Supplementary materials: Contents

Background commentary

Sources. Moody's Analytics provides the Division of Financial Management with forecast data, primarily at the national level. These forecasts are produced monthly by the firm.[1]

The **Federal Open Market Committee (FOMC)**, as defined on their website "consists of twelve members — the seven members of the Board of Governors of the Federal Reserve System; the president of the Federal Reserve Bank of New York; and four of the remaining eleven Reserve Bank presidents, who serve one-year terms on a rotating basis." The FOMC meets eight scheduled times per year. Part of their charge is to make projections for major economic indicators including: real GDP, the headline[2] unemployment rate, core personal consumption expenditures (core CPE), and the federal funds rate. The federal funds rate is the rate that the FOMC influences through its decisions. March saw the first release of their projections during 2025. The prior projection was released in December 2024.

As described on their website: "The **Bureau of Labor Statistics (BLS)** is an agency of the United States Department of Labor. It is the principal fact-finding agency in the broad field of labor economics and statistics and serves as part of the US Federal Statistical System. BLS collects, calculates, analyzes, and publishes data essential to the public, employers, researchers, and government organizations." Among the statistics the BLS publishes are the monthly consumer price index (CPI) report, the monthly jobs openings and labor turnover-survey (JOLTS), the unemployment rate (U-3); the agency also works with state departments of labor to produce quarterly census of employment and wages (CEW) data. CEW data for Idaho is the backbone of the historical data used to produce this *IEF* publication.

The **Bureau of Economic Analysis** produces statistics including gross domestic product and personal income. They also produce personal consumption expenditures (PCE) inflation measures.

The **Organization for Economic Co-Operation and Development (OECD)**, with the US as a member, released their Economic Outlook publication in March 2025. They indicate that business and individual activities, along with economic policy uncertainty, are pointing towards a global softening of the economy. The OECD is looking at trade policies as causing significant changes to the economy by affecting growth and rising inflation. In the upside, adoption of artificial intelligence is expected to increase productivity.

The **International Monetary Fund (IMF)** is another economic coordination group of which the US is a member. In fact, the IMF is a broad organization encompassing most countries of the world. As explained on their website: "The International Monetary Fund, or IMF, works

[1] They are forecast at a quarterly frequency, meaning that a data point forecast pertains to, say 2025q3, i.e., the third quarter of 2025. Smooth interpolations of those quarterly frequency forecasts are then projected down to the monthly forecast frequency by Moody's, and that is employed by DFM. Some state level forecasts are also integrated with the forecast produced internally at DFM. Blending of the two allows for additional input from Moody's, while preserving the variation inherent in non-smoothed data gathered from other sources either at the national level (e.g., the consumer price index also known as the CPI) or the state level (monthly housing starts, both in terms of units for individual household occupation as well as the monetary values associated with those permits).

[2] The headline unemployment rate is the U-3 rate released monthly by the Bureau of Labor Statistics from its monthly jobs surveys.

to achieve sustainable growth and prosperity for all of its 191 member countries. It does so by supporting economic policies that promote financial stability and monetary cooperation, which are essential to increase productivity, job creation, and economic well-being."

Modeling. Main changes in this forecast are the blending of three month's worth of analysis into a '2025q3' forecast. Partly this is a response to the volatility in the model outputs. The three forecasts being blended are the baseline outputs for the *IEM* (Idaho Economic Model) for May, June, and July, with the greatest weight (over 60%) resting on the most recent forecast.

Forecast volatility is inherent in economic modeling. This is most easily seen in the housing data presented in the report, particularly within the housing-permits/starts/completions graphs. In this edition, the displayed graph is for housing completions as a percentage of the housing stock. The denominator in that percentage calculation is large and slowly varying, which helps to stabilize the output seen within the graph. None-the-less, an inspector of that graph can appreciate that the variability of housing permits flows through to housing starts, and subsequently to housing completions, leaving the numerator of that percentage computation to create the jaggedness in the plot.

A more technical modeling change has to do with the re-examination of the forecast for population. The output in this edition is far smoother than what was computed for the April 2025 edition.

Forecast analysis

Forecast comparison. The forecast from Moody's continues to evolve. Tables give the most recent forecast summaries.

US forecasts. DFM provides an interactive opportunity to see the evolution of a few key indicators of the US forecast across recent months due to revisions in the baseline outlook of Moody's. These are available HERE.[3]

Here is a table summarizing changes to the forecast across 2024–2025.

Jul. 25 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,671	23,305	23,666	23,966	24,384	24,933	25,529
P. income	b $	23,403	24,670	25,957	27,164	28,339	29,434	30,623
Population	m	337	340	343	344	345	345	346
Nonfarm	m ct.	156	158	160	160	160	161	162
Wages	b $	11,725	12,401	13,002	13,563	14,066	14,507	15,009
Apr. '25 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,671	23,305	23,611	23,949	24,493	25,079	25,692
P. income	b $	23,403	24,659	25,779	26,912	28,088	29,192	30,417
Population	m	337	340	343	344	345	346	346
Nonfarm	m ct.	156	158	159	159	160	161	162
Wages	b $	11,725	12,390	12,884	13,392	13,864	14,289	14,814
Dec. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,671	23,300	23,821	24,201	24,634	25,150	25,721
P. income	b $	23,403	24,684	25,774	26,926	28,062	29,196	30,480
Population	m	339	342	345	346	347	348	348
Nonfarm	m ct.	156	159	160	161	161	162	162
Wages	b $	11,725	12,421	12,994	13,582	14,111	14,575	15,116
Oct. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,671	23,278	23,804	24,296	24,818	25,384	25,958
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

[3] the url is https://dfm.idaho.gov/about-dfm/about-the-economic-analysis-bureau/key-indicators-dashboard/

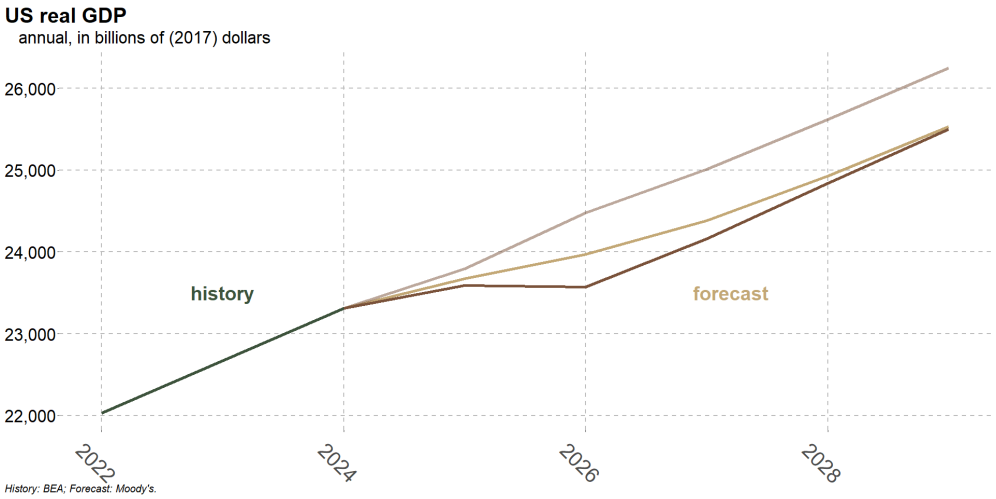
Jul. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
GDP	b (2017) $	22,377	22,896	23,286	23,719	24,239	24,813	25,388
P. income	b $	22,961	24,043	25,072	26,150	27,316	28,582	29,887
Population	m	335	337	338	339	340	342	343
Nonfarm	m ct.	156	159	160	160	161	161	162
Wages	b $	11,798	12,388	12,956	13,469	14,001	14,559	15,136
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. The wage and personal income data available in this edition of the *IEF* is complete through calendar year 2025m3.

Jul. 25 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
P. income	$ m	115,509	122,833	130,339	137,370	145,322	153,750	162,872
Wages	$ m	50,513	55,141	58,349	61,571	64,942	68,435	72,296
Population	ct	1,971,122	2,001,619	2,029,588	2,064,862	2,101,439	2,139,693	2,179,412
Nonfarm	jobs	818,518	834,132	852,072	865,858	881,039	899,915	921,323
Apr. '25 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
P. income	$ m	116,676	123,773	132,600	140,290	147,643	155,262	163,610
Wages	$ m	50,513	54,189	56,633	59,059	61,592	64,093	67,027
Population	ct	1,971,122	2,001,619	2,058,079	2,094,334	2,132,143	2,171,225	2,211,901
Nonfarm	jobs	818,518	834,077	852,134	859,793	870,505	883,215	898,938
Dec. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
P. income	$ m	116,676	124,665	134,234	142,182	150,349	159,992	170,651
Wages	$ m	50,513	54,340	58,792	62,858	67,058	71,457	76,226
Population	ct	1,971,122	2,001,619	2,034,195	2,064,203	2,094,737	2,126,478	2,159,336
Nonfarm	jobs	818,518	841,982	870,557	887,699	904,283	922,678	942,519
Oct. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
P. income	$ m	116,676	124,832	133,868	141,921	150,097	159,283	169,290
Wages	$ m	50,513	54,076	58,025	61,838	65,825	70,094	74,668
Population	ct	1,964,726	1,991,348	2,019,872	2,047,359	2,075,422	2,104,274	2,133,907
Nonfarm	jobs	818,518	840,033	867,123	886,606	905,587	924,950	944,596
Jul. '24 forecast		**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
P. income	$ m	115,750	120,575	126,639	134,344	142,160	150,626	159,616
Wages	$ m	50,843	54,349	58,040	61,309	64,526	67,761	71,207
Population	ct	1,964,726	1,991,425	2,018,403	2,044,996	2,072,399	2,100,652	2,129,620
Nonfarm	jobs	818,518	840,373	860,568	876,062	892,089	908,773	925,438
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	

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

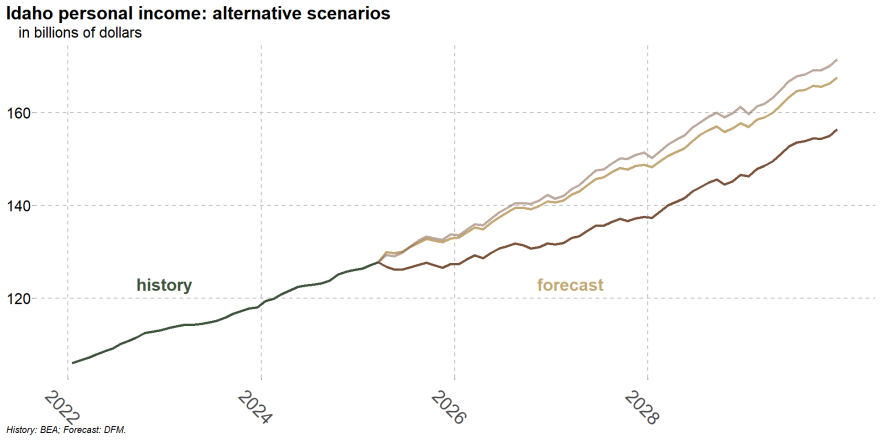
Alternative forecasts. The baseline forecast, being the median forecast from Moody's, has a particular meaning. It represents the mid-point of the scenarios that Moody's envisions as reasonably likely paths for the economy. The alternative scenarios, particularly those that Moody's characterizes as downside cases, represent plausible paths for the economy, but they each involve timing choices to initiate their deviation from the baseline. Many of these downside scenarios are triggered "immediately."



The value of the downside scenarios is that they represent the scope of what a downside could entail. The timing issues of these scenarios beginning immediately are of much less value in the uses that DFM puts them to. In particular, the use of the economic (jobs, wages, personal income, housing, etc.) forecast is to produce revenue forecasts for the state. The baseline revenue forecast is the one presented to the Governor and the Legislature. The alternative forecasts primarily give an indication as to the scope of likely revisions should those situations arise. Those revision estimates from the alternatives inform the likely magnitudes of revenue forecast revisions to be expected when a subsequent revenue forecast is made, such as in August when the revision to the January forecast is released. Thus, the alternative forecasts provide a planning tool to state leaders.

US trajectories. The downside scenario presented here is the mildest one that Moody's details. It entails a two- to three-quarter mild recession beginning in the third quarter of 2025. The contractions are measured at −0.8, then −1.9 and −1.4 percent of GDP for 2025q3–2026q1, with the economy regaining its overall size as measured in the 2025q1–q2 transition during the 2026q3–q4 transition.

Idaho trajectories. Traditionally Idaho has had its baseline and optimistic scenario adhere closely together, with the pessimistic scenarios deviating quickly (this is a feature of the recessions envisioned for the nation beginning immediately for most of the downside scenarios from the national forecasters) and then in a few years paralleling the baseline. The outlook this time fits part of that tradition.



The behavior in the housing sector is largely governed by interest rates. As the recession induces accomodative monetary policy, the pessimistic scenario's housing market benefits with greater housing starts and completions than might otherwise be surmised.

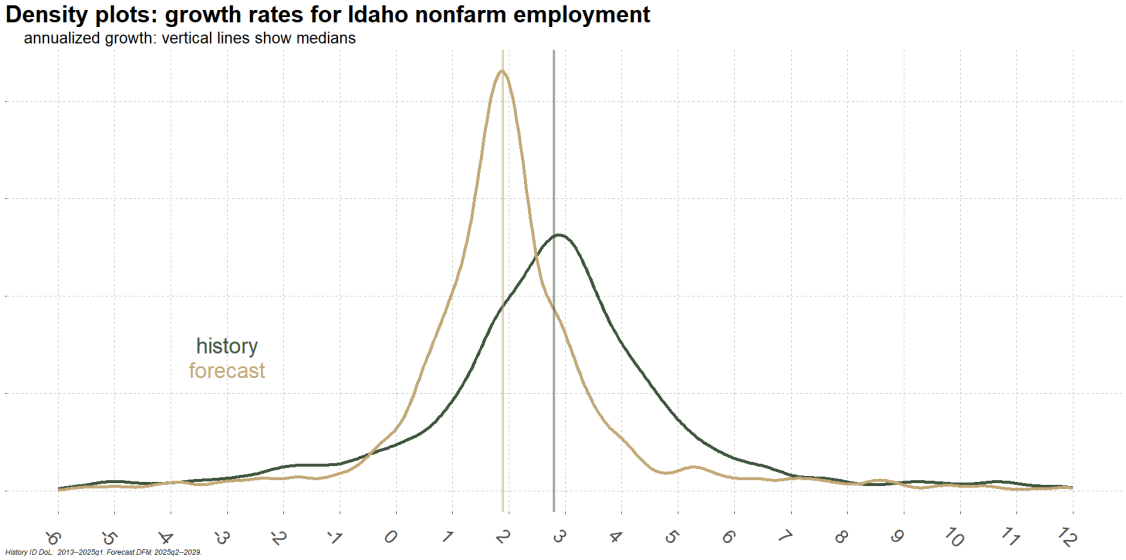
Idaho		**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Nonfarm jobs	baseline	798,120	818,520	834,110	851,280	863,250	877,380	894,920	915,080
	pessimistic	798,120	818,520	834,130	808,980	794,830	807,810	823,460	841,170
	optimistic	798,120	818,520	834,130	852,880	870,070	883,630	900,950	919,670
Wages, m $ (ID DoL)	baseline	43,521	46,317	49,984	52,936	55,858	58,914	62,085	65,662
	pessimistic	43,521	46,317	49,988	50,277	51,251	53,536	56,217	59,340
	optimistic	43,521	46,317	49,988	53,218	56,675	59,983	63,319	66,943
Housing stock	baseline	792,395	811,555	829,848	847,760	865,793	885,255	905,401	926,284
	pessimistic	797,844	816,077	834,108	851,789	868,899	886,945	905,638	925,150
	optimistic	797,844	816,077	834,108	851,795	869,208	888,020	907,509	927,771

Look ahead. The 2025q3 *IEF* is the economic basis for the August 2025 revenue projection on which the executive branch plans its budget requests. The 2025 legislative session in Idaho had several tax-cut and revenue reducing pieces of legislation. These included (among others) a income tax rate reduction[4], diversions from the sales tax revenue stream towards state funds other than the General Fund[5], enhanced refund opportunities for Idaho taxpayers[6] and greater reliance on the Tax Relief Fund for property tax relief[7]. The latter will diminish a year-end transfer back to the General Fund.

With so many changes for the General Fund, it can be challenging to keep straight the which are the expectations for the broader Idaho economy and which are the expectations for the Idaho General Fund. Mostly the direction of influence between these is that the Idaho economy influences the Idaho General Fund.

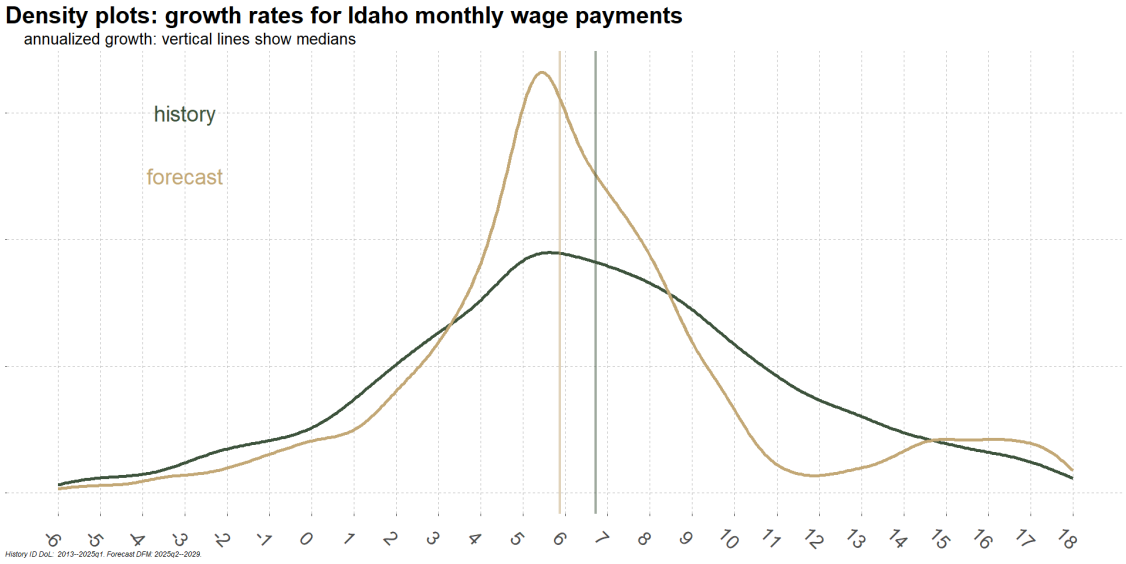
Idaho economy via three density plots. Total nonfarm employment, total wages paid, and total personal income trajectories have been given the main body of this *IEF*. Attention now turns to the density plots for these, which help to put into context the expected future trajectories in terms of the already realized historical trajectories. For these density plots, the annualized growth rate is depicted. Each month of data (whether historical or forecast) produces thirty-six such measurements; that helps to smooth the density since the forecast is using data that is not seasonally adjusted. It also helps to recognize the growth rates that the overall trajectories (historical and forecast) are conveying, rather than the one-month-to-another zigs-and-zags which are inherent in data that is not seasonally smoothed.

➜ The order of presentation of these moves towards establishing: Idaho's economy remains stable.



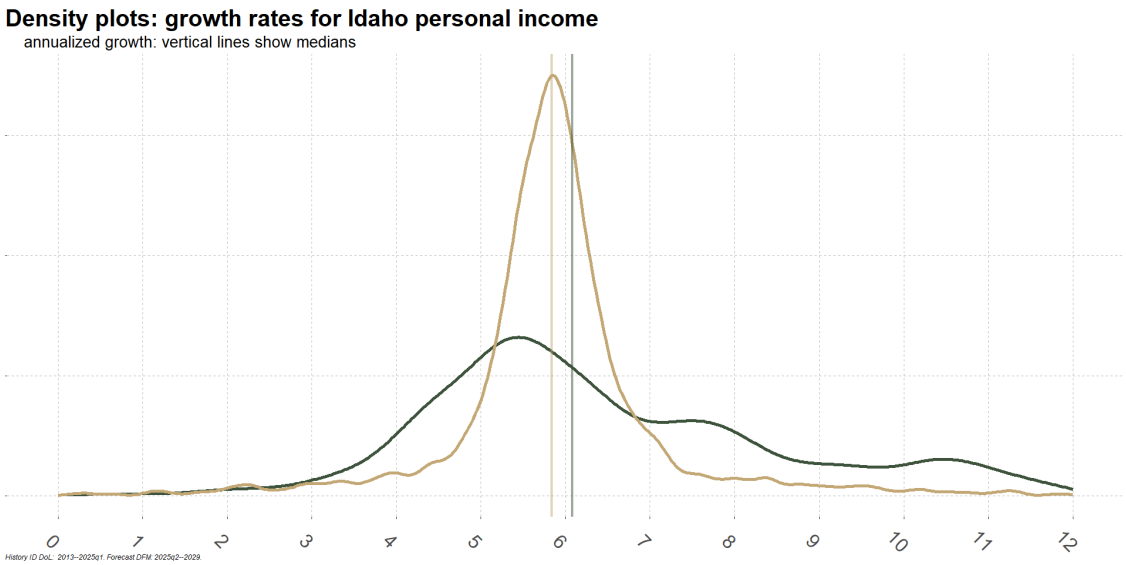
[4] https://legislature.idaho.gov/sessioninfo/2025/legislation/H0040/
[5] https://legislature.idaho.gov/sessioninfo/2025/legislation/H0025/
[6] https://legislature.idaho.gov/sessioninfo/2025/legislation/H0231/
[7] https://legislature.idaho.gov/sessioninfo/2025/legislation/H0304/

This indicates that employment growth, by-and-large, is expected to be slightly weaker than the historical record, though well within the range of growth rates typically seen. The largest difference between the historical growth patterns observed and the forecast growth patterns is that occurrences of measurements of growth rates in the 4–6% realm are expected to be unlikely, though Idaho's history has seen some growth rates in that range. Note that there is essentially little chance in the baseline forecast for growth rates to record negative values (i.e., there is little chance of contraction in employment within the baseline forecast).



While the absolue difference between the median lines in this graph is not dissimilar to that in the total nonfarm employment density plot, because the magnitude of growth are substantially larger (typically in the 2–11% range historically, and typically in the 3–9% range within the forecast), the difference in the median measurements in reality shows a narrowing (i.e., more agreement) between the forecast expectation and the historical record. Here the main difference is that the forecast pattern (the up-and-down pattern inherent in not seasonally adjusted data and their forecasts) does not yet quite replicate the pattern seen in history. Inherent in the programming for the *IEF* is a search through available data to try to improve that pattern matching.

The proximity of the median expected growth rate to the historical median growth rate suggests that the overall forecast is in-line with data, and the shift between the medians being consistent with that seen in the employment forecast also demonstrates a consistency in the modeling.



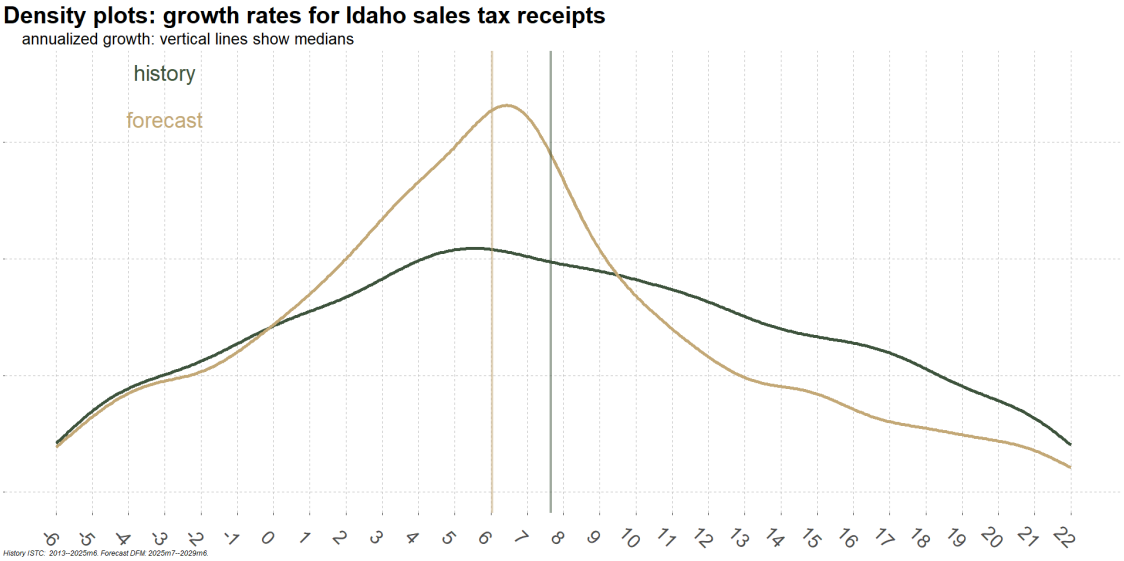
Finally, looking at total personal income, which includes wages as a component, but which as many other stabilizing aspects,[8] there is a narrowing between the forecast expectation and the historical record. The median growth rates are both quite close to 6%. Further, the forecast growth has little chance of being below 5% or above 7% in this baseline forecast.

It is important to remember that this is *total* personal income for the state, not a per-capita income. Total personal income includes that the state is expected to add population, to add jobs, and to see average wages climb.[9]

[8] dividends-interest-and-rent, as well as supplements to salaries are two prominent components of total personal income besides wage payments

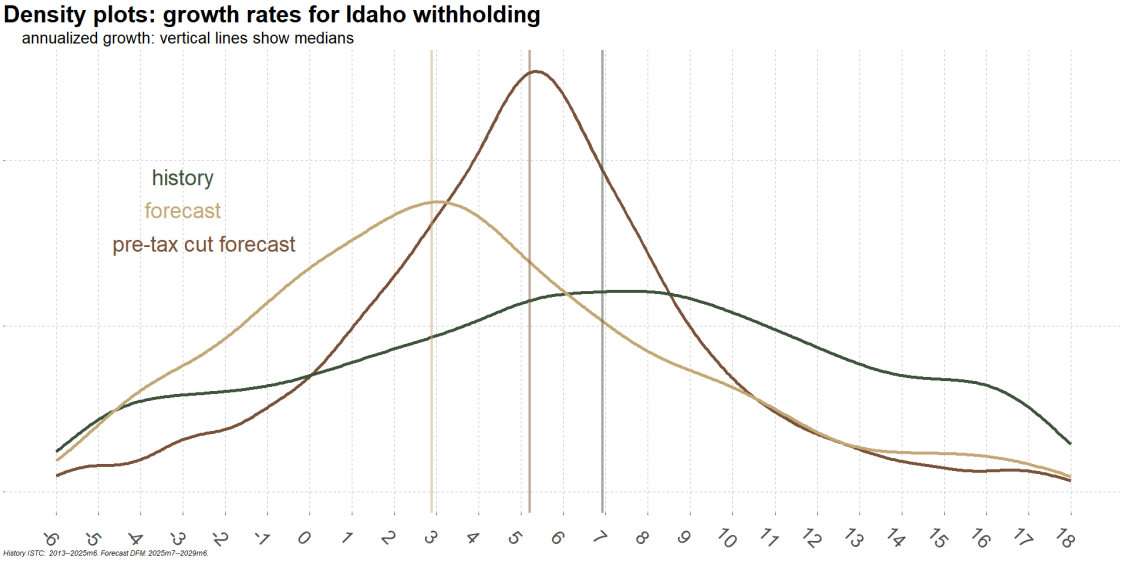
[9] which traditionally pulls up other personal income components such as supplements (e.g., the value of health insurance provided by employers typically increases as wages increase)

Idaho General Fund via two density plots. It is informative to see the expected trajectory of withholding and gross sales tax receipts, and the accompanying density plots. As there is a tax cut[10] working its way across HR and payroll departments, the sales tax gross gives a better picture of the economy's resilience, so that is shown first.



This represents both the historical ability of people in Idaho to spend discretionary income, as well as their propensity to do so. Annualized growth historically has wide variation within it. Some of this has to do with seasonality: the back-to-school season (and summer more broadly) is a driver of sales taxes, as is the holiday shopping season closing each calendar year.

Notice that the forecast for gross sales tax receipts growth is well matched to the historical record. This is visible within the medians (being relatively close) as well as within the shape of the distribution. That reflects a well-established pattern for sales taxes across months.



[10] https://legislature.idaho.gov/sessioninfo/2025/legislation/H0040/

➜ The recent tax cuts are expected to double the effect of the broader US economic situation upon Idaho's withholding receipts.

Withholding growth is mechanically lowered via the phase-in of the impending tax cut. When it is fully realized, the recent tax cut is a 7% reduction in expected income taxes from what would have occurred absent the new law, and that reduction includes withholding. The phase-in of withholding does take time. Employers have to adopt the new withholding tables and often this means that they request their employees revisit their W-4 elections. The expectation is that adoption of the new withholding tables takes about two years.

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[11]
(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.

[11] 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 governed 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 through 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 these are 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). Where source data is available at the monthly level, it is used[12] and where it is not readily available for our own collection, the monthly version from Moody's is used.

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[13][14] 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 variables. Domestic employment equations are specified primarily as functions of state-specific

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

[13] 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.

[14] The US Bureau of Economic Analysis has a note indicating that farm income data at the state level has been discontinued; see BEA discontinuation of SAINC45. In the coming publications, DFM will re-model this portion of the computation.

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)[15] 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.[16]

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.[17] 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

[15] 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.

[16] 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.

[17] 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 education
id_mwr61gsed	Idaho monthly wage rates in state education
id_mwb61gsed	Idaho monthly wage bill in state education
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 receipts
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_e53	employment dummy for real-estate
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_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 corporate 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_metals	Moody's producer price index for metals
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_mwr51	Moody's monthly wage rates in information
mf_us_mwr52	Moody's monthly wage rates in finance
mf_us_mwr53	Moody's monthly wage rates in real-estate
mf_us_mwr54	Moody's monthly wage rates in professional services
mf_us_mwr55	Moody's monthly wage rates in management
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_mwr71	Moody's monthly wage rates in hospitality
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
mf_us_mwrgvsl	Moody's monthly wage rates in state and local government
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_e22	US utilities employment
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_e56	US management employment

us_e61	US private education 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