic shutdown quicker than most states. In the accompanying graph, both raw (not seasonally adjusted) data and its seasonally adjusted counterpart are shown. The raw data is in the bold colors and the seasonally adjusted data is in the grayish colors. The basic industries include the construction industry,[14] utilities, mining, and manufacturing.





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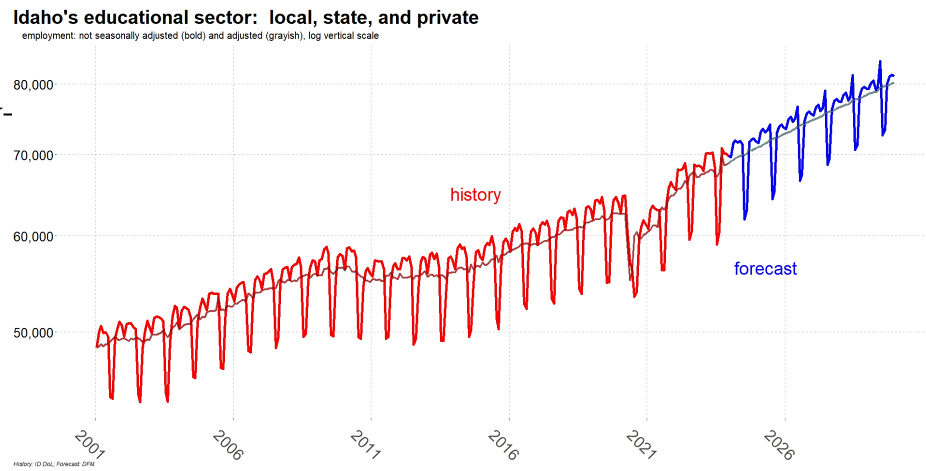
[12] (Dec. 2007–Jun. 2009)

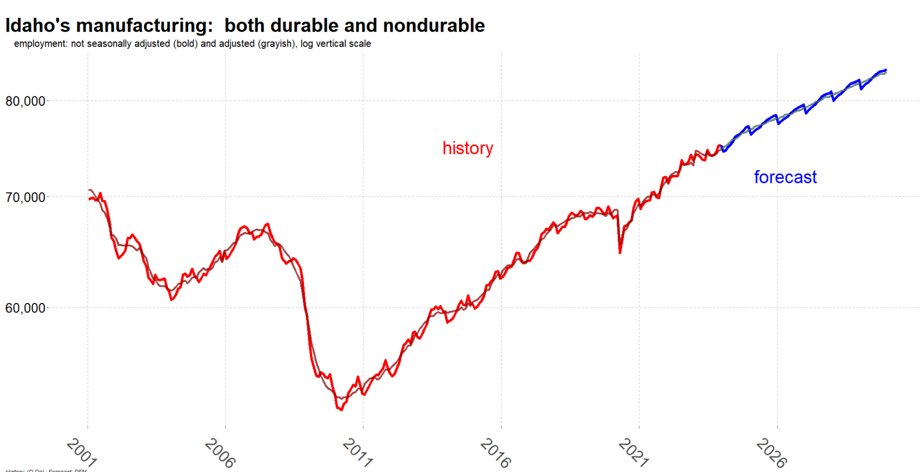
[13] (Feb. 2020–Apr. 2020)

[14] The forecast for construction incorporates another forecasting technique investigated by our intern, Sean Murphy, from Grinnell College. This is a vector auto-regressive model on construction employment and housing permit (monetary) values. Collection of the permit values is new to DFM, courtesy of Sean, and the modeling merges several techniques, with coding and modeling for those also due to him.

Unlike healthcare, there is a great deal of seasonality both in the employment in basic industries as well as in their total wagebills. The two still combine to leave some seasonality in their average monthly wage rates. These wage rates may be somewhat surprising when compared with healthcare wage rates. While doctors are thought of as high-wage occupations, there are plenty of healthcare workers at the other end of the wage spectrum. Conversely, within basic industries is the utilities sector. The average pay in that sector helps to raise the average wage within basic industries.



A good example for discussing the relationship between not seasonally adjusted data and its seasonally-adjustment is the education sector. The short-duration regular downturns in education employment do not dramatically drop the level of employment through seasonal adjustment. Indeed, the stalactite downward only last one-to-two months. The seasonally adjustment procedure recognizes these as the typical pattern. It ignores the sharp turn, but in-turn it lowers the overall level a bit (proportionally about 1/12 to 1/6 of the time is spent in downturn, so the lowering should not be dramatic). Note that the employment level went from just a bit below 50,000 in 2001 to just a bit below 70,000 in 2023. In that time, Idaho's population increased from 1.32 m to 1.96 m people. Thus, educational employment increased by about 40% while population increased by 48%. So education has not had to accommodate quite as many educators as the total population might have suggested.



Though manufacturing is often thought of as the backbone of America's economy, it also has a reputation for periodic layoffs. This is likely reinforced by periodic retooling of factories in the automotive industry. Idaho's manufacturing industries have little seasonality. The overall path these industries have seen within Idaho is similar to that for the basic industries. The recovery from the recent recession was a bit more drawn-out, but growth since 2021 has been consistent and substantial. Our outlook for this sector is for growth. Certainly the food processing manufacturing component is likely to process greater volumes of dairy. Micron's expansion will eventually add to employment. It is unknown what the Vista-Outdoor's transaction of its ammunition production will mean for employment. The Lewiston area has a high concentration of durable manufacturing in that sector.

Forecast analysis

Forecast comparison. In overall assessment, the forecast continues to evolve modestly upwards.

US forecasts. The outlook for the US is for slightly greater employment. Other factors are only lightly adjusted, but the revisions to wages and personal income are upwards. By the end, real GDP is about $100 b richer in the current outlook, relatively little adjustment in a $25 t economy when looking five years into the future.

Apr. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,380	22,960	23,340	23,780	24,300	24,870	25,440
P. income	b $	22,980	24,110	25,130	26,210	27,380	28,630	29,920
Population	m	335	337	338	339	340	342	343
Nonfarm	m ct.	156	158	159	160	161	161	162
Wages	b $	11,820	12,470	13,030	13,550	14,090	14,650	15,230
Jan. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,340	22,710	23,100	23,620	24,180	24,770	25,340
P. income	b $	23,010	24,080	25,070	26,170	27,360	28,610	29,890
Population	m	335	337	338	339	341	342	343
Nonfarm	m ct.	156	157	158	158	159	160	160
Wages	b $	11,830	12,480	13,010	13,530	14,070	14,630	15,210

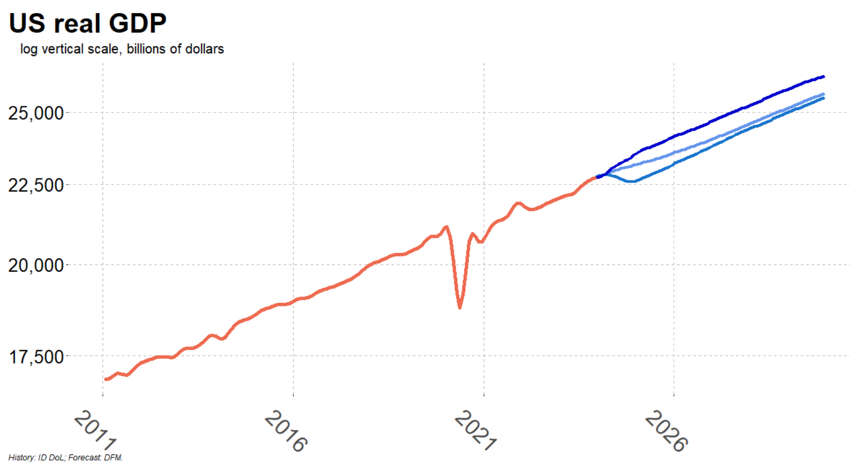
ID forecasts. Idaho's forecast is showing resilience. Population forecasts have consistently shown that Idaho should be crossing the 2 m person level late this calendar year.

Apr. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
P. income	$ m	115,989	119,352	127,203	134,696	142,130	150,133	158,693
Wages	$ m	51,051	54,567	58,339	61,798	65,347	69,056	73,105
Population	ct	1,964,726	1,992,911	2,019,231	2,045,836	2,073,301	2,101,656	2,130,765
Nonfarm	jobs	818,458	846,999	864,081	879,665	896,095	913,435	931,017
Jan. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	
P. income	$ m	114,900	122,776	129,867	137,495	145,156	153,868	
Wages	$ m	51,170	55,026	58,604	61,994	65,546	69,379	
Population	ct	1,988,810	2,008,714	2,038,713	2,062,648	2,081,655	2,098,946	
Nonfarm	jobs	843,117	877,558	901,856	920,909	936,845	952,591	
Oct. '23 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	
P. income	$ m	116,117	123,436	131,626	140,982	150,957	161,954	
Wages	$ m	51,377	55,873	60,432	65,199	70,234	75,673	
Population	ct	1,966,398	1,996,663	2,026,390	2,051,878	2,073,376	2,093,516	
Nonfarm	jobs	851,065	878,787	904,572	930,874	957,266	984,377	

Baseline is the median forecast for Moody's. We discuss an upside as well as a downside case.

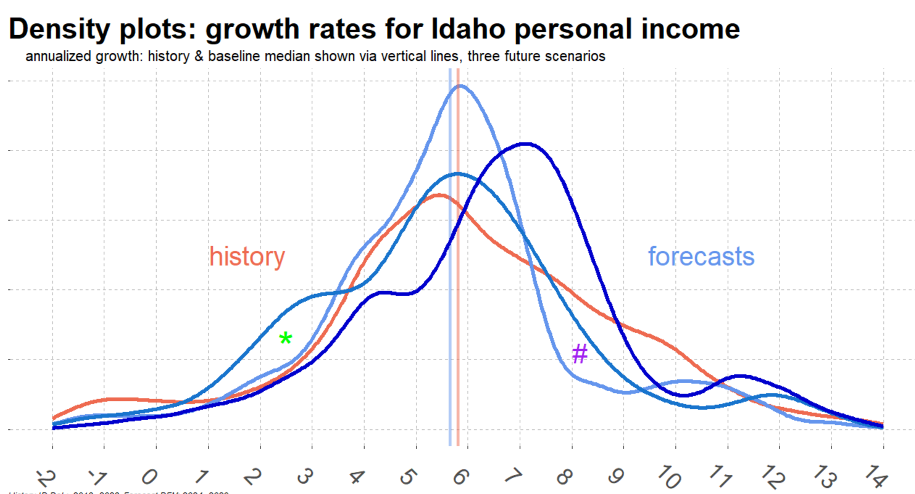
Alternative forecasts.

US trajectories. We simply give an indication of the range of real GDP scenarios envisioned by Moody's as the most likely scenarios on which to plan. Note that the downside scenario nearly recovers GDP from the baseline by the close of the forecast horizon. The upside scenario has a consistent lead over the baseline's GDP.

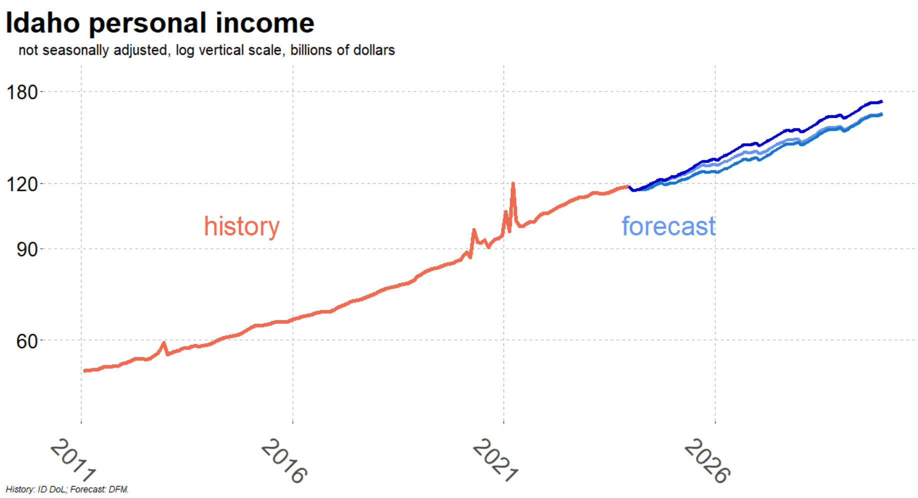


Idaho trajectories. In considering the baseline, upside 10th percentile, and downside 75th percentile national forecasts within the Idaho economic model, the results for total personal income in the state are fairly stable. This is possible to see through the density plots for personal income growth. The baseline forecast is the blue curve with the highest peak. The downside 25th percentile has nearly the same median growth: 5.56 percent versus 5.66 percent annualized growth in the baseline. The upside has median growth instead at 6.66 percent, and this is visible in the darkest blue density curve having its peak to the right of the others.

Looking at the two regions labeled by the green * and purple # show that the downside scenario is more likely to show growth in the 1–3.5 percent range, as well as more likely to show growth in the 7–9 percent range. This is due to the nature of the downside scenario by Moody's. It includes a mild recession and then a recovery, essentially back onto the prior trajectory. Thus the slower growth coming from entering the mild recession are mostly made up by



higher growth coming out of the mild recession. That the catch-up occurs is seen in the trajectory graph. The upside scenario does show personal income achieving levels above the baseline throughout the forecast period. It is the case that the 10th percentile is an optimistic event; only 10 percent of the scenarios Moody's considers beat this one at the national level. In contrast, 25 percent of the scenarios Moody's considers produce less growth in the US economy than that present in the 75th percentile downside case. Across recent history, Idaho's growth has tended to be closer to the upside scenario than the downside ones. Thus the personal income graph here suggests paying attention to see if the more typical baseline-upside near-pairing reappears, as we would expect from history.



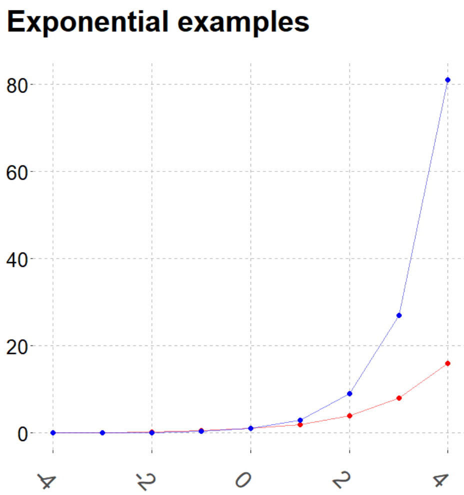
Idaho		2022	2023	2024	2025	2026	2027	2028	2029
Nonfarm jobs	baseline	798,120	818,460	846,840	864,060	879,540	895,780	912,850	930,080
	optimistic	798,120	818,460	848,470	872,000	893,020	912,440	931,520	950,540
	pessimistic	798,120	818,460	836,890	843,470	861,700	882,900	903,100	922,620
wages, m $ (ID DoL)	baseline	43,521.0	46,305.6	50,134.0	53,595.0	56,530.4	59,379.2	62,249.8	65,385.5
	optimistic	43,521.0	46,305.6	50,262.1	54,484.7	58,413.7	62,316.4	66,341.4	70,716.7
	pessimistic	43,521.0	46,305.6	49,649.7	52,521.6	55,738.7	59,294.5	63,034.1	67,149.0
Housing stock	baseline	782,890	803,750	821,440	839,330	858,850	879,970	902,590	926,550
	optimistic	782,890	803,750	821,440	839,330	858,850	879,970	902,590	926,550
	pessimistic	782,890	803,750	821,460	839,620	859,790	881,430	904,310	928,410

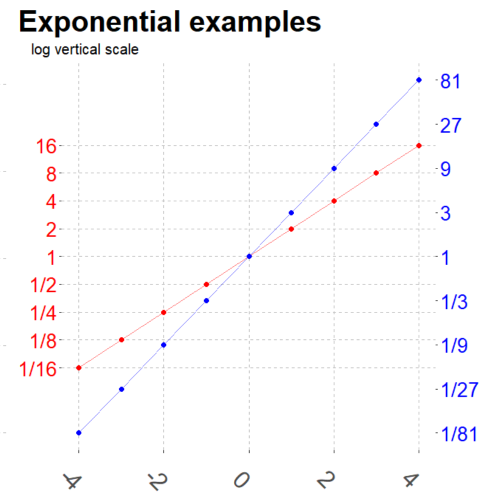
Examples

Log scale.

We present two numeric examples indicating the graphical effect of using a log vertical scale on classical exponential curves. Those curves are typically represented by $y = 2^x$ or 3^x, and we will only investigate these for values of x in $-4, \ldots, 0, \ldots 4$. Here is a table of the associated values and the accompanying graphs. Note that the steepness of the straight lines in the last graph are associated to the base of the exponents, either 2 or 3 in these cases.

x	2^x	3^x
-4	$\frac{1}{16}$	$\frac{1}{81}$
-3	$\frac{1}{8}$	$\frac{1}{27}$
-2	$\frac{1}{4}$	$\frac{1}{9}$
-1	$\frac{1}{2}$	$\frac{1}{3}$
0	1	1
1	2	3
2	4	9
3	8	27
4	16	81

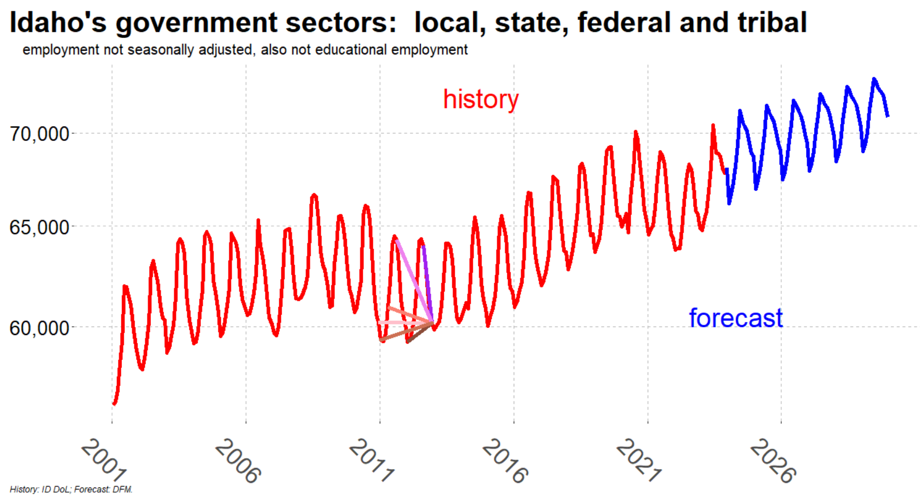




Notice that the ratios between consecutive vertical labels (in red, or separately in blue) is always the same, and that the same vertical distance represents transversing such a ratio.

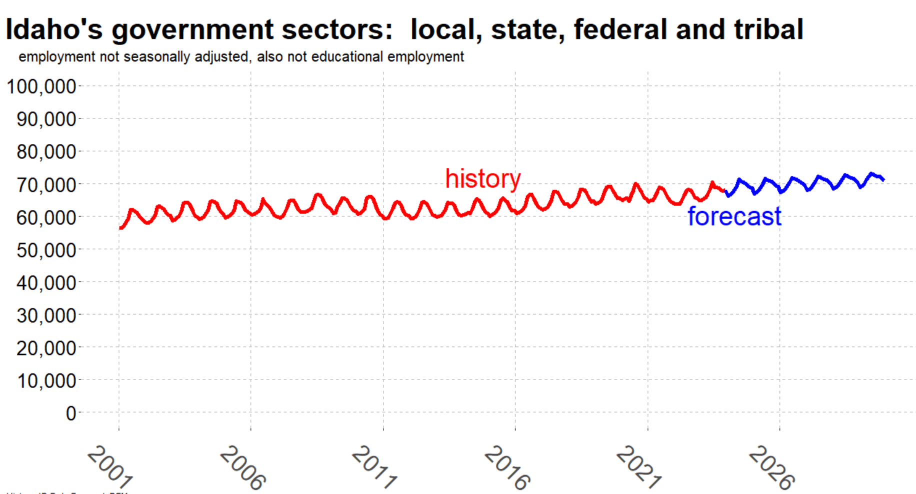
Connecting not seasonally adjusted data and density plots.

Another sector of the economy encompassing several types of employment is government, non-education and non-healthcare.



Seaonality plays a large role in the path of the forecast. Unlike other of our super-sectors, this one has not changed much in employment even as the state has grown substantially; compare the growth here across the past two decades with that in the private services.

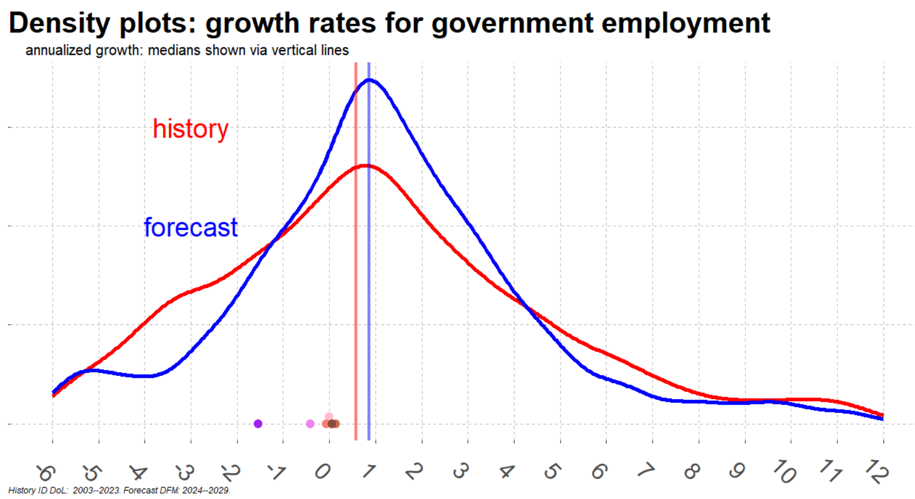
Partly because the growth is pedestrian for this sector, it is a good one to illustrate several features of the graphs we use. As already noted, there is not much growth in this employment sector across time or across the forecast. This can be seen by reading the labels on the vertical axis in the prior graph. It is also quite visible in the next graph, which does not employ a logarithmic scale on the vertical axis. One of the advantages of a logarithmic vertical axis is that it compresses data having a wide range of values. When there is not such a wide range, the logarithmic axis does not provide as much advantage.



It may be somewhat a surprise that there is regular seasonality to governmental work outside of education. Departments where that can quickly be recognized as reasonable include Parks and Lands. For the latter, fire season is certainly a different workforce from mid-winter. That seasonality means that the distribution of annualized growth rates should probably be investigated much as for the cover graph of this publication. To connect that with the graphs here, consider what occurred just prior to the close of 2012. We have introduced, in the first graph of government employment here, six segments all with terminus occurring in December

2012. Each connects an earlier point on the graph with that December 2012 point. Visibly some of these segments represent growth in employment (those with positive slope, meaning upwards to the right) while others represent contraction in government employment (the violet and purple segments do this most obviously, and their slopes are negative, meaning downward to the right).

If we are interested in whether government employment was growing or not in late 2012, we might consider these six line segments to inform our opinion. But these are just a sample of the segments we might consider. Looking at twenty-four such segments, one for each of the prior 24 months, we could compute the average annualized growth rate, which takes into account how many intervening months have elapsed between the two end points of the segments, and produce a density plot. Here we have indicated, via color coordinated dots, the annualized growth rates corresponding to those six line segments. If we imagined dropping the remaining 18 points for the other segments that were not drawn, and then repeating this not only for December 2012, but for each month in the government graph, the eventual pile of dots would have outline much like the smooth hill-like curves in this graph.[15] Here we have separated the growth for the historical record as red, and the anticipated growth for the forecast as blue. We have also included markers for the median historical growth and the median forecast growth.

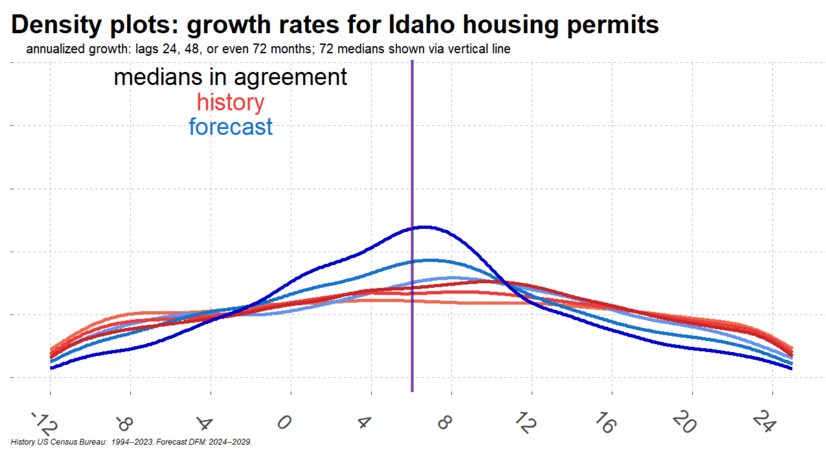


[15] Yes, history would accumulate a larger pile of dots, but the density plots are scaled so that the area under the curves is always 1 so that it can represent probabilities.

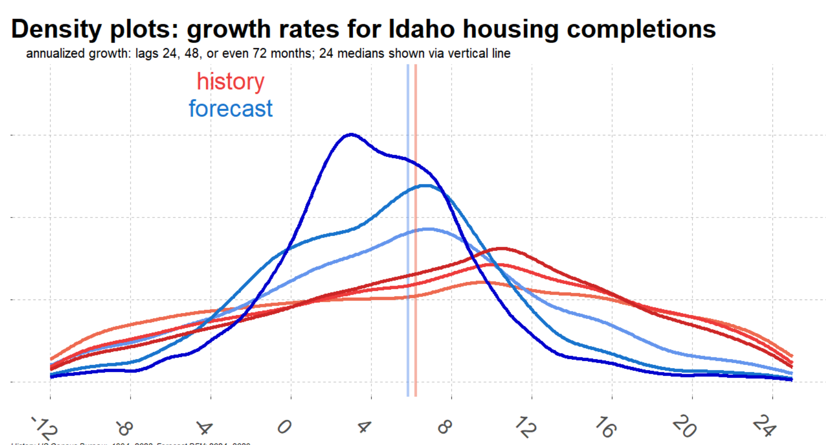
Density plots and limitations.

This example is to dispel the notion that 24 months is automatically a good set of months for graphing densities of annualized growth, and further, that density plots are always informative.

If there is a lot of volatility in the underlying measure, that may not be a long enough duration to see the pattern of growth. This is well illustrated by housing permits, which are quite volatile. Three different densities for history and forecast are graphed. As each color darkens, we enlarge the set of lags we consider, from 1–24 months, up to 1–48 months, and finally 1–72 months. Though the densities for history and for forecast do not look much like eachother, the median growth rates do agree, at least if we consider the densities using lags from 1–72 months. Still, notice how diffuse these densities are; the hills are more like pancakes. Enlarging the set of lags only brings some slight improvement. It does, though, bring another difficulty. If we use 72 lags for computing a density, then quite often the forecast annualized growth rate is reaching far back into history in order to compute the rate. For example, 2026m12 would reach back six year, all the way to 2021m12 to compute that annualized growth. In mid-2024, such a computation really says a lot more about the history than it does about the forecast.



To see that there is some improvement if the underlying measure is not quite so volatile, consider the same type of graph constructed not on permits but on completions. Our investigation of completions based upon starts based upon permits showed that the volatility inherent in permits is somewhat smoothed in the computation of starts (for the Western US, and hence for our Idaho model), then further smoothed in the computation of completions. Note that now the medians are shown for 1–24 lags in the computations of underlying annualize growth. These medians are perhaps reasonably close, but again looking at the underlying densities (the lightest blue and red curves), we still face the situation that the expected growth rates are quite diffuse and the densities appear different shaped for history and future.



Appendix

US Macroeconomic Model by Moody's Analytics

Moody's model is a structural model based upon the IS-LM demand model and the Phillips curve for supply. It has about 2,300 variables forecast in their macroeconomic model, with more than 9 in 10 determined within the model (i.e., endogenously, rather than exogenously, or external to the model.) The firm also characterizes the model as a Keynesian model, with short-term fluctuations largely driven by demand. The firm indicates that substantial shocks can take up to two years to unwind back to an equilibrium path.

There are some particular variables which are central in the model. Moody's says:

> The federal funds rate's effect in the model is systemic. It affects the yield curve, which is critical to consumer spending and business investment. Therefore, it affects real GDP growth, the labor market, and inflation.

To illustrate why shocks may take time to dissipate in the model, Moody's also indicates:

> Monetary policy operates with a lag in the model. Eventually the model's inflation and unemployment rate forecasts return to equilibrium, and the federal funds rate follows.

Monetary policy includes setting and adjusting the federal funds rate, but it also includes other tools that the Federal Reserve has. A recent example of this has been both Quantitative Easing (during the acute phase of the pandemic), and its opposite, Quantitative Tightening (during 2022–present).

Moody's organizes its model into blocks: These include

(1) Consumption through consumer spending
(2) Investment
(3) International trade[16]
(4) Fiscal policy
(5) Supply (labor force potential, for example)
(6) Inflation
(7) Monetary policy and its transmittal
(8) Personal Income
(9) Corporate income
(10) Labor markets (actual employment by sector)
(11) Housing

Moody's provides a detailed look at parts of each of these blocks in their model. Doing so takes the firm 25+ pages. To not extend the length of this publication, we will take only a couple of these for further discussion. The few we do are quite parallel to the Idaho economic model.

Moody's indicates that their model is anything but static, much as the US economy.

[16] Moody's emphasises trade in their model.

> Rarely does a month go by when no changes are made to the model. Equations that are no longer performing well are re-specified, and variables are occasionally added to the model as more data become available or the dynamics of the economy change.

Their wording here also applies to the Idaho economic model.

5 Supply means the long-term economic potential of the US. It is goverened by innate parts of the economy, including population forecasts. As we have learned, it is difficult to find labor without having a population of workers appropriate for the labor, in location, age, skill, and desire to work. Moody's says;

> Labor force supply is a key determinant of potential GDP, which largely depends on demographics. Population is estimated based on Census Bureau birth and death rates and immigration rates that are determined by the economic performance of the U.S. relative to the rest of the world.

Here we see a couple of potential exogenous variables in the Moody's model, namely the data coming from Census Bureau estimates. We also see that each block can and does interact with other blocks in the Moody's model: here international trade interacts with the population portion of the supply block though the strength of the immigration draw that the US economy represent, or will represent in the future.

Another input in the potential labor force is an estimate of what is called the Non-Accelerating Inflation Rate of Unemployment (NAIRU). This concept is a Phillips curve one: if unemployment rates are too low, inflation is expected to not only be present, but to increase in rate. Such a situation is one that the Federal Reserve works to prevent. One of its two charges by Congress is stable prices; that is, the Fed must not allow accelerating inflation to persist. Thus the NAIRU is important for understanding potential labor force; it is not as simple as computing the 16–64 year-olds in the US. NAIRU is another example of an exogenous variable. In this case:

> We use the [Congressional Budget Office] CBO's long-term NAIRU forecast and make that variable exogenous in our model. We then specify an error correction model to predict the value of short-term NAIRU.

This also indicates that parts of Moody's model may have equations of varying types. We have already seen that Moody's employs demographic models to estimate population. These are different from the Ordinary Least Squares (OLS) equations, which dominate the Labor block 10 of Moody's model.

8 The Personal Income block is illustrative of the pervasiveness of Bureau of Economic Analysis data organization across almost all economic forecasts. Principal parts are wage and salaries, supplements to wages and salaries (that is the BEA name; largely this is benefits such as health insurance), dividends, interest, and rent (modeled separately), and proprietors' income.

> Individual wage and salary categories are modeled as functions of industry employment, industry average hourly earnings, and a broad measure of hours worked.

The personal income block certainly interacts with the labor market block 10. Another interaction is present with the Inflation block 6. While industry average hourly earnings are used for each industry, behind the scenes is average hourly earnings in all private industries. Forecasting that broad measure is "the most important wage equation in the macroeconomic model," though Moody's makes this statement within their discussion of the Employment Cost Index, in order to understand CPI inflation.

Idaho Economic Model. The Idaho Economic Model (IEM) is an income and employment-based model of Idaho's economy. The Model consists of a simultaneous system of linear regression equations.

These have historically been estimated at the quarterly frequency as that is the frequency of data provided by IHS Markit (our prior provider of the US forecast) as well as Moody's (our current provider of the US forecast). Some of the source data is available at the monthly frequency. Examples of this include personal income for the US (source: BEA), inflation as measured by the Consumer Price Index (CPI inflation, source: BLS), and local employment (source: Idaho Department of Labor — available in quarterly batches of monthly measurement). We are now running parallel monthly frequency level. Where source data is available at the monthly level, it is used[17] and where it is not readily available for our own collection, the monthly version from Moody's is used. We have indicated[18] an example where the monthly Moody's data is available as is the original source data, and it is visible that there is a slight distinction between the two.

The primary exogenous variables are obtained from the national forecast provider (now Moody's). Endogenous variables are forecast at the state level.

The focal point of the IEM is Idaho personal income, which is given by the identity:

> **personal income = wage and salary payments + other labor income + farm proprietors' income + nonfarm proprietors' income + property income + transfer payments - contributions for social insurance + residence adjustment.**

Except for farm proprietors' income and wage and salary payments, each of the components of personal income is estimated stochastically by a single equation. Farm proprietors' income and wage and salary payments each comprise sub-models containing a system of stochastic equations and identities.

The farm proprietor sector is estimated using a sub-model[19][20] consisting of equations for crop marketing receipts, livestock marketing receipts, production expenses, inventory changes, imputed rent income, corporate farm income, and government payments to farmers. Farm proprietors' income includes inventory changes and imputed rent, but this component is netted out of the tax base.

At the heart of the IEM is the wage and salary sector, which includes stochastic employment equations for North American Industry Classification System employment categories (NAICS). Conceptually, the employment equations are divided into basic and domestic activities. The basic employment equations are specified primarily as functions of national demand and supply

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[17] the quarterly values recorded by the US forecast provider have always been the average values for the corresponding months

[18] see the graph on page 11

[19] As the exogenous variables for the farm model are only available at the annual frequency, the farm model is now computed at that frequency, and monthly values are interpolated from these. The source for the exogenous regressors in the farm model is the FAPRI institute of the University of Missouri, Columbia.

[20] The US Bureau of Economic Analysis has a note indicating that farm income data at the state level is likely to be discontinued; see BEA discontinuation of SAINC45 .

variables. Domestic employment equations are specified primarily as functions of state-specific demand variables. Average wage rates are estimated for each of these employment categories and are combined with employment to arrive at aggregate wage and salary payments.

The demographic component of the model is used to forecast components of population change and housing starts. Resident population, births, and deaths are modeled stochastically. Net migration is calculated residually from the estimates for those variables. Housing starts are divided into single and multiple units. We model housing starts on permits based upon equations estimated for the Western US, and for completions upon starts in a similar manner. These are then used to forecast housing stock, which is also estimated by the US Census Bureau. In this last step, we have a check on our housing model.

The output of the IEM (i.e., the forecast values of the endogenous variables) is determined by the parameters of the equations and the values of exogenous variables over the forecast period. The values of equation parameters are determined by the historic values of both the exogenous and endogenous variables. IEM equation parameters are estimated using the technique of ordinary least squares. Model equations are occasionally re-specified in response to the dynamic nature of the Idaho and national economies. Parameter values for a particular equation (given the same specification) may change as a result of revisions in the historic data or a change in the time interval of the estimation. In general, parameter values should remain relatively constant over time, with changes reflecting changing structural relationships.

Like in Moody's US economic model, most equations are specified in log form. This is generically

$$\log(y) = c_0 + c_1 \cdot \log(x_1) + \cdots + c_n \cdot \log(x_n)$$

which means that

$$y = e^{c_0} \cdot x_1^{c_1} \cdots x_n^{c_n} .$$

These mathematical forms are sufficient to enable good fits of the data without overly complicated equations. This helps to avoid "over-fit", which can precipitate small changes of the inputs redirecting the output in unreasonable directions.

While the equation parameters are determined by structural relationships and remain relatively fixed, the forecast period exogenous variable values are more volatile determinants of the forecast values of endogenous variables. They are more often subject to change as expectations regarding future economic behavior change, and they are more likely to give rise to debate over appropriate values. As mentioned above, the forecast period values of exogenous variables are primarily obtained from Moody's US macroeconomic models.

Since the output of the IEM depends in large part upon the output of the US model, an understanding of the US model, its input assumptions, and its output is useful in evaluating the results of the IEM's forecast. The assumptions and output of the US model are discussed in the National Forecast section, and a discussion of the details of the IEM build and of the Moody's follows.

Idaho Time Series Model. The Idaho Time Series Model (ITS)[21] is a new numeric model of Idaho's economic activity. The model consists of sequential equations solved in modules with dependencies such that downstream modules can rely on data forecasted in earlier modules. The regression equations are estimated using time series forecasting techniques covered by the R 'seasonal' package. The package uses the X-13 ARIMA-SEATS method to understand the typical monthly or quarterly trend from data before creating a forecast. The method is a joint development by the US Census Bureau, Stats Canada, and the Bank of Spain. ARIMA models are time-series models, which means they look to prior measurements of a variable in order to understand subsequent measurements of that *same* variable.[22]

The guiding principal of the time series model is to let the data speak for itself and involve exogenous regressors sparingly. Several equations in the model, such as the adult share of the population, are computed exclusively as ARIMAs with no exogenous regressors. Fewer than five equations in the model use more than two exogenous regressors. Time series models tend to produce accurate forecasts, but without the linkages of multiple regression models like the IEM. For time series forecasts it can be difficult to explain why a forecast is evolving in a particular way.

The first module estimates monthly values for Idaho births, deaths, and net migration and combines these to get a measure for monthly change in population. This contrasts with the IEM which treats migration as a residual. The only exogenous regressors used in this portion of the ITS model are mortgage rates, the US unemployment rate, a dummy for COVID-19, and Idaho housing completions, which are provided by Moody's.

The population estimate feeds into the second module, which then estimates values for the monthly adult population, labor force, and employed persons before estimating monthly levels of employment across the standard employment sectors into which the BEA divides the US economy. To do so, this second module begins by using the population number to create forecasts of the total number of adults, the size of the labor force, and then the number of employed persons.[23] These forecasts rely on Local Area Unemployment Statistics (LAUS, a BLS program) numbers.

Once the labor force is understood, the second module continues by using separate regressions for each major NAICS sector, this time using data from the quarterly Current Employment and Wages (QCEW, another BLS program). An "other" category trues these values up to the total number of employed (since LAUS and QCEW use different definitions). This portion of the

[21] The ITS was pioneered by Matthew Hurt; it has been used for the past year+ in forecasting revenue in a blended model with the IEM. Further integration with this report is the next aim.

[22] An example may be illustrative: an ARIMA forecast of housing would look at prior housing permit activity to predict future housing permit activity; a general regression analysis might look towards population trends to predict future housing permit activity. Both can have merits, and a combination of the methods is often used, though one or the other may be the dominant driver in any particular equation analysis, say the equation analysis of housing permits. The population trends in the second approach are an example of an exogenous regressor for housing starts — they are variables which can be supplied externally from the internal computations of the housing permit equation.

[23] Once the employed number and the labor force number are known, the unemployment rate is easily found: the difference between these gives the unemployed count, and dividing by the labor force number gives the unemployment rate.

second module, focusing on employment categories, uses mortgage rates, the US unemployment rate, the US labor force participation rate, the federal funds rate, and CPI as exogenous regressors. However, each individual regression relies at most on two of these exogenous regressors.

The third model estimates wage rates and wagebills for each of the NAICS categories. The IEM and ITS dis-aggregate labor markets in a similar manner, although the ITS has a finer breakdown. One example is the commonly grouped categories such as 22, 48, and 49 (utilities, and transportation sectors), which the ITS keeps fully separate. The principal data for employment and wages come from the Quarterly Census of Employment and Wages (QCEW). The total QCEW wagebill is the ultimate target, as it is a vital exogenous regressor used in the subsequent personal income and GDP modules.

To get to that total QCEW wagebill, separate wagebills for each NAICS category are computed. These wagebills come about as the product of wage rates and employment numbers. Wage rates are estimated via time-series regression for each NAICS category using the unemployment rate in Idaho and the corresponding national wagerates for each NAICS sector.

The first modules all run on monthly data. If exogenous data come from Moody's on a quarterly basis, the ITS first smooths these data to monthly values and then performs the forecast. The personal income and GDP modules rely on quarterly data. When data is imported from earlier modules in the ITS, these data are monthly, so both the personal income and the GDP modules average the monthly data to obtain quarterly data, and these two modules are run. Currently the GDP module is only for state-level real GDP and only uses the total wagebill as an exogenous regressor. The personal income module forecasts many components of personal income and uses the total wagebill in addition to some of the previously described exogenous regressors.

Variables. It is likely that the choice of variables will change slightly across the next two years. Partly this may reflect removal of what amount to essentially duplications. Partly this may reflect better integration of the components of the model; like Moody's US model, the Idaho economic model is structured in modules or blocks.

Endogenous variables: These are computed within the Idaho economic model.

id_pi	Idaho personal income
id_supp	Idaho supplementary income
id_dir	Idaho dividends, interest, and rent
id_nonfarm_prop	Idaho nonfarm proprietors' income
id_transfer	Idaho transfer payments
id_ra	Idaho residence adjustment
id_si	Idaho social insurance
id_e1133	Idaho employment in wood products industries
id_mwr1133	Idaho monthly wage rates in wood products industries
id_mwb1133	Idaho monthly wage bill in wood products industries
id_e21	Idaho employment in mining
id_mwr21	Idaho monthly wage rates in mining
id_mwb21	Idaho monthly wage bill in mining
id_e22	Idaho employment in utilities
id_mwr22	Idaho monthly wage rates in utilities
id_mwb22	Idaho monthly wage bill in utilities
id_e23	Idaho employment in construction
id_mwr23	Idaho monthly wage rates in construction
id_mwb23	Idaho monthly wage bill in construction
id_e31	Idaho employment in food manufacturing
id_mwr31	Idaho monthly wage rates in food manufacturing
id_mwb31	Idaho monthly wage bill in food manufacturing
id_e32	Idaho employment in other nondurable manufacturing
id_mwr32	Idaho monthly wage rates in other nondurable manufacturing
id_mwb32	Idaho monthly wage bill in other nondurable manufacturing
id_e33	Idaho employment in durable manufacturing
id_mwr33	Idaho monthly wage rates in durable manufacturing
id_mwb33	Idaho monthly wage bill in durable manufacturing
id_e42	Idaho employment in wholesale trade
id_mwr42	Idaho monthly wage rates in wholesale trade
id_mwb42	Idaho monthly wage bill in wholesale trade
id_e44	Idaho employment in retail trade
id_mwr44	Idaho monthly wage rates in retail trade
id_mwb44	Idaho monthly wage bill in retail trade

id_e45	Idaho employment in other retail trade
id_mwr45	Idaho monthly wage rates in other retail trade
id_mwb45	Idaho monthly wage bill in other retail trade
id_e48	Idaho employment in transportation
id_mwr48	Idaho monthly wage rates in transportation
id_mwb48	Idaho monthly wage bill in transportation
id_e49	Idaho employment in delivery and warehousing
id_mwr49	Idaho monthly wage rates in delivery and warehousing
id_mwb49	Idaho monthly wage bill in delivery and warehousing
id_e51	Idaho employment in information
id_mwr51	Idaho monthly wage rates in information
id_mwb51	Idaho monthly wage bill in information
id_e52	Idaho employment in finance and insurance
id_mwr52	Idaho monthly wage rates in finance and insurance
id_mwb52	Idaho monthly wage bill in finance and insurance
id_e53	Idaho employment in real-estate
id_mwr53	Idaho monthly wage rates in real-estate
id_mwb53	Idaho monthly wage bill in real-estate
id_e54	Idaho employment in professional services
id_mwr54	Idaho monthly wage rates in professional services
id_mwb54	Idaho monthly wage bill in professional services
id_e55	Idaho employment in management
id_mwr55	Idaho monthly wage rates in management
id_mwb55	Idaho monthly wage bill in management
id_e56	Idaho employment in administrative services
id_mwr56	Idaho monthly wage rates in administrative services
id_mwb56	Idaho monthly wage bill in administrative services
id_e61	Idaho employment in private education
id_mwr61	Idaho monthly wage rates in private education
id_mwb61	Idaho monthly wage bill in private education
id_e61gsed	Idaho employment in state eduction
id_mwr61gsed	Idaho monthly wage rates in state eduction
id_mwb61gsed	Idaho monthly wage bill in state eduction
id_e61gled	Idaho employment in local education
id_mwr61gled	Idaho monthly wage rates in local education
id_mwb61gled	Idaho monthly wage bill in local education

id_e62	Idaho employment in private healthcare
id_mwr62	Idaho monthly wage rates in private healthcare
id_mwb62	Idaho monthly wage bill in private healthcare
id_e62gshl	Idaho employment in state healthcare
id_mwr62gshl	Idaho monthly wage rates in state healthcare
id_mwb62gshl	Idaho monthly wage bill in state healthcare
id_e62glhl	Idaho employment in local healthcare
id_mwr62glhl	Idaho monthly wage rates in local healthcare
id_mwb62glhl	Idaho monthly wage bill in local healthcare
id_e62gvfhl	Idaho employment in federal healthcare
id_mwr62gvfhl	Idaho monthly wage rates in federal healthcare
id_mwb62gvfh	Idaho monthly wage bill in federal healthcare
id_e71	Idaho employment in hospitality
id_mwr71	Idaho monthly wage rates in hospitality
id_mwb71	Idaho monthly wage bill in hospitality
id_e72	Idaho employment in arts
id_mwr72	Idaho monthly wage rates in arts
id_mwb72	Idaho monthly wage bill in arts
id_e81	Idaho employment in other services
id_mwr81	Idaho monthly wage rates in other services
id_mwb81	Idaho monthly wage bill in other services
id_e92gsad	Idaho employment in state administration
id_mwr92gsad	Idaho monthly wage rates in state administration
id_mwb92gsad	Idaho monthly wage bill in state administration
id_e92glad	Idaho employment in local administration
id_mwr92glad	Idaho monthly wage rates in local administration
id_mwb92glad	Idaho monthly wage bill in local administration
id_e92gvf	Idaho employment in federal administration
id_mwr92gvf	Idaho monthly wage rates in federal administration
id_mwb92gvf	Idaho monthly wage bill in federal administration
id_etribes	Idaho tribal employment
id_mwrtribes	Idaho monthly wage rates for tribal employment
id_mwbtribes	Idaho monthly wage bill for tribal employment
idp_sf	Idaho single-family housing permits
idp_mf	Idaho multi-family housing permits
ids_sf	Idaho single-family housing starts
ids_mf	Idaho multi-family housing starts
idc_sf	Idaho single-family housing completions
idc_mf	Idaho multi-family housing completions

wp_sf	western single-family housing permits
wp_mf	western multi-family housing permits
ws_sf	western single-family housing starts
ws_mf	western multi-family housing starts
wc_sf	western single-family housing completions
wc_mf	western multi-family housing completions
m_idhstk	monthly Idaho housing stock
id0npt	Idaho population
id0nb	Idaho births
id0nd	Idaho deaths
id0nmg	Idaho net migration
id_cow	Idaho income from cattle
id_crop	Idaho income from crops
id_dairy	Idaho income from dairy
id_farm_chem	Idaho farm expenditures on chemicals
id_farm_exp	Idaho farm expenditures
id_farm_gvt	federal transfers to Idaho farms
id_farm_other	other farm income
id_farm_petro	Idaho farm expenditures on fuels
id_farm_prop	Idaho farm proprietors' income
id_farm_receipts	total Idaho farm receipts
id_feed	Idaho farm expenditures on feed
id_hay	Idaho income from hay and related feeds
id_lvstk	Idaho income from livestock
id_seed	Idaho farm expenditures on seed
id_veg	Idaho farm income from vegetables
id_wheat	Idaho farm income from wheat
id_farm_corp	corporate farm income in Idaho
id_farm_inv	Idaho farm inventory change
us_farm_corp	corporate farm income in the US
us_farm_inv	US farm inventory change
us_cow	US farm income from cattle
us_farm_exp	US farm expenditures
us_farm_other	other US farm income
us_farm_petro	US farm expenses on fuel
us_farm_prop	US farm proprietors' income
us_farm_receipts	total US farm reciepts
us_hay	US farm income from hay and related feeds
us_lvstk	US farm income from livestock
us_veg	US farm income from vegetables
us_wheat	US farm income from wheat

Exogenous variables: These are imported into the Idaho economic model from outside sources.

cpi	consumer price index
dum_id_e1133_a	employment dummy for wood products
dum_id_e21	employment dummy for mining
dum_id_e23	employment dummy for construction
dum_id_e44	employment dummy for retail trade
dum_id_e45	employment dummy for other retail trade
dum_id_e48	employment dummy for transportation
dum_id_e49	employment dummy for delivery and warehousing
dum_id_e56	employment dummy for administration
dum_id_e61gled	employment dummy for local education
dum_id_e61gsed	employment dummy for state education
dum_id_e62glhl	employment dummy for local healthcare
dum_id_e62gshl	employment dummy for state healthcare
dum_id_e71	employment dummy for hospitality
dum_id_e72	employment dummy for arts
dum_id_farm_other	employment dummy for other farm income
dum_id_farm_prop	employment dummy for farm proprietors' income
dum_id_farm_receipts	employment dummy for total farm receipts
dum_id_lvstk	employment dummy for farm income from livestock
dum_id_mwr1133	employment dummy for woods products wage rates
dum_id_mwr23	employment dummy for construction wage rates
dum_id_mwr33	employment dummy for durable manufacturing wage rates
dum_id_mwr62	employment dummy for healthcare wage rates
dum_shift_id_farm_corp	employment dummy for corporate farm income
dum_shift_id_farm_inv	employment dummy for farm inventories
dum_shift_us_farm_corp	employment dummy for corporat farm income
ffr	federal funds rate
gdp_farm	GDP from the US farm sector
gdpr	real US GDP
hhaf	household financial assets
hhao	other household assets
ip321	industrial production index for wood products
ip322	industrial production index for paper manufacturing
ip334	industrial production index for semi-conductor industry
ip335	industrial production index for electrical equipment
jpc	personal consumption expenditure inflation

lfpr	US labor force participation rate
mf_farm_pi_af	Moody's farm personal income from all products
mf_farm_pi_lp	Moody's farm personal income from livestock
mf_gdp_farm	Moody's farm GDP
mf_idp_sf	Moody's Idaho single-family permits
mf_idp_mf	Moody's Idaho multi-family permits
mf_ppi_farm	Moody's producer price index for farm products
mf_ppi_food_feed	Moody's producer price index for farm foods and feeds
mf_ppi_metals	Moody's producer price index for metals
mf_us_mwr22	Moody's monthly wage rates in mining
mf_us_mwr23	Moody's monthly wage rates in construction
mf_us_mwr42	Moody's monthly wage rates in wholesale trade
mf_us_mwr44_45	Moody's monthly wage rates in retail trade
mf_us_mwr53	Moody's monthly wage rates in real-estate
mf_us_mwr56	Moody's monthly wage rates in administration
mf_us_mwr61	Moody's monthly wage rates in private education
mf_us_mwr62	Moody's monthly wage rates in healthcare
mf_us_mwr72	Moody's monthly wage rates in arts
mf_us_mwr81	Moody's monthly wage rates in other services
mf_us_mwrndmf	Moody's monthly wage rates in nondurable manufacturing
mf_us_mwrtw	Moody's monthly wage rates in transportation and warehousing
minwage	Moody's forecast for the minimum wage
month	1–12
pmms	average 30-year mortgage rates
productivity	Moody's index for productivity
trend	an increment increasing by 1 each month
u3_nsa	the US U-3 unemployment rate, not seasonally adjusted
us_crop	US crop income
us_dairy	US dairy income
us_div_int	US dividends, interest, and rent income
us_e1133	US employment in wood products
us_e23	US construction employment
us_e42	US wholesale trade employment
us_e44_45	US retail trade employment
us_e52	US finance employment
us_e53	US real-estate employment
us_e62	US healthcare employment
us_edmf	US durable manufacturing employment
us_egvf	US federal government employment

us_egvsl	State and local government employment across the US
us_endmf	US non-durable manufacturing employment
us_etw	US employment in transportation and warehousing
us_farm_chem	US farm expenditures on chemicals
us_farm_gvt	government transfers to US farms
us_feed	US expenditures on farm feeds
us_nonfarm_prop_mf	Moody's forecast of US nonfarm proprietors' incomes
us_pop_tot	US population
us_rent	US income from rent
us_seed	US farm expenses for seed
us_si	US social insurance
us_supp	US supplementary income
us_transfer	federal transfer payments
us_wb_tot	total wages in the US