STATE OF INDIANA

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December 2015 Revenue Forecast

Methodology and Technical Documentation

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Introduction

This document provides an overview of the December 2015 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.

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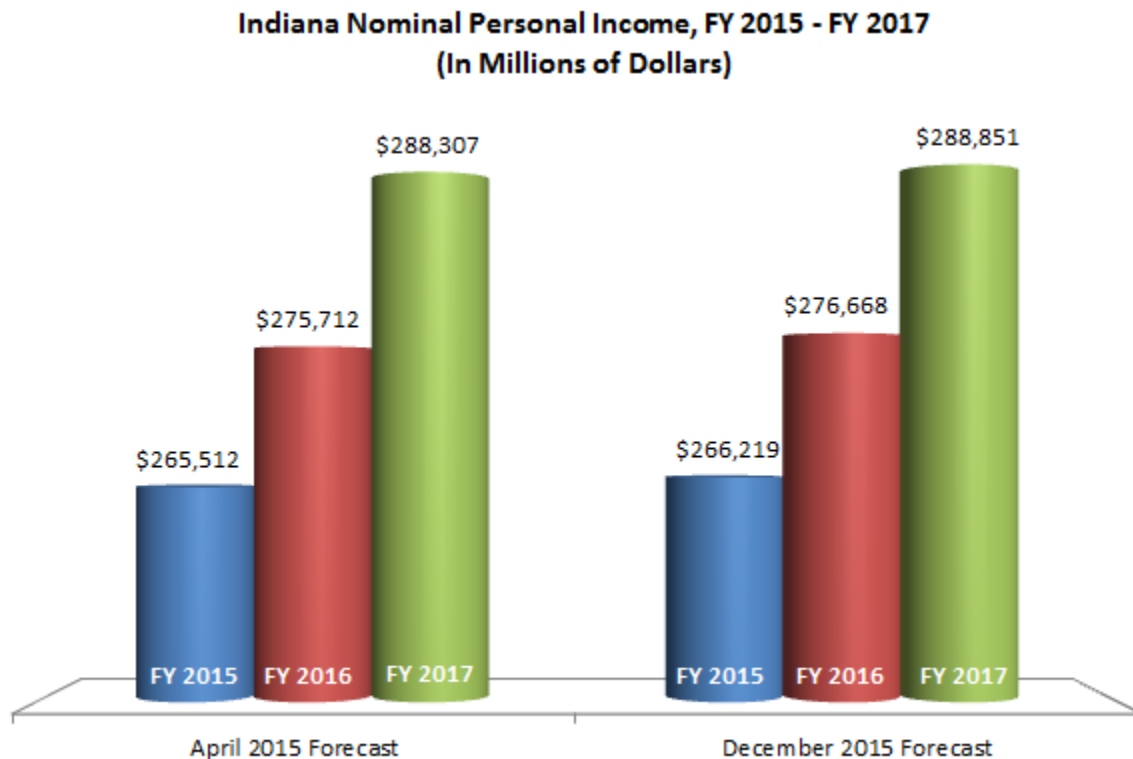
John Grew

Economic Forecast

The forecast committee uses economic forecasts from IHS Global Insight, 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.
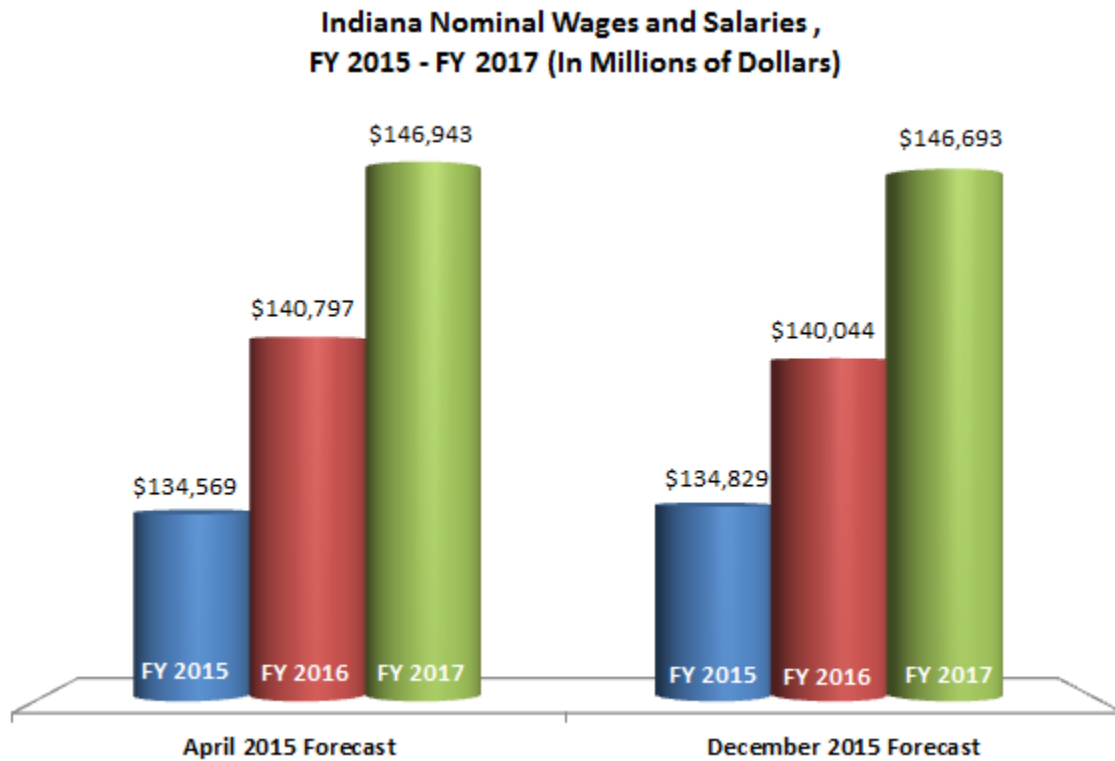
Section I: Commentary on the Economic Forecast

Through fiscal year ("FY") 2015, Indiana state tax revenue grew more quickly than was expected in the April 2015 forecast. Annual revenue growth through FY 2015 was 3.4%. Revenue growth was muted by tax rate changes and lower fuel prices in FY 2015.

Economic forecasts project continued economic expansion through FY 2016 and FY 2017. IHS projects U.S. gross domestic product growth of 3.7% in FY 2016, and 5.1% in FY 2017. Similarly, Indiana gross state product is forecasted to grow by 3.4% in FY 2016, and 4.6% in FY 2017.

Indiana personal income, as tracked by the U.S. Bureau of Economic Analysis ("BEA"), is a key component of the Indiana revenue forecast. Indiana personal income and its components are included in the majority of models used to forecast state revenue. Since the April 2015 forecast, this economic indicator is 0.35% higher in FY 2016 and 0.19% higher in FY 2017.

Indiana Nominal Personal Income, FY 2015 - FY 2017
(In Millions of Dollars)

	April 2015 Forecast			December 2015 Forecast		
FY 2015	$265,512			$266,219		
FY 2016		$275,712			$276,668	
FY 2017			$288,307			$288,851

BEA revised downward Indiana wage and salary disbursements. This economic indicator is the main determinant of the individual income tax forecast. Since the April 2015 forecast, Indiana wage and salary disbursements have decreased for each fiscal year of the forecast biennium period.

**Indiana Nominal Wages and Salaries,
FY 2015 - FY 2017 (In Millions of Dollars)**

April 2015 Forecast			December 2015 Forecast		
FY 2015	FY 2016	FY 2017	FY 2015	FY 2016	FY 2017
$134,569	$140,797	$146,943	$134,829	$140,044	$146,693

The corporate income tax model utilized by the committee is driven by BEA U.S. corporate profits and Indiana manufacturing employment. Profits, which decreased by -0.4% in FY 2016, are forecasted by IHS Global Insight to increase by 6.1% in FY 2017. By comparison, growth in corporate profits at the time of the April 2015 forecast for FY 2016 was 8.1%. Indiana manufacturing employment is projected to grow by 1.1% in FY 2016 and 0.8% in FY 2017.

Section II: Economic Indicators for Indiana

Fiscal Year Amounts

Indiana Economic Indicators	FY 2013	FY 2014	FY 2015	*FY 2016 Forecast*	*FY 2017 Forecast*
Personal Income (millions $)	251,266.25	254,626.64	266,219.38	*276,667.57*	*288,851.13*
Proprietors' Income (millions $)	20,937.36	21,821.16	21,245.06	*21,887.68*	*22,427.34*
Nominal Wages and Salaries (millions $)	126,246.83	129,460.33	134,828.54	*140,043.72*	*146,693.38*
Employment Manufacturing (thousands)	487.58	499.08	514.62	*520.31*	*524.58*
Population > 65 years of age (thousands)	905.28	931.45	959.46	*990.26*	*1,021.07*
Total Housing Starts (thousands)	14.89	17.19	17.24	*17.66*	*21.99*
US Economy					
Corporate Profits (billions $)	2,006.43	2,025.50	2,098.00	*2,090.47*	*2,217.14*

Year-Over-Year Percentage Change

Indiana Economic Indicators	FY 2013	FY 2014	FY 2015	*FY 2016 Forecast*	*FY 2017 Forecast*
Personal Income (millions $)	3.6%	1.3%	4.6%	*3.9%*	*4.4%*
Proprietors' Income (millions $)	10.2%	4.2%	-2.6%	*3.0%*	*2.5%*
Nominal Wages and Salaries (millions $)	3.4%	2.5%	4.1%	*3.9%*	*4.7%*
Employment Manufacturing (thousands)	3.2%	2.4%	3.1%	*1.1%*	*0.8%*
Population > 65 years of age (thousands)	3.2%	2.9%	3.0%	*3.2%*	*3.1%*
Total Housing Starts (thousands)	12.6%	15.5%	0.3%	*2.5%*	*24.5%*
US Economy					
Corporate Profits (billions $)	2.8%	1.0%	3.6%	*-0.4%*	*6.1%*

Section III: Models Used in the Forecast

Sales Tax

A determining factor in sales tax revenues are Indiana's changing demographics. As the population ages, there is a shift in the market basket of goods and services purchased. To account for this change the population over age 65 was added as a proxy for the movement towards greater purchases of services not subject to Indiana sales tax.

Personal income is, by far, the best predictor of sales tax revenue; as people's income increases they tend to spend more, resulting in more sales tax revenue. In previous years, the committee had used adjusted personal income, personal income minus transfer payments, on the assumption that income received via transfer payments was more likely to be spent on non-sales tax eligible goods and services. However, since this year the committee decided to control for the impact of the number of people over the age of sixty-five, it was thought important to include transfer payments which include both Medicare and Social Security income.

The amount of sales tax revenues collected is also subject to changes in the economy. Housing starts were added to the equation to account for this cyclicality.

The model is constructed using historical sales tax collections that are adjusted to account for legislative changes that have altered sales tax collections over the course of the time series. Consequently, the same adjustments must be made in the opposite direction to the forecast values in order to maintain consistency in the time series.

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

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	1.30*
β_1	-0.32**
β_2	0.98***
β_3	0.05***

Model Statistics:

Adjusted R^2	0.996
F –Statistic	1,921.859***
Sample Size (n)	27

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

Historical Revenue Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	5,914.65	-3.9%
2011	6,217.53	5.1%
2012	6,621.82	6.5%
2013	6,795.81	2.6%
2014	6,925.87	1.9%
2015	7,194.85	3.9%

Forecast Revenue Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	7,345.55	2.1%
2017	7,665.29	4.4%

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. BEA's Indiana proprietors' income comprises the majority of these income components. The estimated payments equation used by the committee includes Indiana proprietors' income, 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. The committee used a four year historical average to estimate a fiscal year total.

As with sales, both the withholding and the settlements series have been adjusted to maintain a consistent time series despite legislative changes. The final settlements series includes adjustments for both the College Choice 529 Credit and the Earned Income Tax Credit as well as adjustments for Outside Acts from the 2015 Legislative Session.

Additionally, over the period of the forecast, the income tax rate is scheduled to be reduced from 3.4% 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

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Income Tax: Estimated Payments

Estimated Payments Tax Base = β_0 + (β_1 * Indiana Proprietors' Income) + (β_2 * Dummy CY Q1) + (β_3 * Dummy CY Q2) + (β_4 * Dummy CY Q3) + (β_5 * Year Lag of Estimated Payments) + (β_6 * Dummy for CY 2008 Q2) + (β_7 * Dummy FY 2009 and After)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-230.26
β_1	0.08**
β_2	2,025.73***
β_3	3,028.24***
β_4	1,726.34***
β_5	0.33***
β_6	2,792.06***
β_7	-984.10***

Model Statistics:

Adjusted R^2	0.889
F -Statistic	82.156***
Sample Size (n)	72

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	356.10	-24.5%
2011	378.85	6.4%
2012	394.36	4.1%
2013	433.38	9.9%
2014	427.87	-1.3%
2015	482.96	12.9%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	489.02	1.3%
2017	462.73	-5.4%

Income Tax: Withholdings

Natural Log (Withholdings Tax Base) = β_0 + (β_1 * Natural 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	-1.97***
β_1	1.04***
β_2	0.14***
β_3	0.04***
β_4	0.01**
β_5	0.04***

Model Statistics:

Adjusted R^2	0.989
F -Statistic	1,372.730***
Sample Size (n)	76

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	3,718.73	-3.6%
2011	3,928.39	5.6%
2012	4,086.01	4.0%
2013	4,298.35	5.2%
2014	4,336.91	0.9%
2015	4,501.95	3.8%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	4,588.59	1.9%
2017	4,746.10	3.4%

Corporate Income Tax

The forecast equation used by the committee to estimate corporate adjusted gross income ("AGI") was revised from the April 2015 forecast to account for changes in the Indiana business climate. Specifically, Indiana manufacturing employment as well as a binary variable to control for the structural change to Indiana corporate tax were introduced into this forecast model. The model also 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.

The corporate tax rate is scheduled to gradually decrease until FY 2021. Over the biennium, rates will range from 7.0% in FY 2015 to 6.25% in FY 2017. 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.

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 Employment Manufacturing) + (β_3 * FY 2004 and After)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-8,459.79**
β_1	0.01***
β_2	16.58***
β_3	-1,711.15**

Model Statistics:

Adjusted R^2	0.842
F -Statistic	38.173***
Sample Size (n)	22

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	370.05	-31.6%
2011	486.72	31.5%
2012	702.67	44.4%
2013	676.21	-3.8%
2014	764.74	13.1%
2015	777.78	1.7%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	673.26	-13.4%
2017	659.73	-2.0%

Cigarette & Other Tobacco Products Tax

The committee adopted two equations to estimate the cigarette tax and tobacco products tax. 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 fiscal year real Indiana personal income, a product of real price index and federal tobacco products excise tax, real Indiana excise tax on tobacco products, a real federal tobacco product tax rate, and a trend variable. The sales, income, cigarette tax rate, and price variables are expressed in natural logarithms.

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

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-10.04***
β_1	1.39***
β_2	-0.64***
β_3	0.77***
β_4	-0.15***
β_5	-0.05***

Model Statistics:

Adjusted R^2	0.984
F -Statistic	380.725***
Sample Size (n)	31

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	452.17	-8.1%
2011	445.15	-1.6%
2012	421.05	-5.4%
2013	428.33	1.7%
2014	412.57	-3.7%
2015	404.29	-2.0%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	$399.28	-1.2%
2017	$391.15	-2.0%

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

Other Tobacco Products (OTP)

Natural Log (Sales of Other Tobacco Products) = β_0 + (β_1* Natural Log (Real Indiana Real Personal Income)) + (β_2*Natural Log (Real Tobacco Product Purchasing Price Index Multiplied by the Federal Tobacco Tax Rate)) + (β_3*Indiana's OTP Tax Rate) + (β_4* Real Federal Tobacco Tax Rate) + (β_5* Trend)

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-16.02**
β_1	1.75***
β_2	-0.28**
β_3	-0.02*
β_4	0.01***
β_5	0.02

Model Statistics:

Adjusted R^2	0.984
F -Statistic	338.560***
Sample Size (n)	28

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	29.84	20.7%
2011	33.46	12.1%
2012	35.12	5.0%
2013	33.30	-5.2%
2014	35.00	5.1%
2015	34.97	-0.1%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	40.22	15.0%
2017	42.25	5.0%

Note: 75% of the OTP tax revenues are distributed in the same manner as cigarette tax. 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* Natural Log(FY Real Indiana Personal Income))+ (β_2* Real Price of Beer in Indiana) + (β_3* Natural Log(FY Real Indiana Personal Income for FY 1979 and After)) + (β_4 * Natural 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	3.16**
β_1	0.74***
β_2	-0.04
β_3	-0.75***
β_4	0.26***
β_5	8.92***
β_6	-3.20***
β_7	-0.08***

Model Statistics:

Adjusted R^2	0.980
F -Statistic	344.419***
Sample Size (n)	51

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	4.59	-11.8%
2011	4.81	4.8%
2012	4.73	-1.5%
2013	4.52	-4.5%
2014	4.55	0.8%
2015	4.66	2.4%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	4.75	1.9%
2017	4.77	0.6%

Alcoholic Beverage Taxes: Liquor

Thousands of Gallons of Liquor Sold in Indiana = β_0 + (β_1 * Natural Log (Real Indiana Personal Income)) + (β_2 * Real Price of Liquor in Indiana) + (β_3 * Natural 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	16.69***
β_1	-0.59***
β_2	-0.07***
β_3	2.61***
β_4	-31.64***

Model Statistics:

Adjusted R^2	0.932
F -Statistic	172.721***
Sample Size (n)	51

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	6.26	-29.8%
2011	9.12	45.7%
2012	9.44	3.6%
2013	10.26	8.7%
2014	10.35	0.8%
2015	10.59	2.3%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	10.92	3.1%
2017	12.02	10.1%

Alcoholic Beverage Taxes: Wine

Thousands of Gallons of Wine Sold in Indiana = β_0 + (β_1* Natural 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	1.33
β_1	0.84***
β_2	-0.53***
β_3	-0.26***

Model Statistics:

Adjusted R^2	0.892
F -Statistic	138.797***
Sample Size (n)	51

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

Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	1.86	-6.6%
2011	2.18	17.3%
2012	2.22	2.0%
2013	2.22	-0.3%
2014	2.20	-0.8%
2015	2.25	2.3%

Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	2.39	6.1%
2017	2.60	8.9%

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 Q2 Dummy) + (β_3* CY Q4 Dummy) + (β_4* French Lick Dummy) + (β_5* Four Winds Dummy) + (β_6* Racinos Dummy) + (β_7* (Indiana Personal Income * French Lick Dummy))

Coefficient Statistics:

Coefficient	Estimated Coefficient
β_0	-24,463,501
β_1	3,251***
β_2	-8,721,507*
β_3	-36,653,581***
β_4	1,070,875,586***
β_5	-26,865,669**
β_6	67,466,319***
β_7	-4,946***

Model Statistics:

Adjusted R^2	0.918
F -Statistic	82.662***
Sample Size (n)	52

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

Riverboat and Racino Wagering

Riverboat Wagering Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	538.10	-1.3%
2011	529.05	-1.7%
2012	496.55	-6.1%
2013	448.65	-9.6%
2014	363.32	-19.0%
2015	336.22	-7.5%

Riverboat Wagering Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	318.50	-5.3%
2017	307.31	-3.5%

Racino Wagering Historical Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2010	120.80	12.2%
2011	131.30	8.7%
2012	117.56	-10.5%
2013	105.90	-9.9%
2014	110.71	4.5%
2015	110.55	-0.1%

Racino Wagering Forecast Data		
Fiscal Year	Adjusted Revenue (Millions $)	Growth
2016	104.39	-5.6%
2017	101.56	-2.7%

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 Global Insight. 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.