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# Modeling the D.C. Economy, Revenues, and Debt Service Obligations

March 23, 2022

A Methodology Report by District Economics Group



# Modeling the D.C. Economy, Revenues, and Debt Service Obligations for the Office of the D.C. Auditor: A Methodology Report

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March 9, 2022

Washington, D.C.

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## Introduction

District Economics Group (DEG) was engaged in 2019 by the Office of the D.C. Auditor (ODCA) to design and build forecasting/projection models of the D.C. economy.. DEG developed an econometric forecasting model of the District's GDP, and based upon model forecasts for 2019, 2020, and 2021, estimated District tax revenues for income, property, sales and excise, gross receipts, other tax, and nontax and lottery revenues.<sup>1</sup> The primary purpose of this model is to provide a regular and independent assessment of D.C. government finances to support the D.C. Auditor's revenue certifications for new bond issuances, pursuant to the D.C. Official Code section 1-206.03(b)(1).<sup>2</sup> As a part of this effort, DEG has significantly modified its methodological approach used to estimate District revenues. These revisions allow us to develop more accurate and robust revenue forecasts.

### Why the need for a model revision?

The COVID-19 pandemic dramatically slowed the growth of D.C. GDP between 2019 and 2020. In many parts of the country, state level GDP contracted but, in the District, GDP growth remained positive between 2019 (\$144.4 billion) and 2020 (\$144.6 billion) at 0.13%.<sup>3</sup> The DEG forecasting model relied upon annual measures of GDP to forecast annual levels of the District's gross revenue streams. With the precipitous decline in economic activity in the second quarter of 2020, the model became challenged to account for the change in revenues, and more importantly, the disparate impact of the pandemic on the different revenue sources. For example, while income tax revenues held up surprisingly well during 2020, even growing by 4.05% above the DEG forecast of \$2.983 billion, sales and excise taxes declined precipitously by \$449 million to 26% below the DEG forecast of \$1.729 billion. To provide greater flexibility to the forecasts, DEG has expanded its model to include market-level characteristics in the District to capture the economic dynamics associated with the pandemic, and moved from a calendar year D.C. GDP forecasting model to a fiscal year D.C. GDP model based upon quarterly GDP data with GDP components. The market-level characteristics broadly include information on commercial office and retail space, gauges of demand for hospitality, and multi-family housing market data reported on the CoStar data platform. DEG's new model provides greater flexibility in forecasting the District's revenue streams than its prior model because it is able to accommodate sudden changes in the District's economic landscape. At an aggregate level, however, both models describe a stable relationship of approximately \$60 million of District gross revenues per \$1 billion of District GDP.

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<sup>1</sup> See "Modeling the D.C. Economy, Revenues, and Debt Service Obligations: A Methodology Report by District Economics Group", November 13, 2019. [Dcauditor.org/report/modeling-the-d-c-economy-revenues-and-debt-service-obligations/](https://dcauditor.org/report/modeling-the-d-c-economy-revenues-and-debt-service-obligations/)

<sup>2</sup> The D.C. Auditor issued certifications for bond issues based upon the DEG model forecasts on December 4, 2019, March 11, 2020, November 12, 2021, and November 30, 2021.

<sup>3</sup> BEA forecast of Annual D.C. GDP as of October 1, 2021.

## Methodology

DEG previously built a long-term revenue model for the ODCA using historical economic and fiscal revenue data to parametrize the relationship between D.C. GDP and revenue levels that could then be applied to long-term economic forecasts to determine the implied long-term revenue outlook. The modeling approach used an auto-regressive integrated moving average (ARIMA) specification with U.S. GDP as a regressor to fit the historical time-series of D.C. GDP and to forecast future values of D.C. GDP. The model then used historical and forecast values of D.C. GDP to forecast the District's property tax, income tax, sales and excise tax, as well as nontax and lottery revenues. DEG's models for gross receipts and other tax revenues did not include D.C. GDP as an additional variable. The forecasted revenue measures were used by ODCA to provide certifications for certain bond issuances.

For this model update, DEG improved its forecast estimation in two ways: 1) by starting from quarterly GDP estimates to align with the District's fiscal year rather than starting from calendar year estimates and 2) expanding the model to include measures of commercial real estate, hospitality, and multi-family housing. These changes add sensitivity to DEG's forecast of D.C. revenue streams that may grow at different rates than D.C. GDP. DEG obtained real estate data from CoStar including office vacancy and asking rents for commercial and multi-family properties to improve its ARIMA forecasts of District revenue streams where appropriate to capture market specific events that could influence revenues.<sup>4</sup>

## Analysis

ARIMA models relate a current period value of a variable such as D.C. GDP or D.C. revenues to three operations on prior period values of the same variable. Thus, ARIMA models are described as ARIMA(x,y,z). The first of these operators is the auto-regressive parameter which identifies the number of time lags of the variable of interest to include, the second operator identifies the degree of differencing between the current period and prior period values of the variable, and the third operator identifies the moving average component indicating whether the error term from the prior time period model estimate should be included.

For its models of FY D.C. GDP and six of the District's revenue streams, DEG presents the ARIMA model output including the coefficients and standard errors of any included auto-regressive,

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<sup>4</sup> CoStar Group builds and maintains a library of building- and deal-level commercial and multifamily real estate information. CoStar's Quantitative Analytics Group creates models and algorithms to extract trends in vacancies, rents, and prices, whether for an individual property, a custom set of properties, a submarket or market, or the entire nation. The Group also produces forecasts of the key real estate variables. DEG uses data from CoStar that is specific to Washington, D.C.

moving-average, or external regressor components, as well as an AIC measure (a measure of the goodness of fit of a model). In addition, for each model, the historical and forecasted values are plotted with 95% and 80% confidence intervals along with the OCFO’s most recent forecast for comparison.

### Forecasting FY D.C. GDP

For this model revision, we align D.C. GDP to fiscal years to better track D.C. fiscal year revenue estimates. The D.C. fiscal year begins on October 1<sup>st</sup> and runs through September 30<sup>th</sup> of the following calendar year. DEG uses historical quarterly estimates of U.S. and D.C. GDP from the Bureau of Economic Analysis (BEA) and converts the BEA’s calendar year quarterly estimates into annualized fiscal year estimates. For example, to estimate FY 2020 D.C. GDP, we average over the annualized D.C. GDP estimates for 2019Q4, 2020Q1, 2020Q2, and 2020Q3.

Our model forecast of D.C. GDP begins with FY 2022. To forecast future FY D.C. GDP, the ARIMA model requires that an external regressor also have available projections of future values. We use the forecast of FY U.S. GDP from the Congressional Budget Office (CBO) because the BEA does not publish projections.<sup>5</sup>

After testing various model specifications for FY D.C. GDP, an ARIMA(0,0,2) model was chosen with the log of FY D.C. GDP as the dependent variable and the log of FY U.S. GDP as a regressor as shown in Table 1.

**Table 1: Log of Annual FY D.C. GDP Model Output**

Regression with ARIMA(0,0,2) errors			
Box Cox transformation: lambda= 0			
	MA(1)	MA(2)	Log(FY U.S. GDP)
coefficients:	1.470	1.000	0.966
s.e.	0.243	0.298	0.057
t statistic	6.046	3.359	16.911
sigma <sup>2</sup> = 0.0002339			
log likelihood = 43.90			
AIC=-77.80 AICc=-71.80			

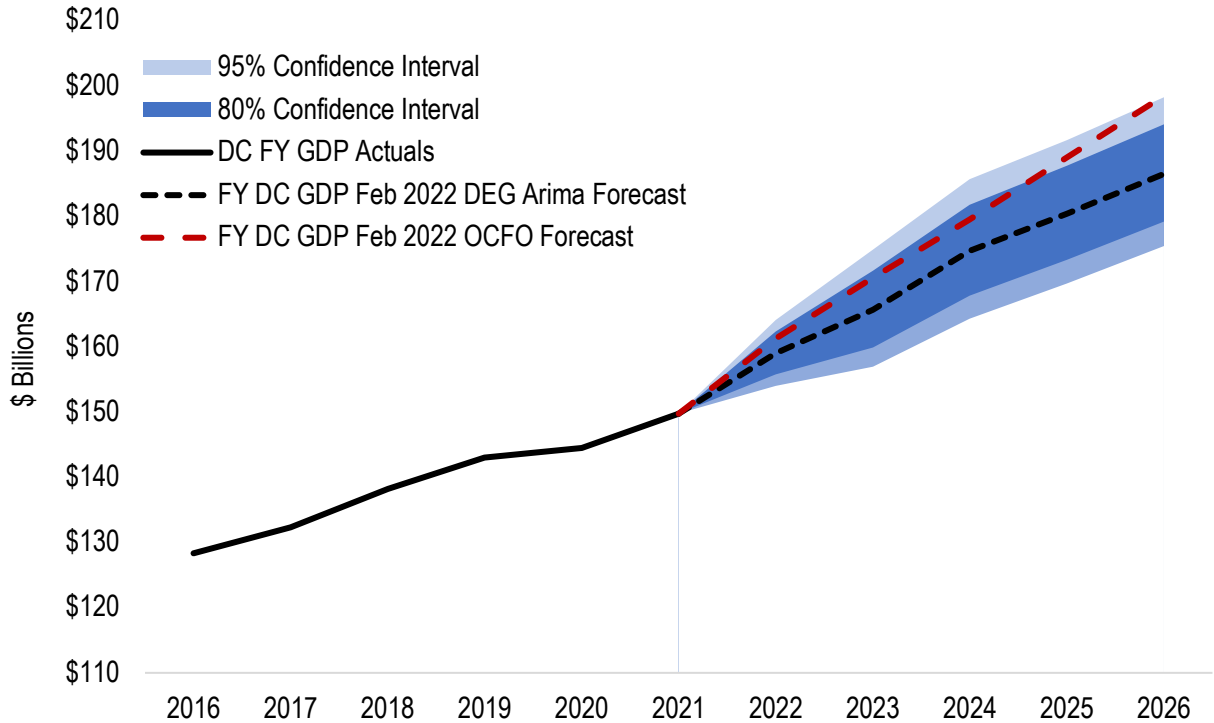
Figure 1 shows the historical and forecasted values of D.C. GDP from this model. The black dashed line shows DEG’s February 2022 forecast of FY D.C. Gross Domestic Product (GDP), and the blue shaded regions show the associated 80% and 95% confidence intervals. (The better the statistical fit of an estimated equation to the data it describes, the narrower the confidence range will be.) The maroon dashed line in the figure depicts the OCFO’s February 2022 forecast of FY D.C. GDP.

DEG’s February 2022 FY D.C. GDP forecast for FY 2022 is \$159.0 billion, which is approximately 1.45% less than the OCFO’s February 2022 estimate of \$161.3 billion. While the DEG and OCFO

<sup>5</sup> The CBO July 2021 economic forecast is used. [www.cbo.gov/data/budget-economic-data#3](http://www.cbo.gov/data/budget-economic-data#3)

D.C. GDP forecasts are similar for FY 2022, they diverge through the rest of the forecast window with the OCFO’s forecast higher in each fiscal year.

Figure 1: FY D.C. GDP Forecast FY 2022-2026



### Forecasting D.C. Revenues

We source historical values of the District’s revenues for FY 2006-2020 from the OCFO as well as actuals for FY 2021, which are published in its February 2022 Quarterly Revenue Estimate. After examining the historical patterns for these revenue sources, we decided to combine the nontax and lottery system revenues into a single category for estimation because the sum of the two presented a more stable historical series from which to forecast. As a result, we estimate six revenue groups separately: income tax, property tax, sales and excise tax, gross receipts, other tax, and nontax and lottery revenues. Table 2 provides a summary of the ARIMA model specifications used to estimate each revenue source along with the additional regressors used in each model.

**Table 2. Summary of Models**

Forecasted Variable	Specification	Additional Variables	AIC
Log FY D.C. GDP	ARIMA(0,0,2)	Log FY U.S. GDP	-77.80
Income Tax	ARIMA(0,1,1)	FY D.C. GDP; Multifamily - Asking Rent per Squarefoot	403.37
Property Tax	ARIMA(1,1,1)	FY D.C. Real Estate/Rental/Leasing GDP; Multifamily - Vacancy Rates; Office - Vacancy Rates	391.82
Sales and Excise Tax	ARIMA(0,1,1)	FY D.C. GDP; Hospitality - Revenue per Available Room	364.00
Gross Receipts	ARIMA(1,1,0)	-----	339.84
Other Taxes	ARIMA(0,1,2)	FY D.C. GDP; Multifamily - Net Deliveries; Office - Net Deliveries	385.45
Nontax and Lottery	ARIMA(0,1,0)	Office Vacancy Rates	375.23

**Income Tax Model**

FY 2021 income tax revenues represented 37.5% of D.C. gross revenue with 75.4% of all income tax revenue sourced from the individual income tax. The income tax ARIMA model includes data from CoStar on D.C. Multi-family asking rents because they are indicative of demand for living space in the District and thus may be positively correlated with income tax revenue. The CoStar database for multi-family housing in D.C. included 3,273 existing buildings and 165,657 units at the end of 2021.<sup>6</sup>

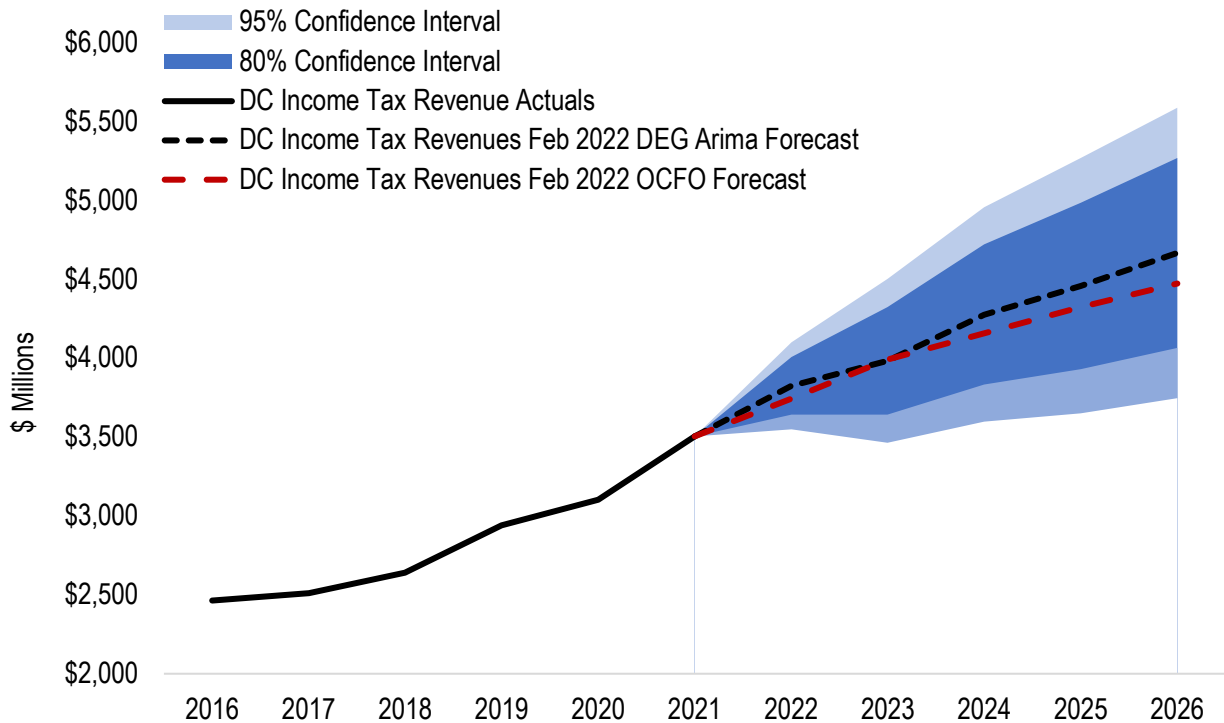
An ARIMA(0,1,1) model with income tax revenues as the dependent variable and two external fiscal year regressors, nominal D.C. GDP and multi-family asking rent per square foot, provided the best fit as shown in Table 3. Figure 2 plots DEG’s February 2022 forecast of D.C. income tax from this model for FY 2022-2026 (black dashed line) as well as the OCFO’s February 2022 forecast for comparison (maroon dashed line). The DEG and OCFO estimates are similar throughout the forecast period, but DEG’s is slightly higher in most of the forecasted fiscal years.

**Table 3. Income Tax Revenues Model Output**

Regression with ARIMA(0,1,1) errors			
	MA(1)	FY D.C. GDP	Multifamily Asking Rent per Sq.Ft.
coefficients:	0.589	38.548	-385,468.6
s.e.	0.186	12.602	902,960.2
t statistic	3.160	3.059	-0.427
sigma <sup>2</sup> = 1.991e+10			
log likelihood = -197.68			
AIC=403.37 AICc=407.37			

<sup>6</sup> Co-Star multi-family housing buildings are “Structure(s) typically containing five or more dwelling units that may also include common areas and facilities, e.g., entrances, lobby, elevators or stairs, mechanical space, walks, grounds, recreational facilities, and parking both covered and open.”

Figure 2. Income Tax Revenue Forecast for FY 2022-2026



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

**Property Tax Model**

FY 2021 property tax revenues represented 32.5% of D.C. gross revenues.

The property tax ARIMA model uses CoStar data on office building and multi-family vacancy rates as additional regressors. Both of these measures relate to the demand for D.C. property and are expected to be positively correlated with property tax revenue. It is worth noting that although it may seem counter-intuitive, higher vacancy rates actually increase property tax revenue because vacant properties are assessed higher property tax rates than occupied residential or occupied commercial space. Vacant property, Class 3, is taxed at \$5.00 per \$100 of assessed value. In comparison, commercial and industrial real property including hotels and motels, Class 2, is taxed at varying rates based on assessed value: \$1.65 if assessed at less than \$5 million; \$1.77 if assessed at between \$5 million and \$10 million; and \$1.89 if assessed at a value greater than \$10 million. Residential real property, including multifamily, is taxed at the lowest rate, \$0.85 per \$100 of assessed value.<sup>7</sup> CoStar records a total inventory of 166 million square feet of office space in Washington, D.C in 2021.<sup>8</sup>

<sup>7</sup> The greatest rates, however, are on blighted properties which are assessed \$10 for every \$100 of assessed value. Detail from the DC OCFO’s Office of Tax and Revenue: <https://otr.cfo.dc.gov/page/real-property-tax-rates>.

<sup>8</sup> CoStar defines office properties as: “The primary intended use of an office building is to house employees of companies that produce a product or service primarily for support services such as administration, accounting,

The property tax model uses an ARIMA(1,1,1) specification model with property tax revenues as the dependent variable and three additional regressors: nominal FY D.C real estate, rental, and leasing GDP (a subset of total nominal FY D.C. GDP), multifamily property vacancy rates, and office space vacancy rates as shown in Table 4. Notably, this is the only model that utilizes a related subset of GDP as a regressor to achieve a better fit; due to the pandemic’s effects on property values, specifically commercial office space, the real estate specific piece of GDP is more reflective of the trend for the District’s property tax revenues through the forecast period. Using the BEA’s historical estimates of the real estate industry component of both U.S. and D.C. GDP as well as the CBO’s forecasts of U.S. residential fixed investment, DEG forecasts the real estate specific component of D.C. GDP. Figure 3 shows the historical amounts of property tax revenues, as well as the DEG and OCFO February 2022 forecasts for FY 2022-2026. Notably, the DEG forecast for property tax revenues shows a decreasing trend through the forecast window.

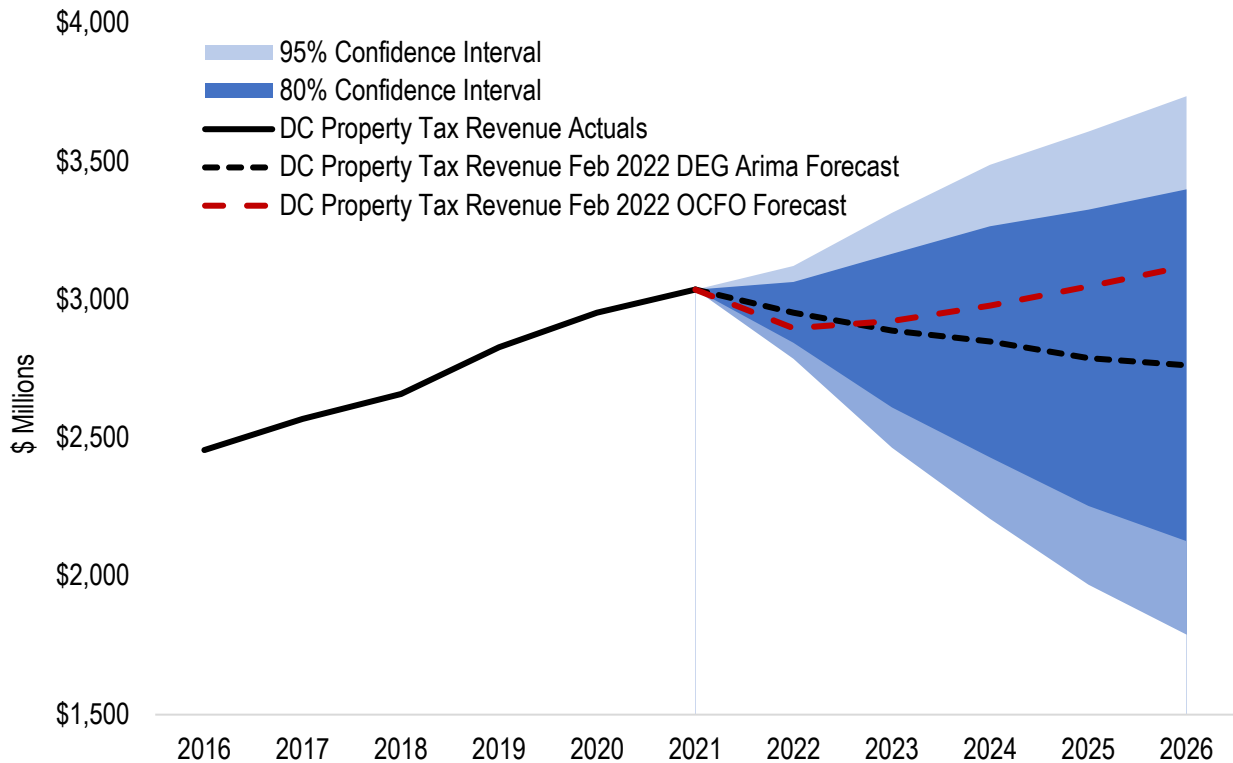
**Table 4. Property Tax Revenues Model Output**

	Regression with ARIMA(1,1,1) errors				
	AR(1)	MA(1)	FY D.C. Real Estate GDP	Multi-Family Vacancy Rate	Office Vacancy Rate
coefficients:	0.391	0.999	24.211	3,149,629.0	7,051,456.0
s.e.	0.273	0.198	29.958	2,176,425.0	3,009,008.0
t statistic	1.434	5.045	0.808	1.447	2.343
sigma^2 = 6.876e+09					
log likelihood = -189.91					
AIC=391.82 AICc=402.32					

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marketing, information processing and dissemination, consulting, human resources management, financial and insurance services, educational and medical services, and other professional services. Office buildings are characterized by work efficient floor plans, work areas, comfortable heating and cooling, cabling for phones and computers, and other conveniences that allow people conduct business. The interior finish and the structural design of the building supports the activities of the employees. Office buildings are typically configured for high density use, with a ratio of people to square footage in the 150 to 300 or more range and less than 25% of the demised floor space allocated to industrial or retail use. Some physical characteristics of a building may assist in classifying the property as "office" if the property's use is not apparent.”

Figure 3. Property Tax Revenue Forecast for FY 2022-2026



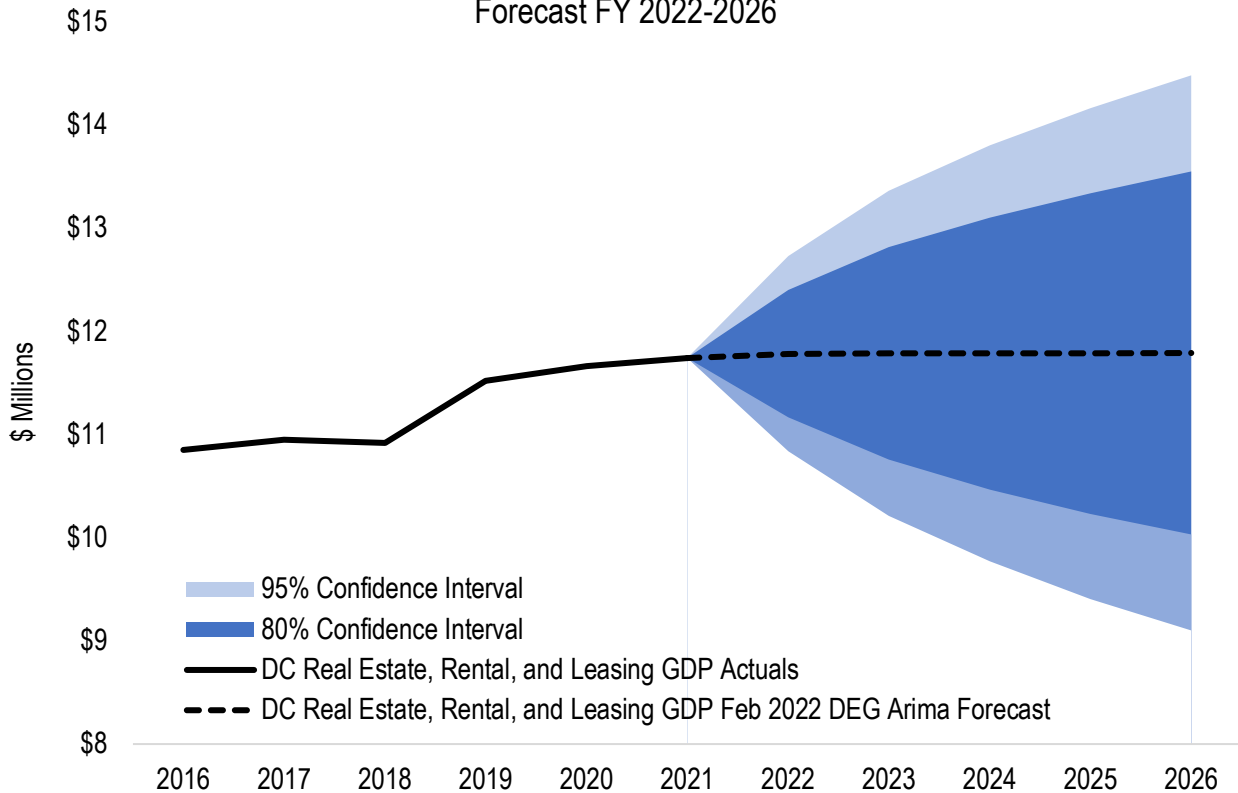
Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

To forecast the District’s property tax revenues, we first forecast the real estate, rental, and lending industry’s contribution to FY D.C. GDP and use this component of GDP as an external regressor in our specification along with multifamily property and office space vacancy rates. First we estimate an auxiliary ARIMA(0,1,1) model with the historical D.C. real estate industry-specific data from the BEA as the dependent variable and the CBO’s historical data on U.S. residential fixed investment as an additional regressor. Second, we use this auxiliary ARIMA(0,1,1) model to forecast the real estate, rental, and leasing industry’s FY D.C. GDP by regressing on the CBO’s projections of residential fixed investment.<sup>9</sup>

Our forecast of the real estate, rental, and leasing industry’s FY D.C. GDP is depicted in Figure 4 below. Notably, while our forecast of total FY D.C. GDP has an upward trend throughout the forecast period, our forecast of the real estate, rental, and leasing industry’s contribution to D.C. GDP is nearly flat through FY 2026. Models using this subset of D.C. GDP performed better at predicting changes in property tax revenues than models using total D.C. GDP.

<sup>9</sup> See [www.cbo.gov/data/budget-economic-data-#11](http://www.cbo.gov/data/budget-economic-data-#11)

Figure 4: Real Estate, Rental, and Leasing Contribution to Total FY D.C. GDP  
Forecast FY 2022-2026



**Sales and excise tax model**

Sales and excise tax revenues represented 14.0% of D.C. gross revenue for FY 2021, with 91.8% of those revenues attributable to general sales taxes.

The sales and excise tax ARIMA model as shown in Table 5, includes hospitality data from CoStar as a proxy for the demand for tourism in D.C. which may be positively correlated with sales and excise tax revenues. DEG tested a variety of hospitality measures, and the best fit was with the average revenue per available room.<sup>10</sup> CoStar records a total inventory of 32,777 rooms at the end of 2021 in Washington, D.C.

An ARIMA(0,1,1) specification of sales and excise tax revenues as the dependent variable with nominal D.C. GDP as well as average revenue per available hospitality room as additional regressors best fit the data. As Figure 5 shows, the DEG February 2022 forecast of sales and excise tax revenue (black dashed line) is notably above the OCFO’s February 2022 forecast (maroon

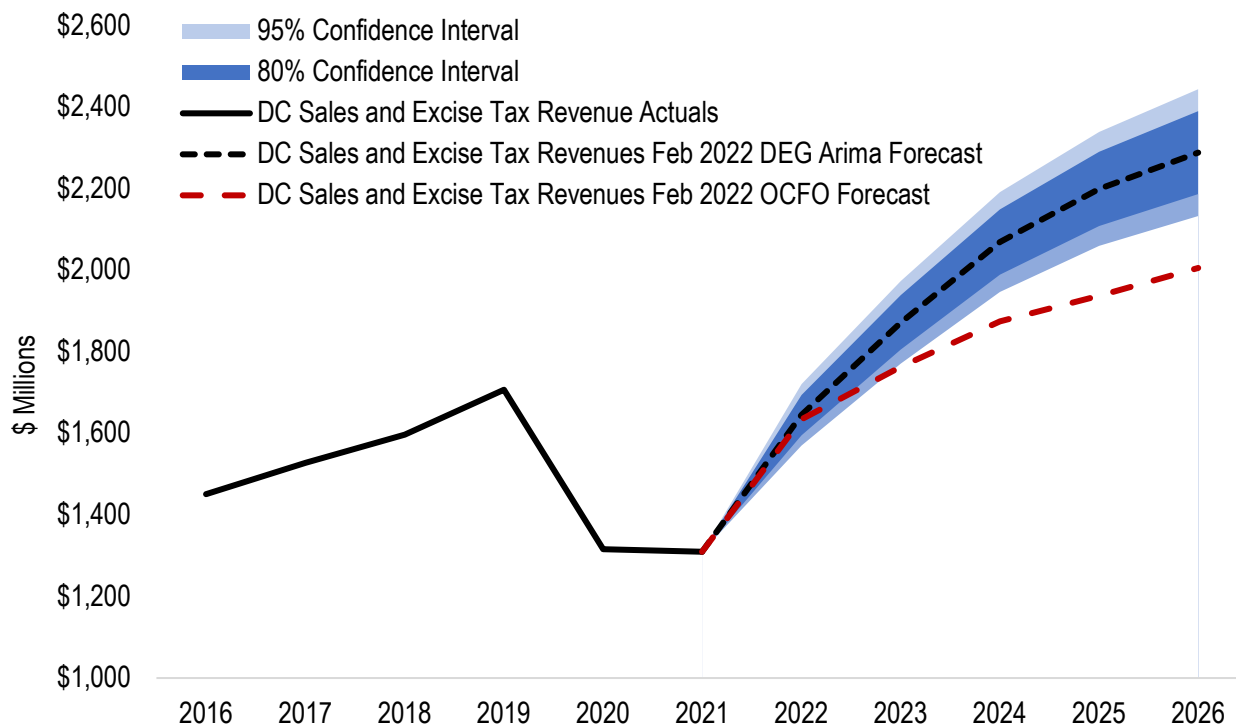
<sup>10</sup> CoStar defines hospitality properties as “all types of lodging facilities including hotels and motels. Hotels are facilities that offer lodging accommodations and a wide range of other services, e.g., restaurants, casinos, convention facilities, meeting rooms, recreational facilities, and commercial shops. These facilities can be labeled Resort, Mixed Use, Luxury, Full Service, Extended Stay, Convention, Apartment, All Suite, etc.”

dashed line) for FY 2024–2026. To a large extent this is driven by CoStar’s forecast of average revenue per room, which is increasing during the forecast period.

**Table 5. Sales and Excise Tax Revenues Model Output**

	Regression with ARIMA(0,1,1) errors		
	MA(1)	FY D.C. GDP	Average Revenue per Available Room
coefficients:	-0.099	10.349	7,294.312
s.e.	0.420	1.862	881.142
t statistic	-0.236	5.557	8.278
sigma^2 = 1.484e+09			
log likelihood = -178.00			
AIC=364.00 AICc=368.00			

**Figure 5. Sales and Excise Tax Revenue Forecast for FY 2022-2026**



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

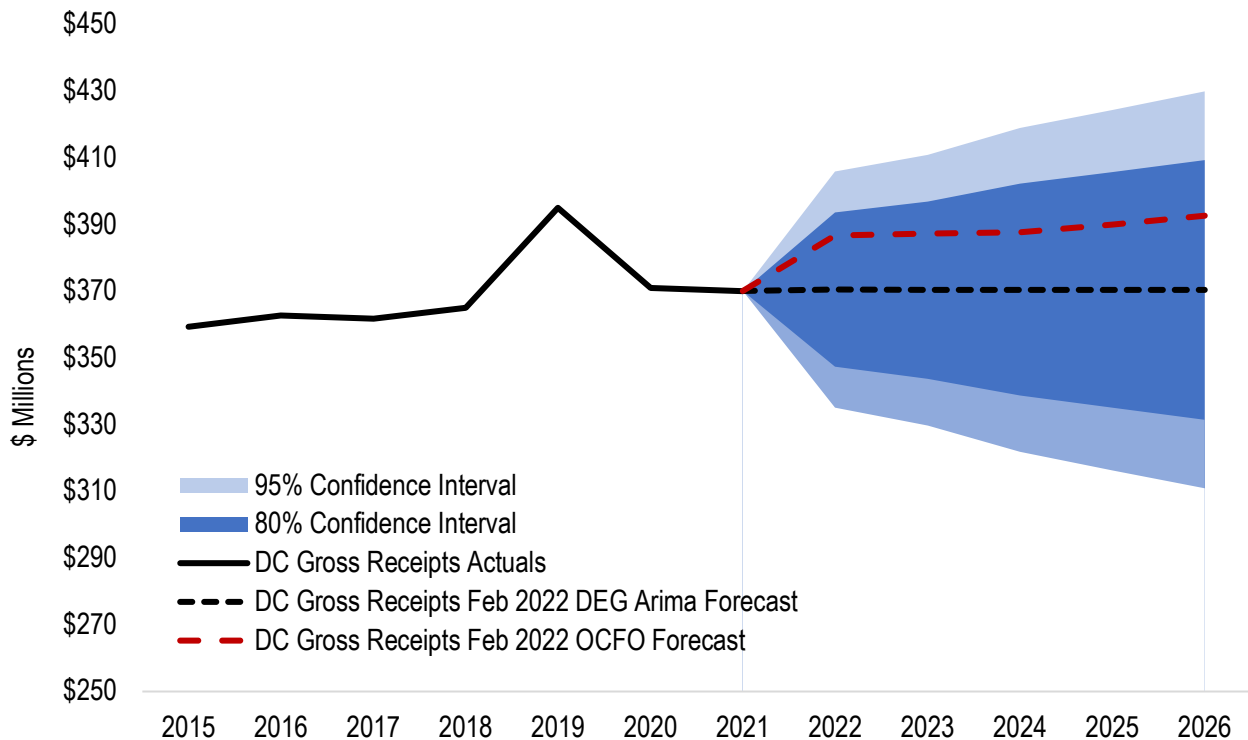
**Gross Receipts Model**

Gross receipts revenues represented 4.0% of gross revenue for FY 2021 with major categories including Public Utilities and Insurance premiums. With the nearly flat time path for these revenues, we did not identify additional variables that improved model fit. Even D.C. GDP did not improve prediction.

An ARIMA(1,1,0) model with gross receipts revenues as the dependent variable and no external regressors was selected as shown in Table 6. Figure 6 shows DEG’s February 2022 forecast of gross receipts revenues resulting from this model (black dashed line) in comparison to the OCFO’s February 2022 forecast (maroon dashed line). The OCFO’s forecast is slightly higher than DEG’s throughout the forecast window.

<b>Table 6. Gross Receipts Model Output</b>	
<b>Regression with ARIMA(1,1,0) errors</b>	
	AR(1)
coefficients:	-0.442
s.e.	0.235
t statistic	-1.880
sigma <sup>2</sup> =	327203555
log likelihood =	-167.92
AIC=	339.84
AICc=	340.84

Figure 6. Gross Receipts Forecast for FY 2022-2026



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO data.

**Other Tax Model**

Other tax revenues represented 6.3% of gross revenue for FY 2021, and 90.9% of these revenues were attributable to deed recordation and deed transfer fees.

The other tax ARIMA model uses net deliveries for multi-family and office properties data from CoStar as additional regressors.<sup>11</sup> These variables capture dynamics of the construction market, and are expected to be positively correlated with deed recordation and transfer fees.

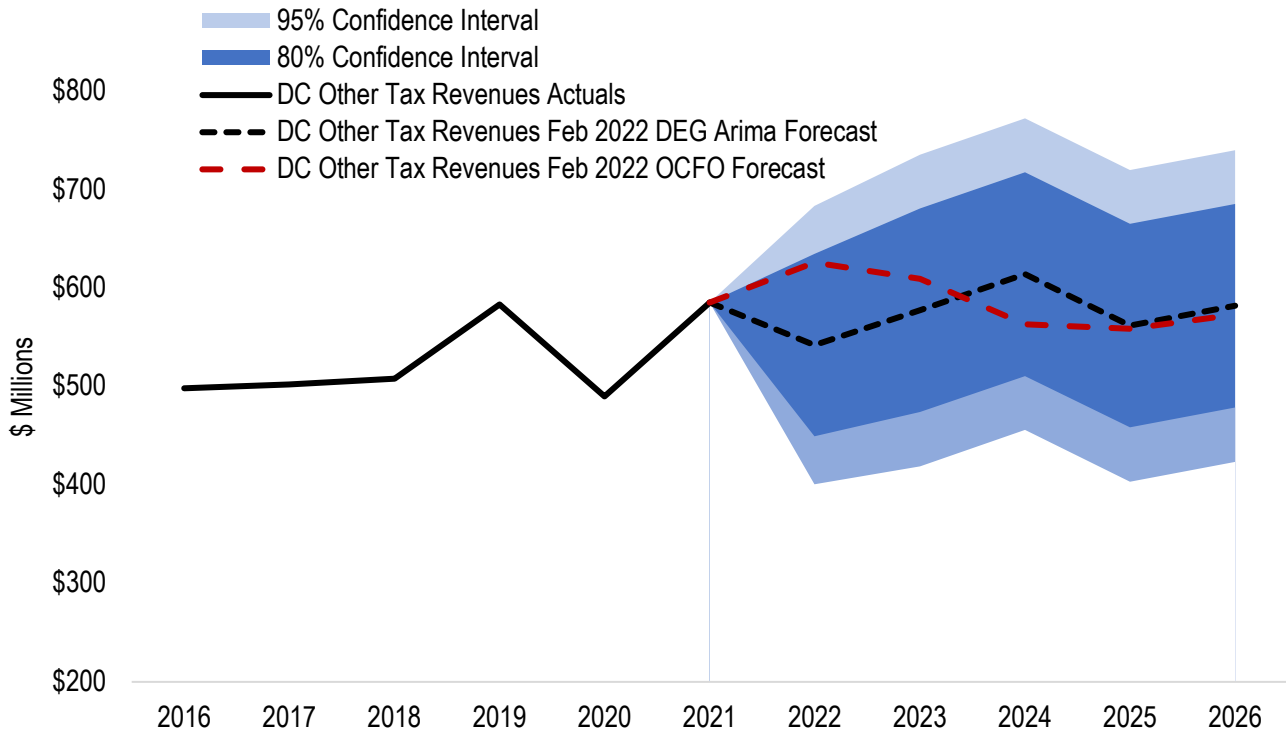
An ARIMA(0,1,2) specification with other tax revenues as the dependent variable and a set of three regressors was selected. The three fiscal year regressors are nominal D.C. GDP, net deliveries of multifamily property, and net deliveries of commercial office space as shown in Table 7. Although the DEG and OCFO February 2022 forecasts of other tax revenues, as shown in Figure 7, show opposing trends through FY 2024, they converge in FY 2026.

**Table 7. Other Tax Revenues Model Output**

Regression with ARIMA(0,1,2) errors					
	MA(1)	MA(2)	FY D.C. GDP	Multi-Family Net Deliveries	Office Net Deliveries
coefficients:	-0.547	-0.452	1.547	71.622	-0.041
s.e.	0.274	0.207	1.886	64.344	0.061
t statistic	-1.999	-2.183	0.820	1.113	-0.665
sigma^2 = 4.899e+09					
log likelihood = -186.73					
AIC=385.45 AICc=395.95					

<sup>11</sup> “CoStar tracks construction start and end dates for every property in the dataset, and can use the construction dates to create full supply histories” and they derive net deliveries as the difference between construction completed and demolition. See Property Tax and Income Tax for definitions and volume of these property types.

Figure 7. Other Tax Revenue Forecast for FY 2022-2026



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

### ***Nontax and Lottery Model***

Nontax and lottery revenues were 5.7% of gross revenue for FY 2021, with 49.2% of this revenue was attributable to licenses & permits and fines & forfeitures revenues.

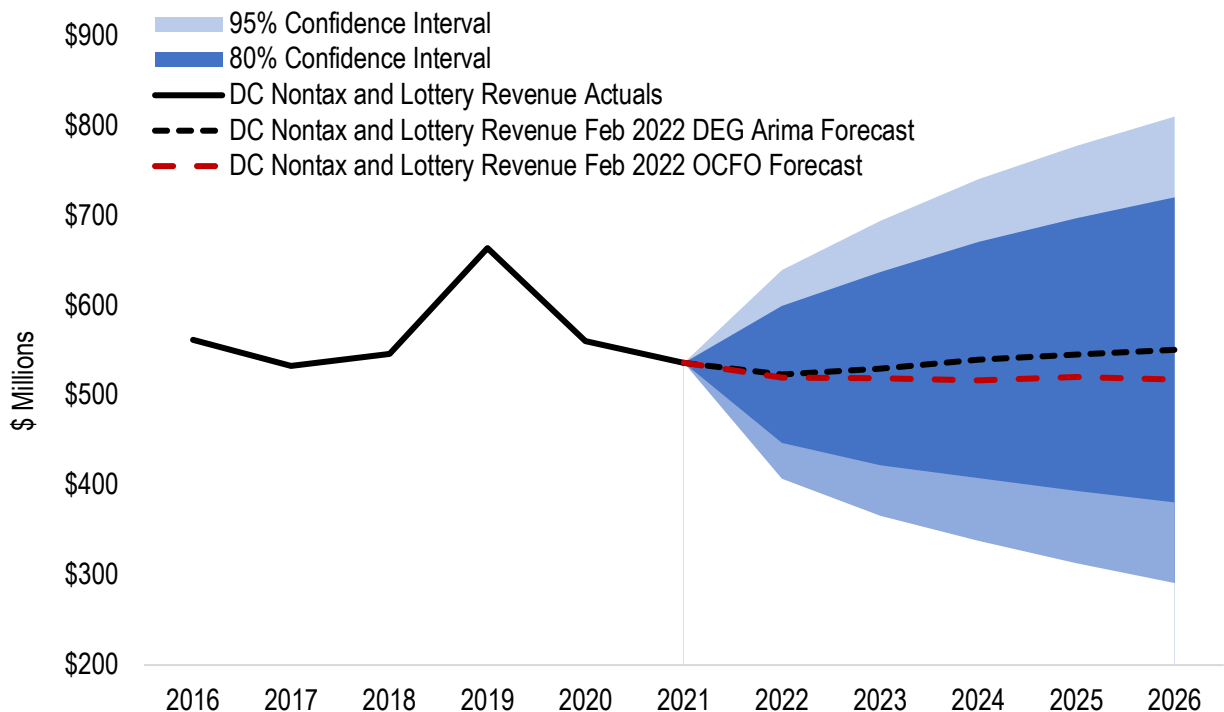
DEG tested a variety of commercial real estate measures in its model of nontax and lottery revenues. Office vacancy rates, which should be negatively correlated with licenses and permits because lower levels of office occupancy imply greater traffic for these revenues, was chosen as an additional regressor. A random walk ARIMA(0,1,0) model with the annual fiscal year sum of nontax and lottery revenues as the dependent variable and office vacancy rates as an external regressor was selected as shown in Table 8. However, we recognize that revenues from licenses and permits and fines and forfeitures can be erratic from one year to another, particularly when considering the effect of the COVID-19 pandemic on the one-half of nontax revenues that arise from these city government enforcement activities. We anticipate further modeling of these revenues going forward.

Figure 8 plots DEG’s February 2022 forecast of nontax and lottery revenues (black dashed line) as well as the OCFO’s February 2022 forecast (maroon dashed line) for comparison. The two forecasts are very similar in FY 2022 and then diverge, with DEG’s following a slightly upward trend and the OCFO’s remaining relatively flat.

**Table 8. Nontax and Lottery Revenues Model Output**

Regression with ARIMA(0,1,0) errors	
	Office Vacancy Rate
coefficients:	-1,447,941
s.e.	1,779,314
t statistic	-0.814
sigma^2 =	3.512e+09
log likelihood =	-185.61
AIC=	375.23
AICc=	376.23

**Figure 8. Nontax and Lottery Revenue Forecast for FY 2022-2026**



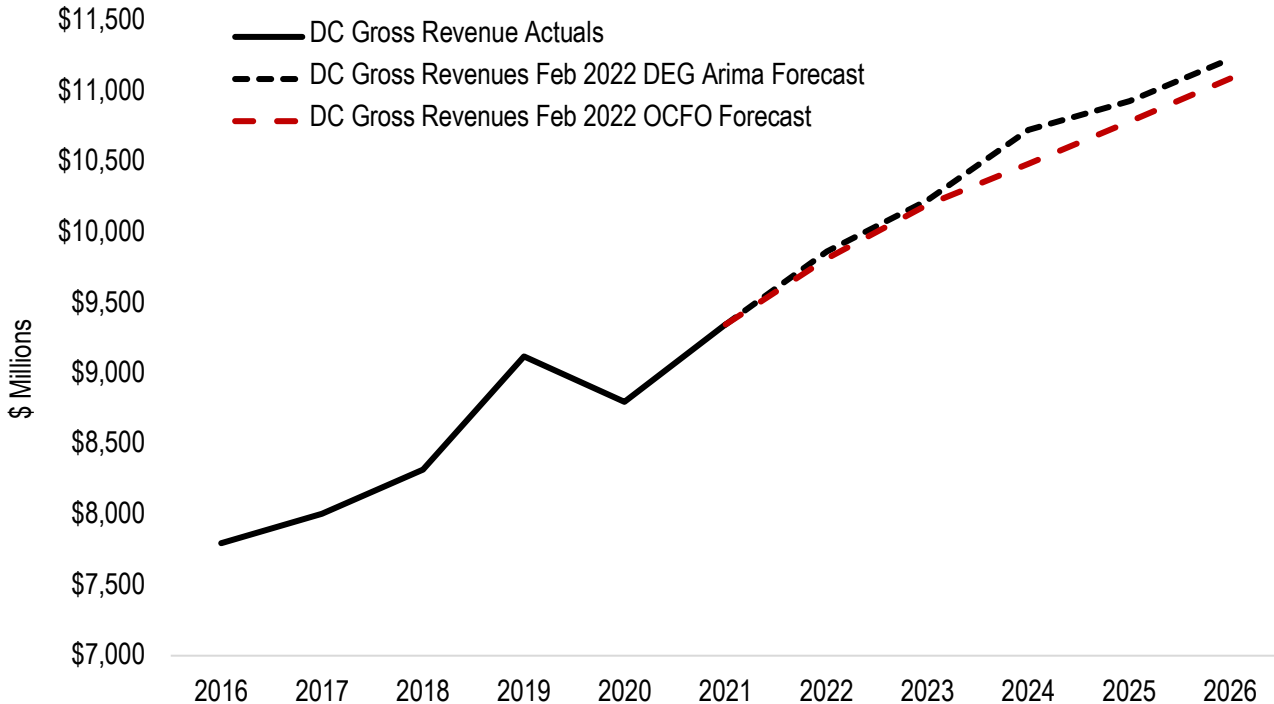
Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

## Gross Revenues

Gross revenues are the sum of each revenue stream – income tax, property tax, sales and excise tax, other tax, gross receipts, and nontax and lottery – before dedicated tax revenues are netted out. With dedicated taxes, the D.C. government earmarks revenue from one or more of these sources, although not income taxes, to support particular programs or activities, such as building a new convention center or expanding affordable housing. Dedicated revenues are not available for general budgeting purposes. Gross revenues less dedicated revenues comprise the District’s local fund revenue.

By summing over our forecasts of the revenue components, we can compare our forecast of gross revenue with that of the OCFO. The two forecasts are depicted in Figure 9 below; the DEG February 2022 forecast is the black dashed line and the OCFO February 2022 forecast is the maroon dashed line. The DEG and OCFO forecasts are comparable and feature similar growth paths through the forecast window, however, the DEG forecast is slightly higher in FY 2024-2026. In numerical terms, for FY 2026, DEG’s forecast of \$11.23 billion is 1.25% higher than the OCFO’s forecast of \$11.09 billion.

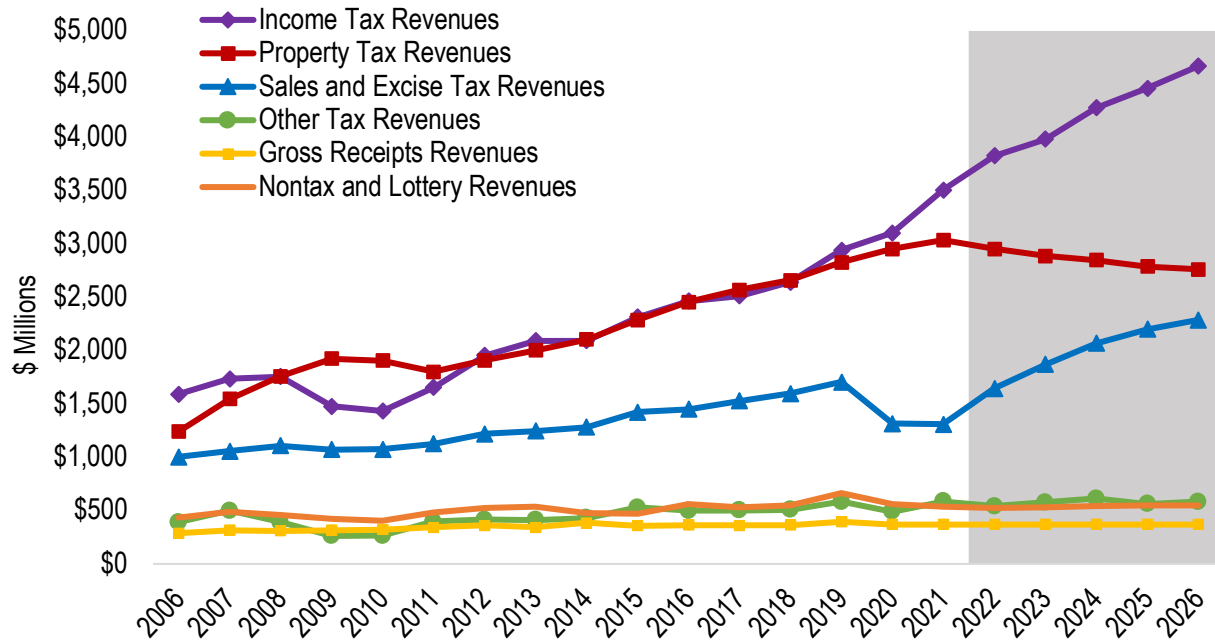
**Figure 9. DEG and OCFO Gross Revenue Forecasts for FY 2022-2026**



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

Figure 10 plots the historical values of the District’s revenue collections through FY 2021 as well as DEG’s gross forecasts through FY 2026. The figure highlights the impact of the COVID-19 pandemic on some of District’s revenues streams from FY 2019 to 2021. Income tax revenues were not impacted by the pandemic, consistently increasing from fiscal year to fiscal year through the pandemic and into our forecast. On the other hand, understandably, sales and excise tax revenues substantially dropped between FY 2019 and FY 2020, and dropped slightly further in FY 2021. Our forecasts do not have these revenues recovering to and surpassing pre-pandemic levels until FY 2023. The greatest impact might turn out to be on property tax revenues, the District’s second largest source of revenue, which we forecast to decline slightly through FY 2026.

**Figure 10. D.C. Revenue Streams, Including Dedicated Revenues, with DEG forecasts for FY 2022-FY 2026**



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar platform data.

While Figure 10 plots the DEG’s forecasts of the District’s revenue streams as gross amounts before the revenues dedicated by the District to support particular programs and activities are removed, Table 9 provides these gross forecasts numerically. For comparison, DEG’s October 2021 forecasts, which were created using DEG’s previous methodology, and the OCFO’s February 2022 forecasts are provided as well. Note that DEG’s two forecasts do not have the same forecast windows, with its October 2021 forecast through FY 2025 and its February 2022 forecast one year later through FY 2026.

In contrast with its October 2021 forecasts, DEG’s February 2022 estimates show consistently greater income tax and sales and excise tax revenues for FY 2022-2025 that both have in common. On the other hand, DEG’s February 2022 estimates show consistently lower property tax, other tax, gross receipts, and nontax and lottery revenues.

**Table 9. DEG February 2022 Revised Gross Fiscal Year Revenue Stream Forecasts, Compared with DEG October 2021 and OCFO February 2022 Forecasts.**

Fiscal Year	Income tax revenue			Property tax revenue			Sales and excise tax revenue		
	DEG Feb 2022	DEG Oct 2021	OCFO Feb 2022	DEG Feb 2022	DEG Oct 2021	OCFO Feb 2022	DEG Feb 2022	DEG Oct 2021	OCFO Feb 2022
2022	\$3,827,004	\$3,393,563	\$3,745,849	\$2,954,686	\$2,989,024	\$2,897,816	\$1,645,115	\$1,465,384	\$1,634,052
2023	\$3,985,118	\$3,522,210	\$3,991,611	\$2,889,600	\$3,115,564	\$2,923,513	\$1,872,428	\$1,531,711	\$1,763,616
2024	\$4,278,835	\$3,638,080	\$4,159,395	\$2,849,094	\$3,228,036	\$2,979,858	\$2,069,608	\$1,591,451	\$1,875,196
2025	\$4,460,918	\$3,757,307	\$4,326,219	\$2,789,846	\$3,343,657	\$3,048,620	\$2,199,894	\$1,652,921	\$1,938,476
2026	\$4,670,074	--	\$4,475,872	\$2,763,597	--	\$3,122,087	\$2,288,858	--	\$2,005,921
Fiscal Year	Other tax revenue			Gross receipts revenue			Nontax and lottery revenue		
	DEG Feb 2022	DEG Oct 2021	OCFO Feb 2022	DEG Feb 2022	DEG Oct 2021	OCFO Feb 2022	DEG Feb 2022	DEG Oct 2021	OCFO Feb 2022
2022	\$542,121	\$586,709	\$625,973	\$370,572	\$387,867	\$386,756	\$523,602	\$620,933	\$520,112
2023	\$577,331	\$622,369	\$609,262	\$370,379	\$400,959	\$387,355	\$530,132	\$637,002	\$519,469
2024	\$614,207	\$647,673	\$562,990	\$370,464	\$400,815	\$387,741	\$539,714	\$651,474	\$517,005
2025	\$561,777	\$675,698	\$558,715	\$370,426	\$409,291	\$390,067	\$545,922	\$666,366	\$520,732
2026	\$581,964	--	\$573,145	\$370,443	--	\$392,702	\$551,037	--	\$517,706

Note: The DEG October 2021 forecasts were created using DEG's previous methodology.

Both Table 9 and Figure 10 focus on gross revenues before netting out the District's dedicated revenues. The OCFO's February 2022 Quarterly Revenue Estimates details these dedicated revenues for FY 2021 and FY 2022. A summary table also showing FY 2020 data from the OCFO's December 2021 Quarterly Revenue Estimates is provided below (Table 10). The table focuses on dedicated property tax, sales and excise, gross receipts, and other tax revenues because no income tax or nontax and lottery revenues were dedicated from gross revenue in these fiscal years

**Table 10. Dedicated Portion of Gross Revenues by Source (\$000s)**

		FY 2020	FY 2021	FY 2022 (OCFO Est.)
Property Tax	Gross Revenues	2,954,093	3,037,653	2,897,816
	Dedicated Taxes	44,377	43,939	39,396
	Percentage Dedicated	1.50%	1.45%	1.36%
Sales and Excise Tax	Gross Revenues	1,316,574	1,309,821	1,634,052
	Dedicated Taxes	403,344	358,876	451,324
	Percentage Dedicated	30.64%	27.40%	27.62%
Gross Receipts	Gross Revenues	371,123	370,135	386,756
	Dedicated Taxes	131,125	138,297	146,823
	Percentage Dedicated	35.33%	37.36%	37.96%
Other Tax	Gross Revenues	489,988	585,255	625,973
	Dedicated Taxes	69,019	81,161	86,297
	Percentage Dedicated	14.09%	13.87%	13.79%
<b>Total Dedicated Taxes</b>		<b>647,865</b>	<b>622,273</b>	<b>723,840</b>

Source: OCFO December 2021 and February 2022 Quarterly Revenue Estimates.

Note: FY 2020 and FY 2021 values are actuals whereas FY 2022 values are estimated by the OCFO.

In FY 2021, twenty programs and organizations were allocated dedicated revenues from the District’s gross revenue - including the Washington Metropolitan Area Transit Authority, the Convention Center, and the Housing Production Trust Fund – amounting to \$622.3 million, which was 3.95% less than the \$647.9 million dedicated in FY 2020. Notably, most dedicated revenues are from sales and excise tax collections; however, as noted in the District’s Annual Comprehensive Financial Report (ACFR), due to the continued impacts of the COVID-19 pandemic, the dedicated sales and use tax revenues were slightly lower in FY 2021 compared with FY 2020.

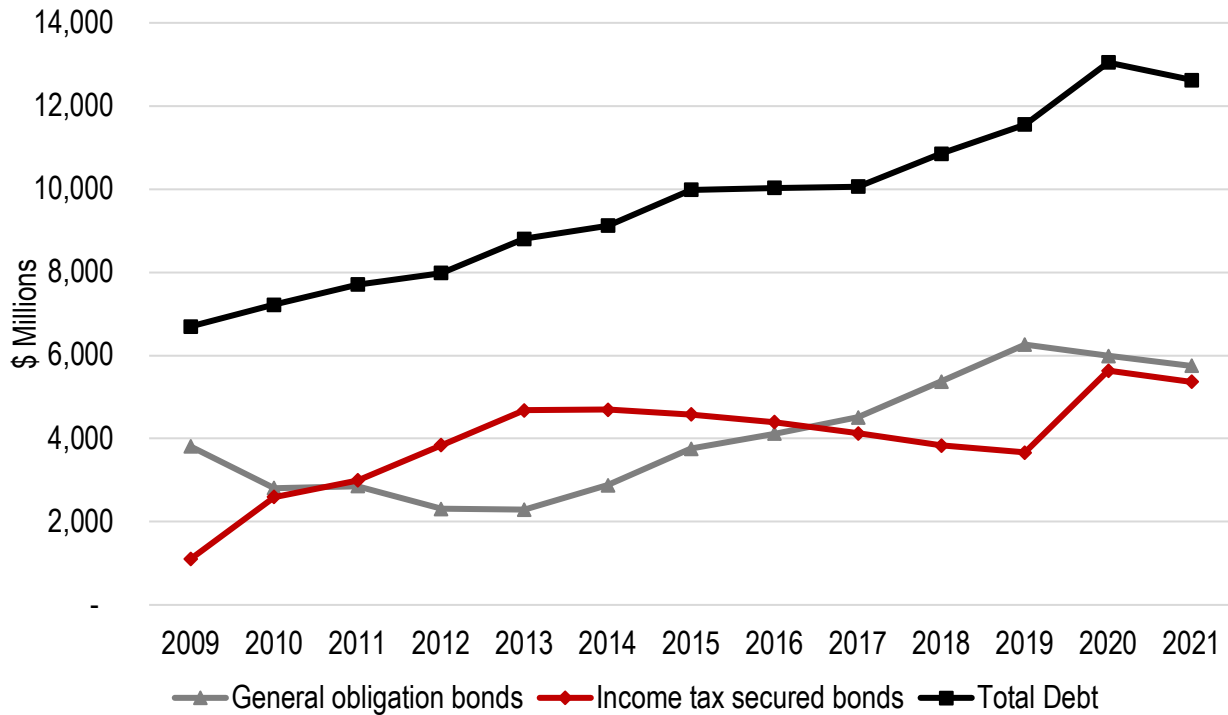
#### ***D.C. Government Bonds and Long-term Liabilities***

Figure 11 shows the District’s total amount of debt outstanding through FY 2021 with General Obligation (GO) and Income Tax Secured (ITS) bond outstanding debt broken out. Notably, total and general obligation outstanding debt have steadily increased over time, although showing a slight decrease between FY 2020 and FY 2021; the trend is more variable for ITS bonds, which had decreasing outstanding debt from FY 2013 to FY 2019 but saw an increase in FY 2020 followed by a slight decrease in FY 2021.

These specific types of bonds are highlighted because they are subject to the 17 percent test statistic calculated in Table 12. Interestingly, ITS bond issuances pledge income tax revenues as coverage, requiring the D.C. government to maintain an amount of income tax revenue sufficient

to cover a multiple – typically 1.5 or 2 times – of the amount of principal and interest payments due (but this amount is not considered dedicated revenue).

**Figure 11. Historical Outstanding Total Debt from Government Activities with General Obligation (GO) and Income Tax Secured (ITS) Bonds Highlighted, as of September 30, 2021**

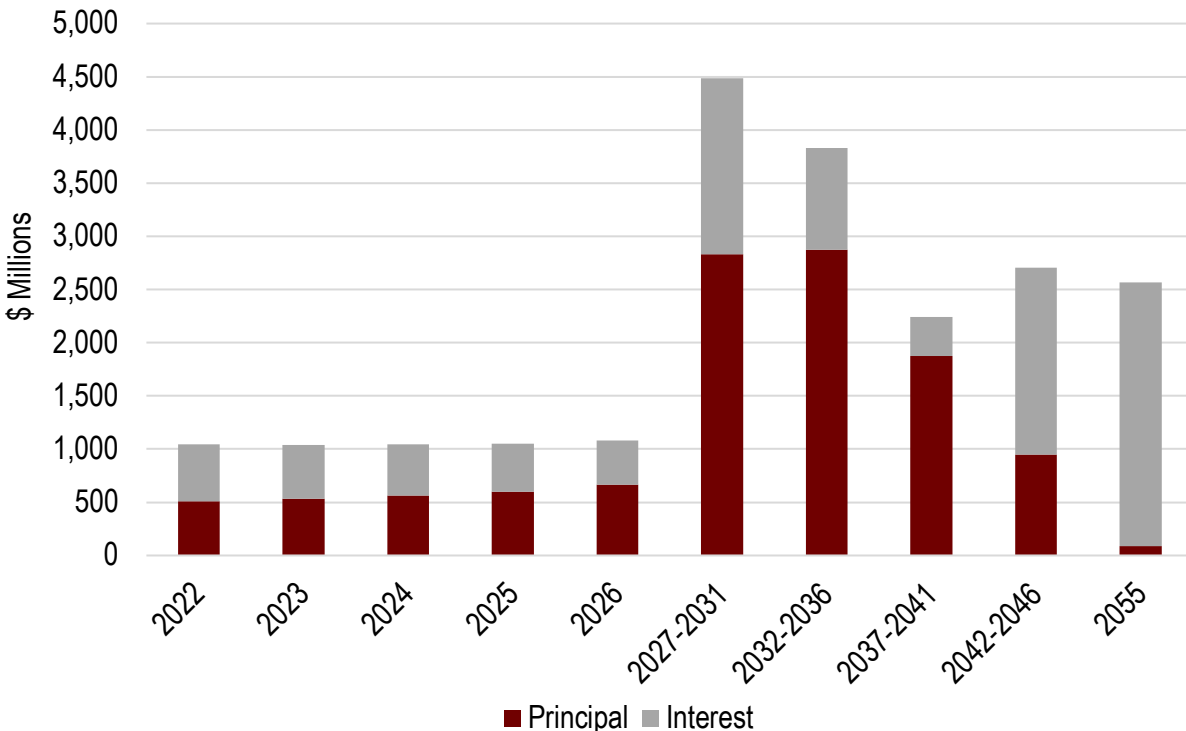


Source: FY 2021 D.C. Annual Comprehensive Financial Report (ACFR), Exhibit S-3C.

Notes: Total debt includes GO and ITS bonds, Tax Increment Financing (TIF) bonds, Qualified Zone Academy bonds, Certificates of Participation, Bond Anticipation Notes, Capital Leases, Ballpark bonds, Housing Production Trust Fund Deed Tax Revenue bonds, PILOT revenue bonds, GARVEE bonds, and Tobacco Settlement bonds.

While Figure 11 plots the District’s historical levels of outstanding debt, Figure 12 shows the future long-term annual debt service principal and interest obligations that need to be funded through the D.C. budget in each year through 2026, and then every five years afterwards. The liability is broken up into principal and interest payments as of September 30, 2021 and does not reflect any new debt issuances that the D.C. government may issue in the future.

**Figure 12. Principal and Interest Payments on the District's Long-Term Liabilities as of September 30, 2021**



Source: FY 2021 D.C. Annual Comprehensive Financial Report (ACFR), Note 7: Long-Term Liabilities.

Notes: Total debt includes GO and ITS bonds, Tax Increment Financing (TIF) bonds, Qualified Zone Academy bonds, Ballpark bonds, Housing Production Trust Fund Deed Tax Revenue bonds, PILOT revenue bonds, GARVEE bonds, Tobacco Settlement bonds, and 225 Virginia Avenue Lease.

### The 17% debt limitation

The D.C. Auditor is required to certify that the aggregate amount of certain outstanding bond obligations of the District of Columbia will not exceed 17% of District revenues. The two types of bond issuances applicable to this limit are General Obligation (GO) and Income Tax Secured (ITS) bonds.

Using our February FY 2022 revenue stream forecasts shown in Table 9 and netting out any dedicated revenues from the gross amounts, an updated version of the applicable revenue is shown in Table 11.<sup>12</sup> DEG's February 2022 estimate of the District's Total Local Source, General Fund Revenue for FY 2022 is \$9.14 billion. Table 12 details the District's potential debt service for FY 2022 on GO and ITS bonds, incorporating principal and interest payment data from the FY 2021 D.C. Annual Comprehensive Financial Report (ACFR). DEG's estimate of the 17 percent test

<sup>12</sup> DEG nets out the District's dedicated revenues for FY 2022 which are detailed in Table 1 of the OCFO's December 2021 Revised Revenue Estimates: under each individual revenue source, any dedicated revenues are titled as "Dedicated to other funds."

statistic – the ratio of the District’s FY 2022 obligations on GO and ITS bonds to DEG’s FY 2022 General Fund Revenue Estimate – is 9.60%.

**Table 11. FY 2022 Total Local Source, General Fund Revenue Estimate (Net of Dedicated Taxes) by DEG dated March 8, 2022 (\$ Thousands)**

Revenue Source	DEG's FY 2022 Total Local Source, General Fund Revenue Estimate (Net of Dedicated Taxes)
Income Taxes	\$3,827,004
Property Taxes	\$2,915,290
Sales and Excise Taxes	\$1,193,791
Gross Receipts Taxes	\$223,749
Other Taxes	\$455,824
Total Taxes	\$8,615,659
Total Non-Tax and Lottery Revenues	\$523,602
<b>Total Local Source, General Fund Revenue Estimate</b>	<b>\$9,139,261</b>

Sources: DEG February FY 2022 revenue stream estimates and OCFO February 2022 estimates of dedicated revenues.

**Table 12: FY 2022 Debt Service Applicable to the 17 Percent Test, Comprised of Principal and Interest Payments on the District’s Current GO and ITS Bond Obligations as of September 30, 2021.**

Principal and Interest From:	FY 2022 Principal and Interest Payments	FY 2022 Payments as Percent of General Fund Revenue Estimate
General Obligation (GO) bonds	\$451,284,000	4.94%
Income Tax Secured (ITS) bonds	\$425,787,000	4.66%
Total	\$877,071,000	9.60%

Sources: FY 2022 debt service on GO and ITS bond obligations from the FY 2021 D.C. ACFR, Note 7: Long-Term Liabilities.

Table 13 provides details of the components of the data necessary for this certification through the FY 2022 – FY 2026 forecast period. The principal and interest obligations of the District’s GO and ITS bonds in each fiscal year are shown in the first panel and summed on the annual debt service line. The second panel calculates local fund revenue for each fiscal year in the forecast period, netting out the OCFO’s estimates of dedicated revenues from DEG’s gross revenue forecasts. The third panel provides calculation of the 17 percent statistic, dividing the annual debt service by the local fund revenue in each fiscal year.

The fourth panel provides information on how much additional GO or ITS bond debt the D.C. government can undertake in the coming fiscal years without violating the 17 percent test. The first line, the “Debt service cost limitation on local fund revenue,” is calculated as 17 percent of the local fund revenue in the second panel: it essentially provides an upper bound of how much principal and interest the District can owe in total in any fiscal year and still be able to satisfy the 17 percent test requirements. By subtracting the annual debt service in the first panel from this upper bound, we calculate the amount of *additional* debt service that could be owed in each

fiscal year and provide it in the last line of the table. For example, the District currently has \$877 million in annual debt service obligations for FY 2022 on its outstanding GO and ITS and it could undertake an additional \$677 million in principal and interest obligations for FY 2022 without violating the 17 percent test.

While it is the normal course of business for the D.C. government to issue bonds each year, budget analysis documents typically do not include projections of future bond issues. And so, the future principal and interest payments in this table reflect the District’s current obligations as of September 30, 2021.

**Table 13. Principal and Interest Payments on GO and ITS Bonds Due with FY Debt Service Limitation for FY 2022 – 2026 as of September 30, 2021. (\$ Millions)**

	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Principal	402	467	481	513	526
Interest	475	454	431	407	382
Annual debt service	877	920	912	920	920
DEG gross revenues forecast	9,863	10,225	10,722	10,929	11,226
OCFO estimated dedicated revenues	724	749	788	809	823
Local fund revenue	9,139	9,476	9,934	10,120	10,403
FY annual debt service as share of local fund revenue (17% test statistic)	9.60%	9.71%	9.18%	9.09%	8.84%
Debt service cost limitation on local fund revenue (17% of Local Fund Revenue)	1,554	1,611	1,689	1,720	1,769
Additional debt service that could be issued within the 17% limit on local fund revenue	677	690	777	800	848

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## About ODCA

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The mission of the Office of the District of Columbia Auditor (ODCA) is to support the Council of the District of Columbia by making sound recommendations that improve the effectiveness, efficiency, and accountability of the District government.

To fulfill our mission, we conduct performance audits, non-audit reviews, and revenue certifications. The residents of the District of Columbia are one of our primary customers and we strive to keep the residents of the District of Columbia informed on how their government is operating and how their tax money is being spent.

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