STATE OF INDIANA

Michael R. Pence
Governor

STATE BUDGET AGENCY
212 State House
Indianapolis, Indiana 46204-2796
317-232-5610

Brian E. Bailey
Director

December 2016 Revenue Forecast

Methodology and Technical Documentation

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Introduction

This document provides an overview of the December 2016 state revenue forecast. The calculation instructions, model specifications, summary statistics, and forecasts are included.

For further information and assistance in the calculation of models, please contact the State Budget Agency's Tax and Revenue Division at 317-232-5610.

Revenue Forecast Committee

The revenue forecast committee is comprised of members from both the executive and legislative branches. Staff from both the State Budget Agency and Legislative Services Agency have a vital role in the process by assisting with data analysis and modeling. Each forecast model and revenue estimate is agreed to by the technical committee on a consensus basis.

Technical Committee:
Erik Gonzalez, House Democratic Appointee
Dr. John Mikesell, Indiana University SPEA
Susan Preble, Senate Democratic Appointee
David Reynolds, Senate Republican Appointee
Ben Tooley, House Republican Appointee
Bill Weinmann, State Budget Agency

Budget Committee Appointed Advisors:
Dr. Dagney Faulk, Ball State University CBER
John Grew

Key Contributors:
John Etnier, State Budget Agency
Heath Holloway, Legislative Services Agency
Randhir Jha, Legislative Services Agency
Dr. Jim Landers, Legislative Services Agency
Allison Leeuw, Legislative Services Agency
Lauren Tanselle, Legislative Services Agency
Payodhi Thapliyal, State Budget Agency
Gayani Wedippuli, State Budget Agency

Economic Forecast

The forecast committee uses economic forecasts from IHS Markit, Inc. Forecasts cited in this document are provided by IHS, a leading economic consulting firm. IHS is routinely ranked among the leading economic forecasters in studies by The Wall Street Journal and Bloomberg Markets.

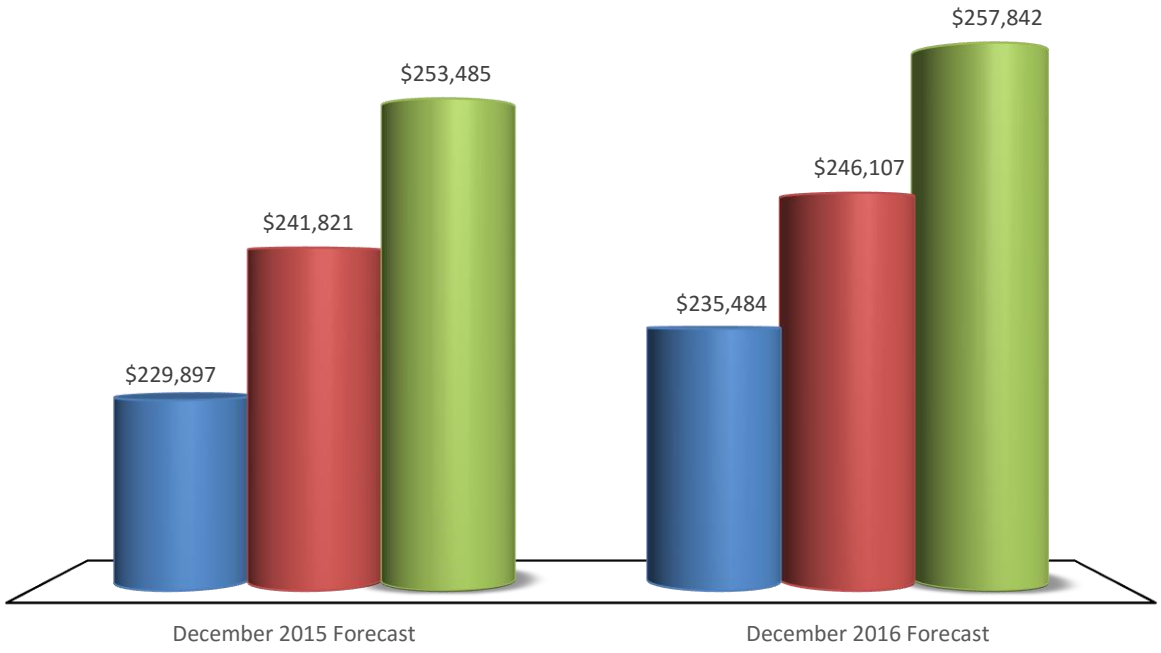
Section I: Commentary on the Economic Forecast

Through fiscal year ("FY") 2016, Indiana state tax revenue grew slower than expected in the December 2015 forecast. Annual revenue fell short of estimate by 0.7%. Revenue growth was muted by tax rate changes and lower fuel prices in FY 2016.

Economic growth is expected to be modest from FY17 thru FY 2019. IHS projects U.S. gross domestic product growth of 3.9% in FY 2017, 4.9% in FY 2018, and 4.9% in FY 2019. Similarly, Indiana gross state product is forecasted to grow by 3.5% in FY 2017, 4.5% in FY 2018, and 4.5% in FY 2019.

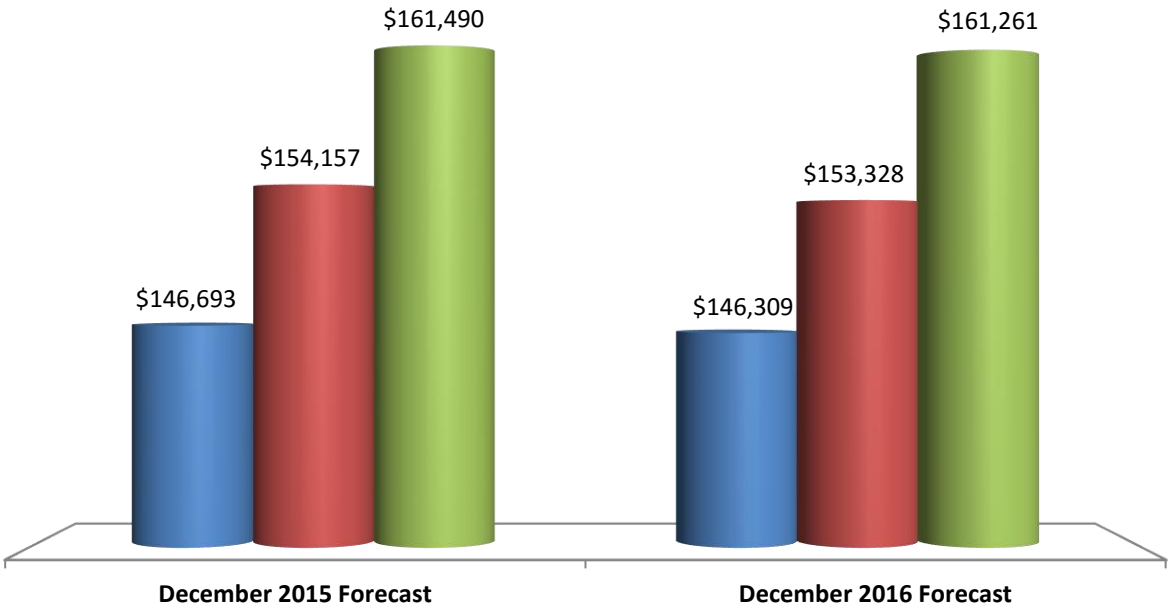
Indiana personal income (net of transfer payments), a key component of Indiana sales tax revenue. IHS Markit forecasts IPI to grow by 4.2% in FY 2017, 4.7% in FY 2018, and 4.9% in FY 2019.

Indiana Nominal Personal Income without Transfer Payments, FY 2017 - FY 2019 (In Millions of Dollars)



Indiana wage and salary disbursements are a key determinant of the individual income tax forecast. IHS Markit forecasts this economic indicator to grow by 3.6% in FY 2017, 4.8% in FY 2018, and 5.2% in FY 2019.

Indiana Nominal Wages and Salaries ,
FY 2017 - FY 2019 (In Millions of Dollars)



The corporate income tax model is IHS Markit's forecast of U.S. corporate profits and Indiana manufacturing employment. Corporate profits, which decreased by -0.4% in FY 2016, are forecasted by IHS Markit to increase by 3.2% in FY 2017, by 5.1% in 2018 and 2.8% in 2019. Indiana manufacturing employment which grew by 0.9% in FY 2016, is projected to decline in FY 2017 by -1.0%, then have no growth in 2018, before experiencing modest growth of 0.9% in 2019.

Section II: Economic Indicators for Indiana

Fiscal Year Amounts

Indiana Economic Indicators	FY 2015	FY 2016	*FY 2017 Forecast*	*FY 2018 Forecast*	*FY 2019 Forecast*
Personal Income (millions $)	272,529.30	280,200.90	*293,030.27*	*306,316.99*	*321,482.04*
Transfer Payments (millions $)	53,530.36	54,914.35	*57,546.61*	*60,209.62*	*63,639.99*
Nominal Wages and Salaries (millions $)	135,219.68	141,275.36	*146,309.08*	*153,327.53*	*161,260.79*
Employment Manufacturing (thousands)	514.45	519.16	*513.85*	*513.94*	*518.46*
Population > 65 years of age (thousands)	956.58	984.45	*1,013.96*	*1,042.17*	*1,069.47*
Total Housing Starts (thousands)	17.10	18.29	*19.34*	*21.33*	*22.30*
US Economy					
Corporate Profits (billions $)	2,174.70	2,029.35	*2,093.67*	*2,199.98*	*2,262.52*
Highway Consumption of Gasoline (billions)	178.07	182.37	*181.18*	*179.38*	*182.43*
Average Retail Price of Gasoline (cents $)	289.88	230.52	*232.66*	*245.73*	*262.36*
S&P 500 Index	2,038.37	2,025.66	*2,179.14*	*2,279.37*	*2,360.60*

Year-Over-Year Percentage Change

Indiana Economic Indicators	FY 2015	FY 2016	*FY 2017 Forecast*	*FY 2018 Forecast*	*FY 2019 Forecast*
Personal Income (millions $)	4.7%	2.8%	*4.6%*	*4.5%*	*5.0%*
Transfer Payments (millions $)	7.7%	2.6%	*4.8%*	*4.6%*	*5.7%*
Nominal Wages and Salaries (millions $)	4.6%	4.5%	*3.6%*	*4.8%*	*5.2%*
Employment Manufacturing (thousands)	3.1%	0.9%	*-1.0%*	*0.0%*	*0.9%*
Population > 65 years of age (thousands)	2.8%	2.9%	*3.0%*	*2.8%*	*2.6%*
Total Housing Starts (thousands)	-0.6%	7.0%	*5.7%*	*10.3%*	*4.5%*
US Economy					
Corporate Profits (billions $)	4.7%	-6.7%	*3.2%*	*5.1%*	*2.8%*
US Highway Gallon Consumption (billions)	2.1%	2.4%	*-0.7%*	*-1.0%*	*1.7%*
Retail Price on All Grades of Gasoline (cents $)	-18.3%	-20.5%	*0.9%*	*5.6%*	*6.8%*
S&P 500 Index	13.6%	-0.6%	*7.6%*	*4.6%*	*3.6%*

Section III: Models Used in the Forecast

Sales Tax

The sales and use tax model experienced major revisions in 2016. The sales and use tax base was split into two components – gasoline use tax (GUT) base, and sales tax net of the GUT base. To accomplish this split into the two new data bases, first, the gasoline use tax base was developed using the historical series of (known) monthly gasoline use tax revenue, the sales tax rate on gasoline, and monthly taxable gallons of gasoline sold. A quarterly series was used to capture the seasonal effect of gasoline consumption and generate a more accurate sales tax rate on gasoline. The gasoline use tax rate has been subject to monthly changes since the implementation of the gasoline use tax methodology in FY 2015. This methodology differs from the sales tax methodology used for all other taxable purchases. All purchases other than gasoline purchases, have a fixed 7% tax rate applied to the taxable portion of the purchase. Prior to FY 2015, tracing back to FY 1995, , there was a semiannual sales tax rate on gasoline under the prepaid system of gasoline, which allowed for organizations to prepay the amount of gasoline they expected to consume then trueing up the difference at the end of the month. Prior to FY 2001 no data was available to isolate sales tax on gasoline purchases. Therefore, an estimation technique was used to expand the time series in order to offset the amount of gasoline tax collections from all other sales tax by using the Federal Highway 551 report for gallons and determining a ratio to apply to the known gasoline tax collections and proportionally estimating the sales taxable gallons from the non-sales taxable gallons back to FY 1989. The GUT model also controlled for seasonal, quarterly effects through the use of seasonal dummy variables and variables to control for the periods during which legislation changed the methodology for the calculation and collection of gasoline use tax.

The base for sales tax net of GUT was calculated by subtracting the historical series of gasoline use tax revenue from historical series of total sales tax revenue then dividing the result by the prevailing sales tax rate in each period to generate the new historical series for sales tax net of GUT.

Historical sales and use tax collections are also adjusted to account for legislative changes and tax holidays that have altered tax collections over the course of the two time series. Consequently, the same adjustments must be made in the opposite direction to the forecast values in order to maintain consistency in each of the time series.

The reason for developing the two models was to better account for the impact that volatile gasoline prices have on total sales and use tax. For sales tax net of GUT the same model used in the December 2015 was used in the current forecast with one adjustment. Rather than use only Indiana Personal Income, the committee elected to use Indiana adjusted personal income, which is personal income net of transfer payments. This was done to capture the spending base most likely used to consume taxable goods. The other variables used in the model are Indiana population over 65 to control for the blend of goods and services purchased by this population segment versus the total population, and Indiana housing starts to control for other economic conditions such as recessions.

Total Sales Tax Forecast = Gasoline Use Tax + Sales Net of Gasoline Use Tax

Sales Tax: Sales Net of Gasoline Use Tax

Log (Sales Tax Base) = β_0 + (β_1 * Log (Indiana Adjusted Personal Income)) + (β_2 * Log (Indiana Population>65)) + (β_3 * Log (Indiana Housing Starts))

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	1.852***
β_1	1.030***
β_2	-0.458***
β_3	0.031 **

Model Statistics:

Adjusted R^2	0.995
F –Statistic	1,932.490***
Sample Size (n)	28

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Revenue Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	6,146.77	4.8%
2013	6,289.00	2.3%
2014	6,426.44	2.2%
2015	6,714.46	4.5%
2016	6,842.97	1.9%

Forecast Revenue Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	7,056.43	3.1%
2018	7,312.84	3.6%
2019	7,590.46	3.8%

Sales Tax: Gasoline Use Tax (GUT)

Log (GUT Base) = β_0 + (β_1 * US Gas Prices) + (β_2 * US Highway Consumption of Gasoline) + (β_3 * Dummy CY Q1) + (β_4 * Dummy CY Q2) + (β_5 * Dummy CY Q3) + (β_6 * Dummy FY 2015 Q1) + (β_7 * Dummy FY 2015 and on) + (β_8 * Dummy FY 1995 to FY 2015)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	257.231***
β_1	-12.213***
β_2	2.838***
β_3	-60.898***
β_4	0.934
β_5	34.357***
β_6	-136.036***
β_7	49.787***
β_8	28.135 **

Model Statistics:

Adjusted R^2	0.846
F –Statistic	27.008***
Sample Size (n)	112

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Revenue Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	475.12	33.9%
2013	505.73	6.4%
2014	499.33	-1.3%
2015	480.64	-3.7%
2016	379.63	-21.0%

Forecast Revenue Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	343.77	-9.4%
2018	305.20	-11.2%
2019	299.26	-1.9%

Individual Income Tax

The committee determined that the income tax forecast should be derived using three separate equations to account for differences between income taxes collected through estimated payments, tax withheld from salary and wage disbursements, and income tax return filings. The selected equations use quarterly data rather than fiscal year data to account for fluctuations throughout each fiscal year.

Estimated payments are mainly collected on investment income, sole proprietors' income, and business income. The estimated payments equation used by the committee includes the S&P 500 Index, the previous year's quarterly estimated payments, and a set of binary variables to account for seasonal factors and structural changes in estimated payment activity.

Withholding on income tax is driven mainly by Indiana salary and wage disbursements. Additionally, income tax can be withheld on pension benefits, retirement benefits, and some government transfer payments.

The settlement amounts include refunds for overpayment and all forms of final remits. New this year, the committee used an autoregressive model of one year with seasonal quarterly variables.

As with sales and use, both the withholding and the settlements series have been adjusted to maintain a consistent time series despite legislative changes.

Additionally, over the period of the forecast, the income tax rate is scheduled to be reduced from 3.3% in the middle of FY 2015 to 3.23% by the middle of FY 2017. As a result, while the growth rate of many of the explanatory models used to forecast income tax collections are expected to decrease and then increase, total collections will increase more slowly.

Total Income Tax Forecast = Estimated Payments + Withholding + Settlements

Income Tax: Estimated Payments

Estimated Payments Tax Base = β_0 + (β_1 * Year Lag of Estimated Payments) + (β_2 * S&P 500 Index) + (β_3 * Dummy CY Q1) + (β_4 * Dummy CY Q2) + (β_5 * Dummy CY Q3) + (β_6 * Dummy for CY 2008 Q2) + (β_7 * Dummy FY 2009 and after)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-622.495
β_1	0.330***
β_2	1.288***
β_3	1,972.629***
β_4	3,126.983***
β_5	1,760.078***
β_6	3,209.078***
β_7	-855.134***

Model Statistics:

Adjusted R^2	0.94
F -Statistic	94.426***
Sample Size (n)	77

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	404.26	2.0%
2013	437.11	8.1%
2014	427.16	-2.3%
2015	483.84	13.3%
2016	584.89	20.2%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	587.99	0.5%
2018	606.66	3.2%
2019	628.23	3.6%

Income Tax: Withholdings

Log (Withholdings Tax Base) = β_0 + (β_1 * Log (Indiana Nominal Wages and Salaries)) + (β_2 * Dummy FY Q3) + (β_3 * Dummy FY Q4) + (β_4 * Dummy FY Q1) + (β_5 * Number of Months Following a Five Friday)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-2.211***
β_1	1.060***
β_2	0.141***
β_3	0.083***
β_4	0.027**
β_5	0.043***

Model Statistics:

Adjusted R^2	0.97
F -Statistic	514.219***
Sample Size (n)	81

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	4,233.20	4.0%
2013	4,277.11	1.0%
2014	4,314.27	0.9%
2015	4,470.72	3.6%
2016	4,578.48	2.3%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	4,771.28	4.2%
2018	4,957.97	3.9%
2019	5,284.25	6.9%

Corporate Income Tax

The forecast equation used by the committee to estimate corporate adjusted gross income ("AGI") was not revised from the December 2015 forecast. The model includes a year lag of the fiscal year National Income and Product Accounts (NIPA) corporate profits to account for varying corporate fiscal years and the lagged influence of corporate profits on corporate AGI, Indiana manufacturing employment and a binary variable to control for the structural change to Indiana's corporate tax in FY 2004.

The corporate tax rate is scheduled to gradually decrease until FY 2021. Over the biennium, rates will range from 6.5% in FY 2016 to 5.75% in FY 2019. The reduction in the corporate tax rate will cause Indiana corporate tax revenues to grow at a slower rate than the expected growth of US corporate profits. The corporate tax collections data and forecast are also adjusted to account for past legislative changes, and occasional reclassification of withholdings for pass-through entities from corporate to individual as returns are filed.

In addition to the equation for corporate AGI, revenues from the smaller utility receipts tax, the utility services use tax, and the financial institutions tax were forecast separately using historical averages. These forecasts are then added together to get a total corporate tax forecast.

Corporate Tax Base = β_0 + (β_1 * Year Lag of FY US Corporate Profits) + (β_2 * Indiana Manufacturing Employment) + (β_3 * FY 2004 and after)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-8,080.056***
β_1	6.221***
β_2	16.195***
β_3	-1,653.368**

Model Statistics:

Adjusted R^2	0.879
F -Statistic	723.702***
Sample Size (n)	23

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	702.67	44.4%
2013	676.21	-3.8%
2014	764.74	13.1%
2015	777.78	1.7%
2016	699.19	-10.1%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	627.08	-10.3%
2018	641.62	2.3%
2019	646.75	0.8%

Cigarette & Other Tobacco Products Tax

The committee estimates cigarette tax and tobacco products tax separately. Cigarette sales, measured in packs of 20, depends upon fiscal year real Indiana personal income, an estimate of the sum of the four surrounding states' real prices, the real Indiana price, the real Indiana cigarette excise tax rate, and a trend variable. Other tobacco product sales are estimated based on an annual fiscal year trend.

Log (Packets Sold) = β_0 + (β_1 * Log (Real FY Indiana Personal Income)) + (β_2* Log (Real Indiana Cigarette Price)) + (β_3* Log (Real All Neighbor's Price)) + (β_4* Log (Real Indiana Cigarette Tax Rate)) + (β_5* Trend)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-11.738***
β_1	1.520***
β_2	-0.721***
β_3	0.880***
β_4	-0.150***
β_5	-0.058***

Model Statistics:

Adjusted R^2	0.985
F -Statistic	395.199***
Sample Size (n)	32

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	421.05	-5.4%
2013	428.33	1.7%
2014	412.57	-3.7%
2015	404.29	-2.0%
2016	409.50	1.3%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	389.80	-4.8%
2018	378.70	-2.8%
2019	371.20	-2.0%

Note: The state General Fund receives 58.7% of the cigarette tax distributions.

Alcoholic Beverage Taxes

The alcoholic beverage tax model includes three equations: one for beer, one for liquor, and one for wine. All three equations include fiscal year real Indiana personal income and the real beverage price. The beer equation includes dummy variables for 1979 and after, 1993 and after, and 2013 and after. The liquor equation includes a dummy variable for 1999 and after. It also includes a variable where the dummy for fiscal years after 1998 is multiplied by the log of real Indiana personal income. The wine equation includes dummy variables for 1987 and after. For all equations, the income and price variables were adjusted by the gross domestic product price deflator. The sales and income variables are expressed in terms of natural logarithms. The price variables are not in natural logarithms.

Alcoholic Beverage Taxes: Beer

Thousands of Gallons of Beer Sold in Indiana = β_0 + (β_1* Log(FY Real Indiana Personal Income))+ (β_2* Real Price of Beer in Indiana) + (β_3* Log(FY Real Indiana Personal Income for FY 1979 and After)) + (β_4 * Log(Real Indiana Personal Income for FY 1993 and After)) + (β_5* Dummy Variable for FY 1979 and After) + (β_6 * Dummy Variable for FY 1993 and After) + (β_7 * Dummy Variable for FY 2013 and After)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	3.246***
β_1	0.735***
β_2	-0.045
β_3	-0.747***
β_4	0.259***
β_5	8.846***
β_6	-3.136***
β_7	-0.082***

Model Statistics:

Adjusted R^2	0.980
F -Statistic	351.970***
Sample Size (n)	52

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	4.73	-1.5%
2013	4.52	-4.5%
2014	4.55	0.8%
2015	4.66	2.4%
2016	4.80	3.0%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	5.20	8.3%
2018	5.36	3.1%
2019	5.52	3.0%

Alcoholic Beverage Taxes: Liquor

Thousands of Gallons of Liquor Sold in Indiana = β_0 + (β_1 * Log (Real Indiana Personal Income)) + (β_2 * Real Price of Liquor in Indiana) + (β_3 * Log (FY Real Indiana Personal Income for FY 1999 and After)) + (β_4 * Dummy Variable for FY 1999 and after)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	16.672***
β_1	-0.590***
β_2	-0.072***
β_3	2.289***
β_4	-27.751***

Model Statistics:

Adjusted R^2	0.940
F -Statistic	199.042***
Sample Size (n)	52

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	9.44	3.6%
2013	10.26	8.7%
2014	10.35	0.8%
2015	10.59	2.3%
2016	10.89	2.8%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	11.80	8.4%
2018	12.16	3.1%
2019	12.52	3.0%

Alcoholic Beverage Taxes: Wine

Thousands of Gallons of Wine Sold in Indiana = β_0 + (β_1* Log (Real Indiana Personal Income)) + (β_2 * Real Price of Wine in Indiana) + (β_3 * Dummy Variable for 1987 and after)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	1.570
β_1	0.816***
β_2	-0.521***
β_3	-0.249***

Model Statistics:

Adjusted R^2	0.895
F -Statistic	146.040***
Sample Size (n)	52

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	2.22	2.0%
2013	2.22	-0.3%
2014	2.20	-0.8%
2015	2.25	2.3%
2016	2.31	2.7%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	2.50	8.2%
2018	2.58	3.2%
2019	2.66	3.1%

Riverboat and Racino Wagering

The committee adopted an equation to estimate the total adjusted gross wagering receipts of the state's eleven riverboat casinos and two racinos. Adjusted gross wagering receipts serve as the tax base for both wagering taxes. These estimates are then adjusted to compute the estimated fiscal year riverboat wagering tax collections and racino slot machine wagering tax collections. The equation estimates the quarterly total adjusted gross wagering receipts with nominal Indiana personal income, a set of dummy variables for market and seasonal changes, and an interaction variable that accounts for other economic and market circumstances.

The baseline adjusted gross wagering receipts forecast is then adjusted to account for: (1) potential competitive impacts from new casino operations in neighboring states, (2) changes in Indiana laws, and (3) court decisions impacting taxation of gaming revenues.

Total Adjusted Gross Wagering Receipts = β_0+ (β_1* Indiana Personal Income) + (β_2* CY Q4 Dummy) + (β_3* Four Winds Dummy) + (β_4* Racinos Dummy) + (β_5* Ohio Dummy) + (β_6* Indiana Personal Income * Four Winds Dummy)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-71,621,865
β_1	3,497***
β_2	-29,618,629***
β_3	1,001,393,672***
β_4	75,045,550***
β_5	-67,581,380***
β_6	-4,808***

Model Statistics:

Adjusted R^2	0.901
F -Statistic	84.731***
Sample Size (n)	56

*Significance: *p < 0.1, **p < 0.05, ***p < 0.01*

Riverboat and Racino Wagering

Riverboat Wagering Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	496.55	-6.1%
2013	448.65	-9.6%
2014	363.32	-19.0%
2015	336.22	-7.5%
2016	330.04	-1.8%

Riverboat Wagering Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	298.39	-9.6%
2018	290.21	-2.7%
2019	281.35	-3.1%

Racino Wagering Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2012	117.56	-10.5%
2013	105.90	-9.9%
2014	110.71	4.5%
2015	110.55	-0.1%
2016	110.89	0.3%

Racino Wagering Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2017	109.03	-1.7%
2018	110.78	1.6%
2019	110.02	-0.7%

Section IV: Technical Explanations

General Note on the Statistical Forecast Methodology

Models from this forecast are estimated using ordinary least squares regression ("OLS"). The OLS equation estimates the relationship between the explanatory variables (*x*) and the response variable (*y*). The multiple regression function is described by the equation below:

$$y = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \ldots + \hat{\beta}_n x_n$$

In this equation $\hat{\beta}_1$ represents the relationship between the explanatory variable x_1 and the response variable *y,* while $\hat{\beta}_0$ equals the point at which the regression line intercepts with the y axis. The models used to estimate the state revenue forecast use this functional form. Certain models use the natural logarithmic form of the explanatory and response variables.

In order to calculate the forecast values of state revenue (*y* in the equation above) the committee uses forecast values of the explanatory variables (*x*) from IHS Markit. By substituting the forecast values of *x* into the equation, a future value of *y* can be estimated.

Explanations of summary statistics

Standard summary statistics for each model are included with the model specifications.

The Adjusted R^2 listed in the model summaries describes the total variation in the response variable (*y*) explained by the explanatory variables (*x*). An Adjusted R^2 equal to 0.90 means that 90% of the change in the dependent variable was explained by the change in the explanatory variables.

The number of observations, or sample size, used to estimate the model is also listed as "n". Most of the forecast models are based on annual data, meaning that a model with a "n" equal to thirty is using thirty years of data. Certain models are based on quarterly data and in this case the statistic refers to the number of quarters used to estimate the model.

The F-statistic measures the overall statistical significance of the model and allows for an assessment of the probability that the coefficients estimated by the model do not equal zero. The relationship observed in the model is likely representative of reality if the F-statistic is significant.

The p-value measures the significance of the relationship between a particular explanatory variable and the response variable in the model. While the F-statistic and the associated p-value evaluate the entire model simultaneously, the p-values associated with the coefficients examine each relationship independently.