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

January 4, 2023

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

January 4, 2023

Washington, D.C.

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Introduction

District Economics Group (DEG) has been engaged by the Office of the D.C. Auditor (ODCA) to design and build a forecasting/projection model of the D.C. economy and budget since 2019. 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.¹ 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).² As a part of this effort, DEG significantly modified its methodological approach used to estimate the District's revenues in March 2022 and has made further modifications in November 2022.³ These revisions allow DEG to develop more accurate and robust revenue forecasts.

Methodology

Prior to the March 2022 revision, 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 due to the COVID-19 pandemic, DEG's model became challenged to account for the change in revenues, and more importantly, the disparate impact of the pandemic on the different revenue sources. To address these challenges, DEG's March 2022 revision expanded the 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. These modifications improved the flexibility of DEG's model forecasts to account for sudden changes in District revenue streams and differential growth rates in revenue with respect to D.C. GDP. The November 2022 update builds upon the March 2022 model by introducing more explanatory variables to capture changes in the D.C. economy and by revising the model specifications for both D.C. GDP and three of the District's revenue streams to better forecast their anticipated growth.

This update includes many of the same market-level characteristics as the March 2022 revision, such as commercial office and retail space and multi-family housing market data reported on the

¹ 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/)

² 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, November 30, 2021, and May 18, 2022.

³ See "Modeling the D.C. Economy, Revenues, and Debt Service Obligations," March 23, 2022. <https://dcauditor.org/report/7042/>

CoStar data platform.⁴ However, DEG now includes national aggregate forecasts of capital gains tax receipts (for the income tax model) and unemployment (for the sales tax model) to capture underlying macroeconomic trends that may not be reflected in localized commercial real estate activity. While the March 2022 model and the November 2022 update have differing D.C. GDP and revenue forecasts, they each describe a stable relationship of approximately \$60 million of District gross revenues per \$1 billion of District GDP.

Analysis

ARIMA models relate a current period value of a variable such as D.C. GDP or D.C. revenues to prior period values of the same variable modified in three ways. Thus, ARIMA models are described as ARIMA(p,d,q). 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 estimate should be included.

ARIMA models of FY D.C. GDP and six of the District's revenue streams are shown with model output including the coefficients and standard errors of the auto-regressive, moving-average, or external regressor components, as well as three measures of the goodness of fit, the AIC measure (lower values denote better fit and the AICc adjusts this measure for small sample sizes, which is relevant for this analysis) and the log likelihood. 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. For this model revision, the most recent forecasts from the OCFO are from its September 2022 Revenue Estimates.⁵

Forecasting FY D.C. GDP

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 1st and runs through September 30th 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.

⁴ 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.

⁵ The OCFO's September 2022 Revenue Estimates can be found at: https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/September%202022%20Rev%20Est%20Ltr_0.pdf. See Table 1 for the OCFO's forecasts for each revenue stream through FY 2026.

After testing various model specifications for FY D.C. GDP, an ARIMA(0,0,3) model was chosen with the log of FY D.C. GDP as the dependent variable and the log of FY U.S. GDP as an external regressor as shown in Table 1. To forecast future FY D.C. GDP, the ARIMA model requires that a regressor also have available projections of future values and so, DEG utilizes the forecast of FY U.S. GDP from the Congressional Budget Office (CBO) because the BEA does not publish projections.⁶

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

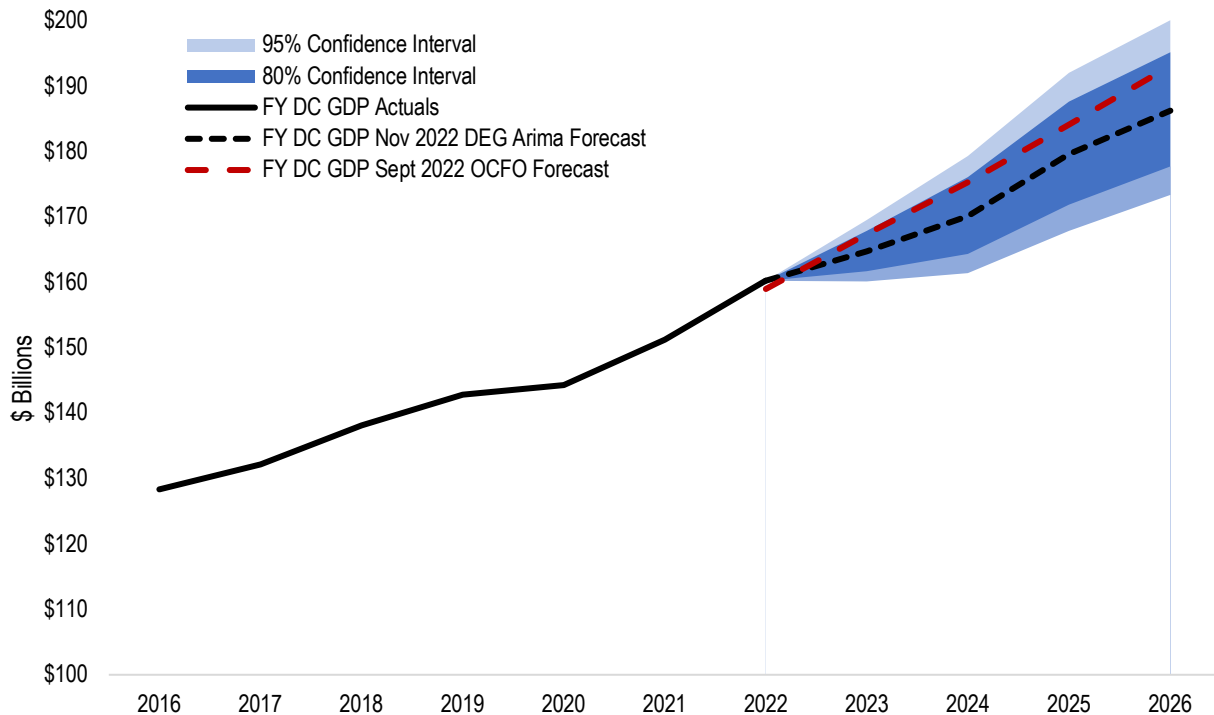
Regression with ARIMA(0,0,3) errors Box Cox transformation: lambda= 0				
	MA(1)	MA(2)	MA(3)	Log(FY U.S. GDP)
coefficients:	1.6095	1.6095	0.9999	0.8953
s.e.	0.7879	0.6145	0.8172	0.0543
t statistic	2.0428	2.6192	1.2236	16.4880
sigma^2 = 0.0001862				
log likelihood = 48.33				
AIC=-84.65 AICc=-76.25				

Figure 1 shows the historical and forecasted values of D.C. GDP from this model. The black dashed line shows DEG's November 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 September 2022 forecast of FY D.C. GDP.

DEG's November 2022 FY D.C. GDP forecast for FY 2022 is \$160.3 billion, which is approximately 0.8% greater than the OCFO's September 2022 estimate of \$159.0 billion. While the DEG and OCFO D.C. GDP forecasts are similar for FY 2023, with DEG's estimate at \$164.8 billion or 1.6% lower than the OCFO's estimate of \$167.4 billion, they diverge through the rest of the forecast period with the OCFO's forecast higher in each fiscal year.

⁶ The CBO May 2022 economic forecast is used. www.cbo.gov/data/budget-economic-data#3

Figure 1. FY D.C. GDP Forecast FY 2023-2026



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

Forecasting D.C. Revenues

DEG uses historical values of the District's revenues for FY 2006-2021 as well as estimated values for FY 2022 from the OCFO September 2022 Quarterly Revenue Estimate. While the OCFO considers FY 2022 data to be estimated rather than actual, DEG treats it as historical data for this model update and the revenue forecasts for each revenue stream in the DEG model begin with FY 2023.

We add the nontax and lottery system revenues into a single category for estimation because historical trends indicate that these two revenue streams are more stable when combined. As a result, we estimate six separate revenue groups: 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 external regressors used in each model.

Table 2. Summary of Models

Summary of Models			
Forecasted Variable	Model Specification	External Regressors	AIC
Log FY DC GDP	ARIMA(0,0,3)	Log FY US GDP	-84.65
Income Tax	ARIMA(2,0,0)	FY DC GDP; Lagged DC Office Vacancy Rate; FY US Capital Gains Receipts	449.03
Property Tax	ARIMA(1,1,1)	FY DC Real Estate/Rental/Leasing GDP; Lagged DC Office Vacancy Rates	415.44
Sales and Excise Tax	ARIMA(0,1,1)	FY DC GDP; DC Retail Vacancy Rates; CBO National Unemployment Rate	419.61
Gross Receipts Other	ARIMA(1,1,0)	-----	361.78
Taxes Nontax and	ARIMA(0,1,1)	FY DC GDP; DC Multifamily Net Deliveries; DC Office Net Deliveries	386.86
Lottery	ARIMA(1,1,1)	DC Office Vacancy Rates	377.37

Income Tax Model

FY 2022 income tax revenues account for 39.0% of D.C. gross revenue with 75.1% of all income tax revenue coming from the individual income tax.

Income tax revenues include both corporate franchise taxes and individual income taxes. DEG includes data from CoStar on FY D.C. office vacancy rates, lagged by two fiscal years, in the income tax ARIMA model because office vacancy rates are indicative of business activity in the District. Office vacancy rates capture the effects of remote work as well as business activity, such as businesses opening and closing, and are correlated with the corporate franchise component of income tax revenue.

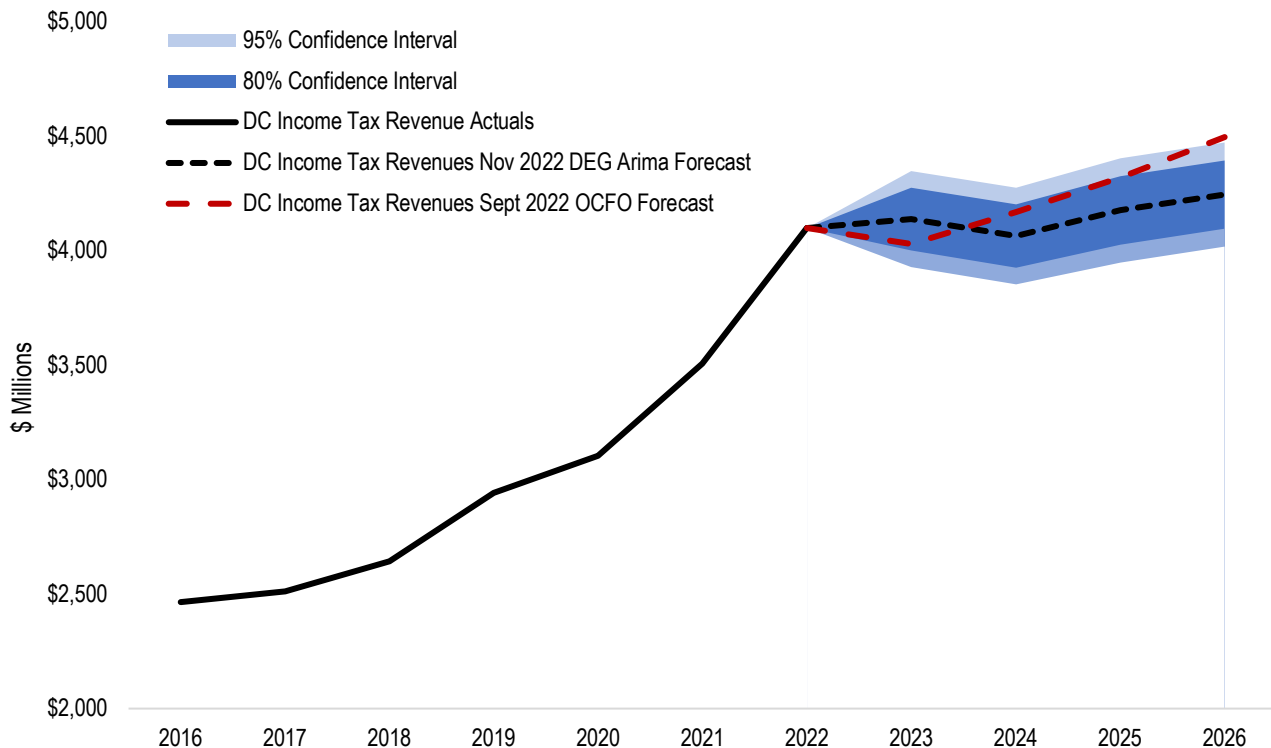
To capture trends underlying the individual income tax component, the income tax ARIMA model also includes CBO data on FY U.S. capital gains tax receipts which are expected to be positively correlated with District income tax revenue collections. Capital gains receipts have been very strong during the most recent three fiscal years, but the CBO expects this series to have much slower growth during the forecast period.

An ARIMA(2,0,0) model of income tax revenues with three external fiscal year regressors, nominal D.C. GDP, lagged D.C. office vacancy rates, and U.S. capital gains tax receipts provided the best fit as shown in Table 3.

Table 3. Income Tax Revenues Model Output

	Regression with ARIMA(2,0,0) errors				
	AR(1)	AR(2)	D.C. GDP	Office Vacancy Rate, 2 Fiscal Year Lag	U.S. Capital Gains Receipts
coefficients:	-0.0071	-0.4138	9.8808	8,706,159	7,369.95
s.e.	0.2780	0.2771	3.5685	3,187,938	739.642
t statistic	-0.0255	-1.4933	2.7689	2.7310	9.9763
sigma^2 = 1.15e+10					
log likelihood = -217.51					
AIC=449.03 AICc=461.47					

Figure 2 plots DEG's November 2022 forecast of D.C. income tax revenue from this model for FY 2022-2026 (black dashed line) as well as the OCFO's September 2022 forecast for comparison (maroon dashed line). DEG's estimates of income tax revenue are initially higher than the OCFO's estimates but from FY 2024 onwards, the OCFO estimates higher revenue and higher growth than DEG.

Figure 2. Income Tax Revenue Forecast for FY 2023-2026

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

Property Tax Model

FY 2022 property tax revenues represent approximately 27.9% of D.C. gross revenues.

The property tax model uses an ARIMA(1,1,1) specification model with property tax revenues as the dependent variable and two additional regressors: nominal FY D.C. real estate, rental, and leasing GDP (a subset of total nominal FY D.C. GDP) and lagged fiscal year D.C. office space vacancy rates as shown in Table 4. The vacancy rate measure is lagged by two fiscal years to reflect the delay between when assessments on D.C. properties are made and when the property tax revenues associated with those assessments are collected. Additionally, it is expected that the lagged office vacancy variable will be negatively correlated with property tax revenues because higher vacancy rates as a result of the pandemic imply lower future revenue collections. CoStar's platform records a total inventory of 167 million square feet of office space in Washington, D.C in 2022.⁷

Notably, the property tax model 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.

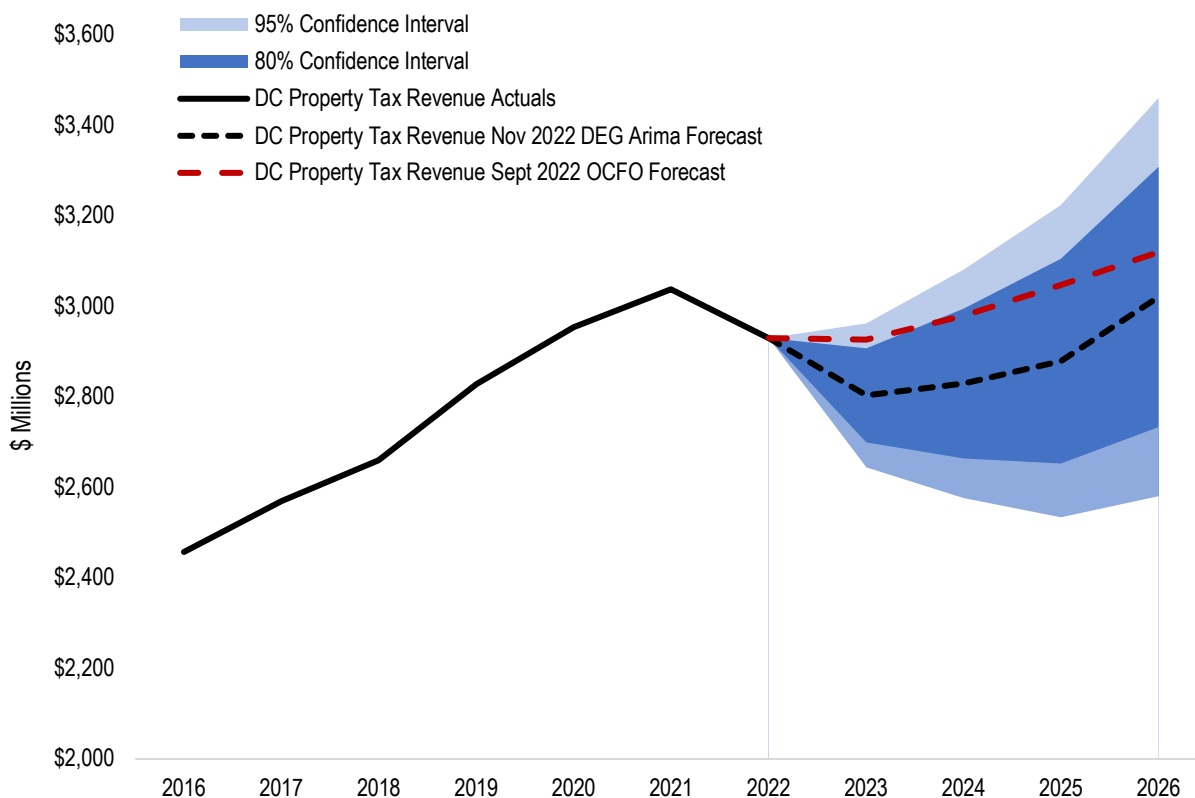
Table 4. Property Tax Revenues Model Output

Regression with ARIMA(1,1,1) errors				
	AR(1)	MA(1)	D.C. Real Estate GDP	Lagged Office Vacancy Rate
coefficients:	0.9965	-0.7550	-135.556	-12,550,739
s.e.	0.0096	0.2954	46.2303	2,957,296
t statistic	103.8021	-2.5559	-2.9322	-4.2440
sigma^2 = 6.537e+09				
log likelihood = -202.72				
AIC=415.44 AICc=421.44				

⁷ 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, 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 shows the historical amounts of property tax revenues, as well as the DEG November 2022 and OCFO September 2022 forecasts for FY 2022-2026. DEG's forecast of property tax revenue initially declines in FY 2023 and then gradually increases through FY 2026. DEG's forecast is consistently less than the OCFO's estimates and does not attain FY 2021 levels at any time during the forecast period.

Figure 3. Property Tax Revenue Forecast for FY 2023-2026



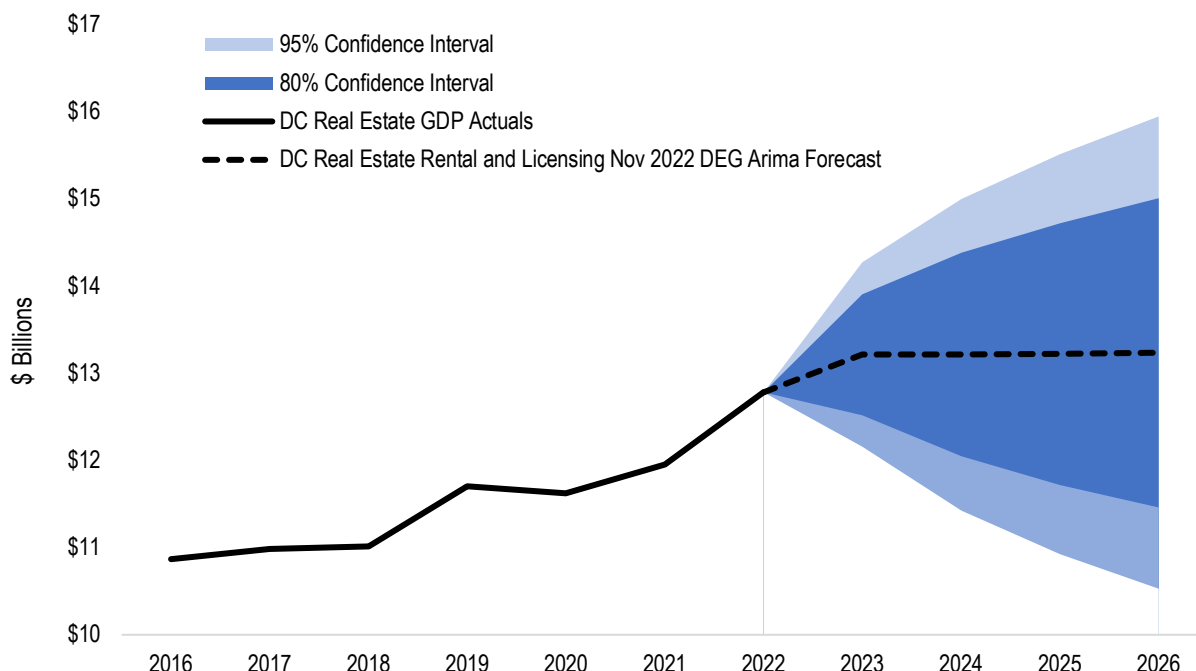
Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar data.

To forecast the District's property tax revenues, we first forecast the real estate, rental, and leasing industry's contribution to FY D.C. GDP and use this component of GDP as an external regressor in our specification along with lagged D.C. 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.⁸

⁸ See www.cbo.gov/data/budget-economic-data-#11

Figure 4 depicts the DEG forecast of the real estate component of FY D.C. GDP. Notably, while the DEG forecast of total FY D.C. GDP has an upward trend throughout the forecast period, the 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.

Figure 4. Real Estate, Rental, and Leasing Contribution to Total FY D.C. GDP Forecast FY 2023-2026.



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

Sales and Excise Tax Model

Sales and excise tax revenues are estimated at 16.8% of D.C. gross revenue for FY 2022, with 93.7% of those revenues attributable to general sales taxes.

The sales and excise tax ARIMA model, as shown in Table 5, has changed significantly from DEG’s March 2022 revision. The prior model used revenue per available hospitality room as an external regressor to proxy for the demand for tourism in D.C. However, CoStar no longer provides this variable as a forecasted series. The November 2022 sales and excise tax model replaces this hospitality variable with fiscal year D.C. retail vacancy rates and U.S. unemployment rates. Both of these variables are included to proxy for retail activity in the District and are expected to have a negative relationship with sales and excise tax revenues. The model also includes fiscal year D.C. GDP as an external regressor.

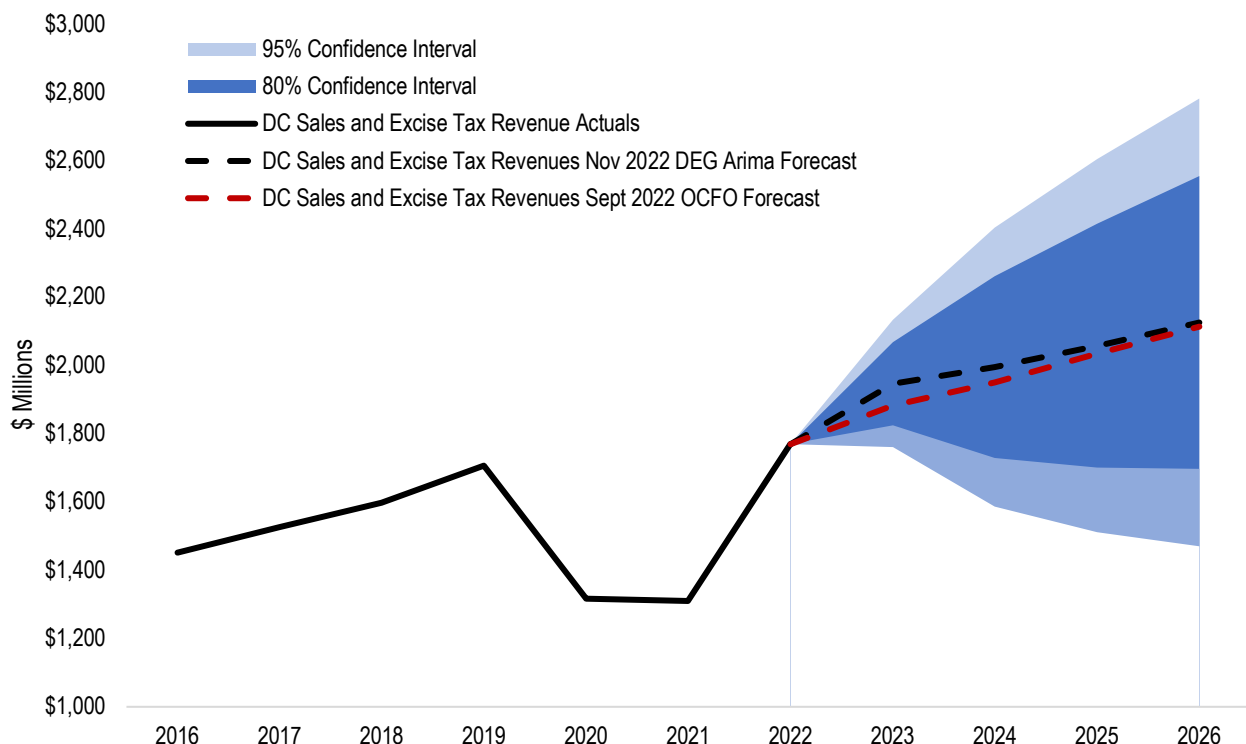
An ARIMA(0,1,1) specification of sales and excise tax revenues as the dependent variable with nominal D.C. GDP, the D.C. retail vacancy rate, and the U.S. unemployment rate as additional

fiscal year regressors best fit the data. As Figure 5 shows, the DEG November 2022 forecast of sales and excise tax revenue (black dashed line) is very similar to the OCFO September 2022 forecast (maroon dashed line) throughout the forecast period.

Table 5. Sales and Excise Tax Revenues Model Output

	Regression with ARIMA(0,1,1) errors			
	MA(1)	D.C. GDP	Retail Vacancy Rate	U.S. Unemployment Rate
coefficients:	1.0000	10.9041	-10,977,825	-7,710,111
s.e.	0.2315	7.4483	2,978,343	1,359,455
t statistic	4.3197	1.4640	-3.6859	-5.6715
sigma ² = 8.586e+09				
log likelihood = -204.81				
AIC=419.61 AICc=425.61				

Figure 5. Sales and Excise Tax Revenue Forecast for FY 2023-2026



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

Gross Receipts Model

Gross receipts revenues represent an estimated 3.7% of gross revenue for FY 2022 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 including D.C. GDP into the ARIMA specification did not improve prediction.

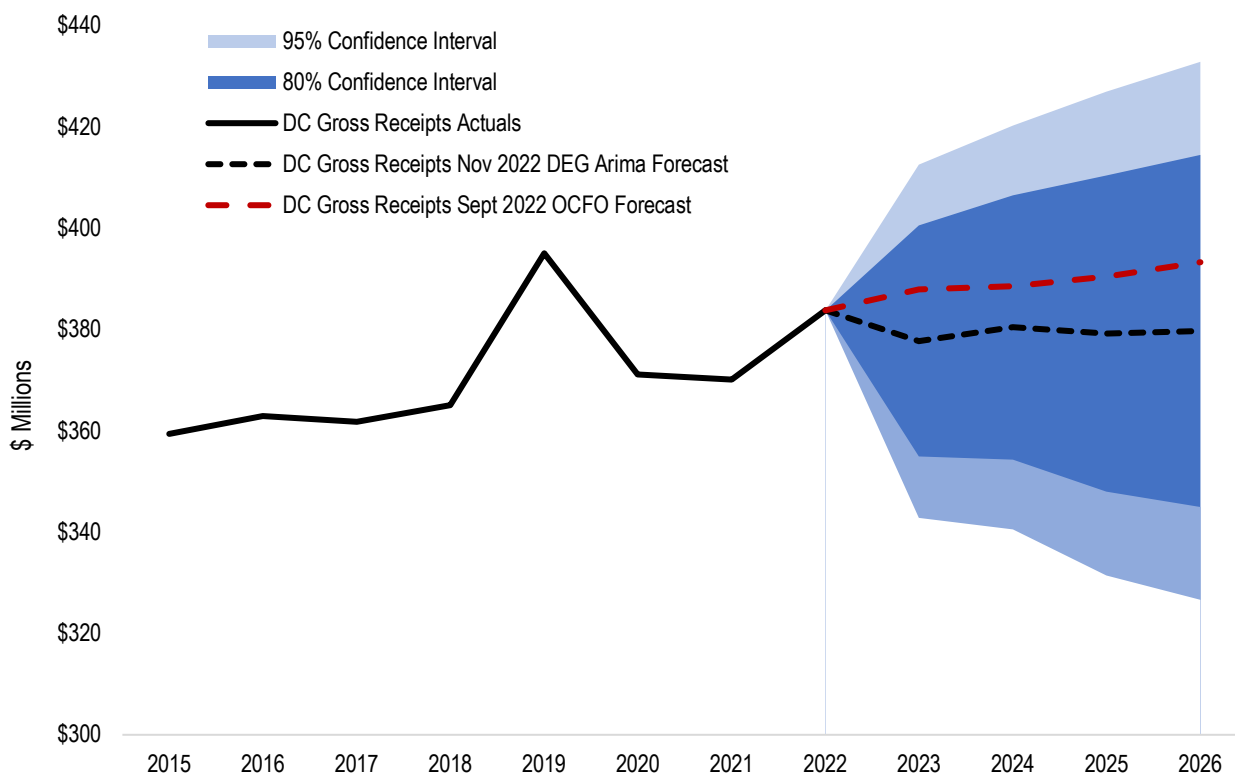
As shown in Table 6, the best model to predict gross receipts is an ARIMA(1,1,0) model with gross receipts revenues as the dependent variable and no external regressors. Figure 6 shows DEG's November 2022 forecast of gross receipts revenues resulting from this model (black dashed line) in comparison to the OCFO's September 2022 forecast (maroon dashed line). The OCFO's forecast is slightly higher than DEG's throughout the forecast period.

Table 6. Gross Receipts Model Output

Regression with ARIMA(1,1,0) errors

	AR(1)
coefficients:	-0.4452
s.e.	0.2320
t statistic	-1.9190
sigma^2 = 3.17e+08	
log likelihood = -178.89	
AIC=361.78 AICc=362.71	

Figure 6. Gross Receipts Forecast for FY 2023-2026



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

Other Tax Model

Other tax revenues represent an estimated 7.1% of gross revenue for FY 2022, and 87.8% of these revenues are attributable to deed recordation and deed transfer fees.

The other tax ARIMA model uses net deliveries for multi-family and net deliveries for office properties data from CoStar as additional regressors.⁹ These variables capture dynamics of the construction market and are expected to be positively correlated with deed recordation and transfer fees. The CoStar database for multi-family housing in D.C. included 3,475 existing buildings and 172,067 units in November 2022.¹⁰

An ARIMA(0,1,1) 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. Notably, both the DEG November 2022 and OCFO September 2022 forecasts of other tax revenues, as shown in Figure 7, decrease after FY 2022 and do not reach that level again within the forecast period. And while DEG's model initially forecasts a steeper decline than the OCFO's, it also recovers faster.

The OCFO estimates a 27.6% increase in other tax revenues between FY 2021 and FY 2022. This large increase in FY 2022 is an anomaly in the historical data for other tax revenues. Because ARIMA models predict future levels based upon prior year levels, were we to include FY 2022 in the estimation it would have propagated the FY 2022 anomaly into the FY 2023 to FY 2026 period. To avoid this outcome, we did not include FY 2022 in the estimation.

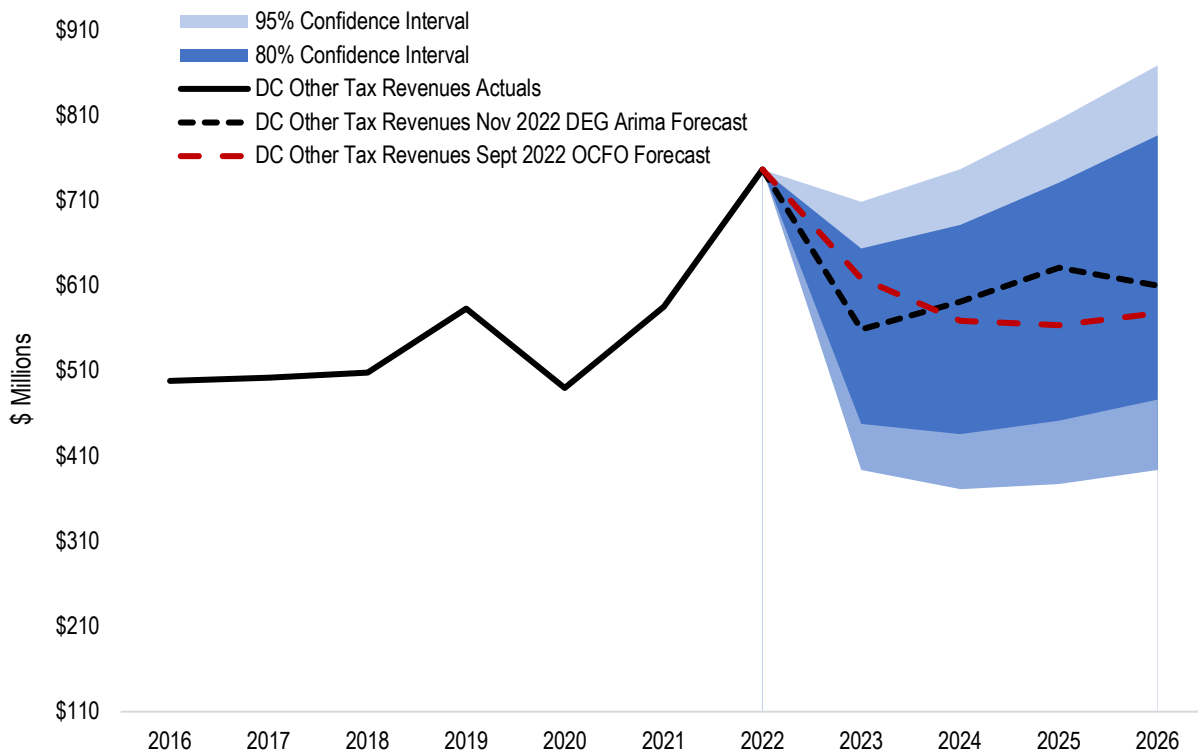
Table 7. Other Tax Revenues Model Output

	Regression with ARIMA(0,1,1) errors			
	MA(1)	D.C. GDP	Multi-Family Net Deliveries	Office Net Deliveries
coefficients:	-0.3483	1.6390	29.6629	-0.0731
s.e.	0.4090	3.4476	71.9372	0.0613
t statistic	-0.8516	0.4754	0.4123	-1.1925
sigma^2 = 6.452e+09				
log likelihood = -188.43				
AIC=386.86 AICc=393.53				

⁹ CoStar defines net deliveries as construction completed less demolition.

¹⁰ 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 7. Other Tax Revenue Forecast for FY 2023-2026



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

Nontax and Lottery Model

Nontax and lottery revenues comprise 5.6% of D.C. gross revenue for FY 2022, with 50.3% of this revenue attributable to licenses & permits and fines (for example, traffic and parking 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 vacancy imply more vehicle traffic and thus presumably higher levels of traffic fines for these revenues, was chosen as an additional regressor. An ARIMA(1,1,1) model with the annual fiscal year sum of nontax and lottery revenues as the dependent variable and the D.C. office vacancy rate 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 volatile 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.

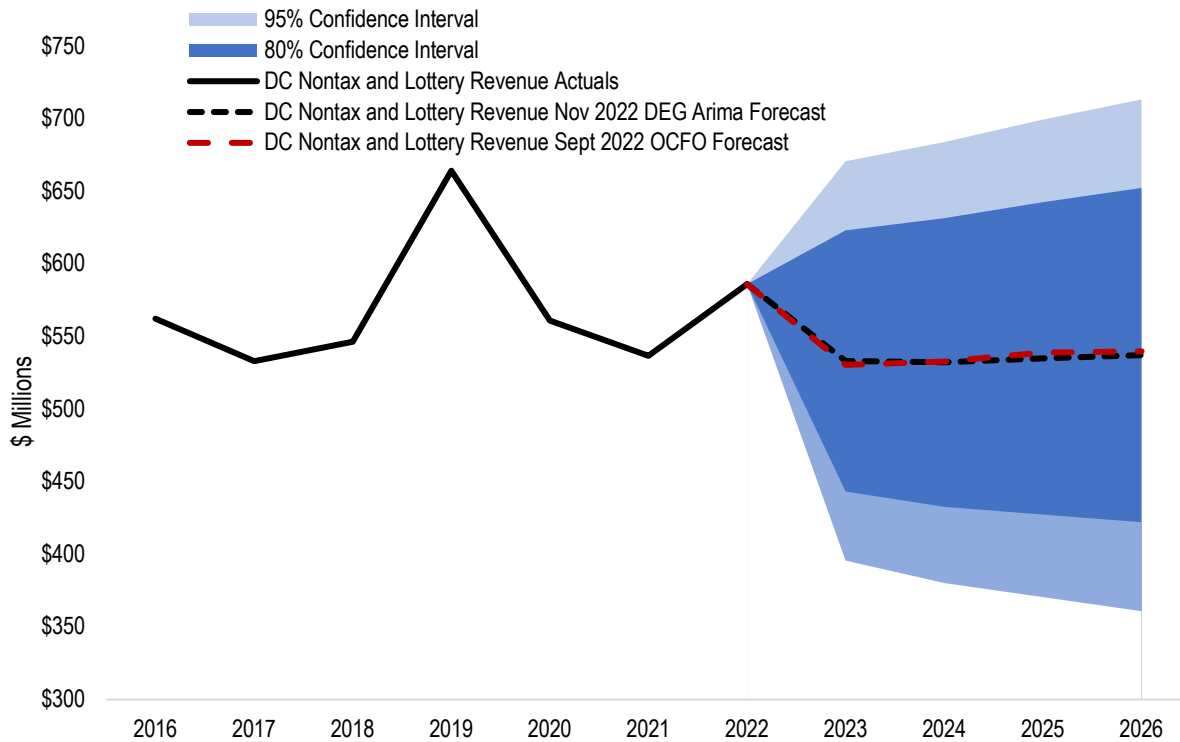
Figure 8 plots DEG’s November 2022 forecast of nontax and lottery revenues (black dashed line) as well as the OCFO’s September 2022 forecast (maroon dashed line) for comparison. The two forecasts are very similar throughout the forecast period.

The OCFO estimates a percentage increase of 9.2% in nontax and lottery revenues between FY 2021 and FY 2022. This increase in FY 2022 appears to be an outlier as the OCFO’s estimates of nontax and lottery revenues for FY 2023 through FY 2026 are very similar to their FY 2021 level. Because ARIMA models predict future levels based upon prior year levels, we exclude FY 2022 in our estimation to avoid forecasting future nontax and lottery revenues off the outlier.

Table 8. Nontax and Lottery Revenues Model Output

Regression with ARIMA(1,1,1) errors			
	AR(1)	MA(1)	Office Vacancy Rate
coefficients:	0.1697	-0.5541	-697,136.3
s.e.	0.4765	0.4181	1,783,880.5
t statistic	0.3561	-1.3253	-0.3908
sigma^2 = 3.572e+09			
log likelihood = -184.68			
AIC=377.37 AICc=381.37			

Figure 8. Nontax and Lottery Revenue Forecast for FY 2023-2026



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO and CoStar 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 to support 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 November 2022 forecast is the black dashed line and the OCFO September 2022 forecast is the maroon dashed line. While the DEG and OCFO forecasts diverge in FY 2024 with the OCFO’s estimates higher from FY 2024 through FY 2026, overall, they are comparable and feature similar growth paths. In numerical terms, for FY 2026, DEG’s forecast of \$10.92 billion is 2.86% less than the OCFO’s forecast of \$11.24 billion.

Figure 9. DEG and OCFO Gross Revenue Forecasts for FY 2023-2026

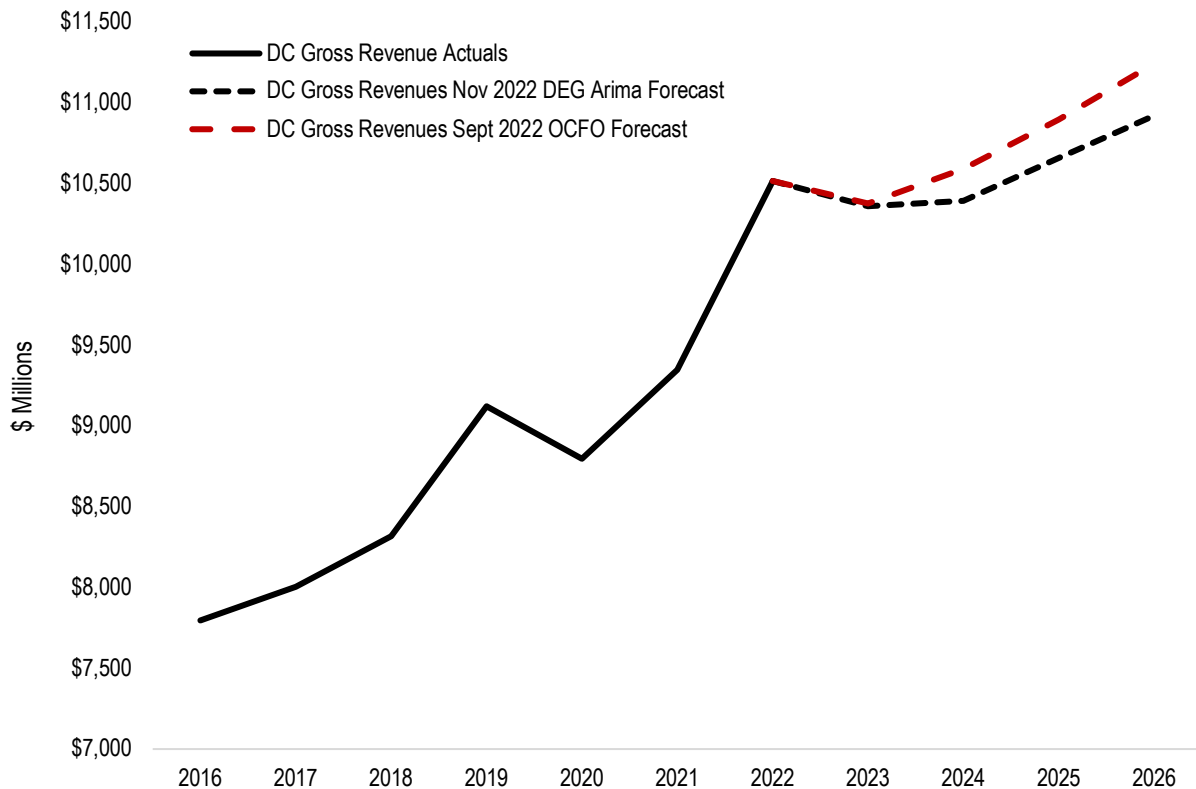
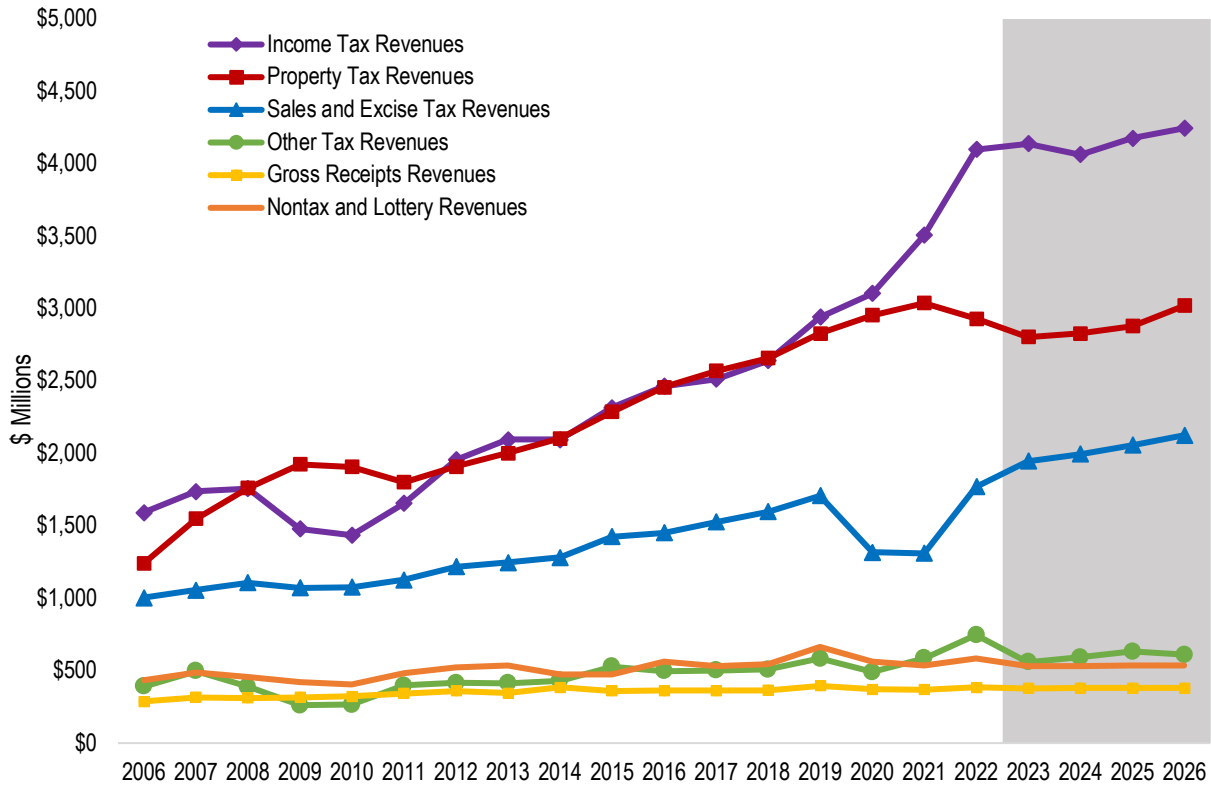


Figure 10 plots the historical values of the District's revenue collections through FY 2022 as well as DEG's gross forecasts through FY 2026. The figure highlights the impact of the COVID-19 pandemic on some of the District's revenues streams from FY 2019 to FY 2021. Income tax revenues were not impacted by the pandemic, consistently increasing from fiscal year to fiscal year through the pandemic; however, their growth stagnates in DEG's forecasts through FY 2026, even declining in FY 2024, largely due to expected decreases in capital gains realizations. 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.

Figure 10. D.C. Revenue Streams, Including Dedicated Revenues, with DEG Forecasts for FY 2023-2026.



Source: Office of the Chief Financial Officer (OCFO); DEG estimates based upon OCFO, CoStar, and CBO 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 most recent forecasts from May 2022, which were created using its March 2022 methodology to certify issuance of the Series 2022 General Obligation Commercial Paper, and the OCFO's September 2022 forecasts are provided as well.

DEG's November update features higher income tax revenues for FY 2022 and FY 2023, but lower income tax revenues for FY 2024 through FY 2026. The same can be said for sales and excise tax as well as nontax and lottery revenues. DEG's November 2022 gross receipts forecast, on the other hand, is consistently higher than its May 2022 forecast of that revenue stream.

Table 9. DEG November 2022 Revised Gross Fiscal Year Revenue Stream Forecasts, Compared with DEG May 2022 and OCFO September 2022 Forecasts.

Fiscal Year	Income tax revenue			Property tax revenue			Sales and excise tax revenue		
	DEG May 2022	DEG Nov 2022	OCFO Sept 2022	DEG May 2022	DEG Nov 2022	OCFO Sept 2022	DEG May 2022	DEG Nov 2022	OCFO Sept 2022
2022	\$3,845,172	\$4,099,115	\$4,099,115	\$2,964,948	\$2,929,345	\$2,929,345	\$1,649,340	\$1,769,384	\$1,769,384
2023	\$3,936,995	\$4,138,876	\$4,029,717	\$2,910,436	\$2,803,320	\$2,926,432	\$1,864,129	\$1,946,863	\$1,882,968
2024	\$4,236,070	\$4,064,653	\$4,168,564	\$2,866,687	\$2,829,153	\$2,979,923	\$2,073,909	\$1,995,234	\$1,951,153
2025	\$4,456,959	\$4,176,276	\$4,320,758	\$2,834,127	\$2,878,897	\$3,047,689	\$2,203,339	\$2,057,522	\$2,035,343
2026	\$4,662,507	\$4,245,626	\$4,496,562	\$2,808,728	\$3,020,746	\$3,119,741	\$2,304,640	\$2,125,782	\$2,113,682
Fiscal Year	Other tax revenue			Gross receipts tax revenue			Nontax and lottery revenue		
	DEG May 2022	DEG Nov 2022	OCFO Sept 2022	DEG May 2022	DEG Nov 2022	OCFO Sept 2022	DEG May 2022	DEG Nov 2022	OCFO Sept 2022
2022	\$529,962	\$746,537	\$746,537	\$370,572	\$383,810	\$383,810	\$523,944	\$586,173	\$586,173
2023	\$559,430	\$558,899	\$618,273	\$370,379	\$377,723	\$387,929	\$528,318	\$533,273	\$530,539
2024	\$592,875	\$591,582	\$569,061	\$370,464	\$380,432	\$388,576	\$538,005	\$532,321	\$532,878
2025	\$549,510	\$631,546	\$563,878	\$370,426	\$379,226	\$390,434	\$541,660	\$534,981	\$538,844
2026	\$565,377	\$610,532	\$578,340	\$370,443	\$379,763	\$393,304	\$544,182	\$537,254	\$539,733

Both Table 9 and Figure 10 focus on gross revenues before removing the District's dedicated revenues. The OCFO's September 2022 Quarterly Revenue Estimates details these dedicated revenues for FY 2021, FY 2022, and FY 2023 and the December 2021 Quarterly Revenue Estimates details FY 2020. Table 10 summarizes these dedicated revenues with a focus 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.)	FY 2023 (OCFO Est.)
Property	OCFO Gross Revenues	2,954,093	3,037,653	2,929,345	2,926,432
	Dedicated Taxes	44,377	43,939	40,003	39,898
	Percentage Dedicated	1.50%	1.45%	1.37%	1.36%
Sales and Excise	OCFO Gross Revenues	1,316,574	1,309,821	1,769,384	1,882,968
	Dedicated Taxes	403,344	358,876	473,728	514,213
	Percentage Dedicated	30.64%	27.40%	26.77%	27.31%
Gross Receipts	OCFO Gross Revenues	371,123	370,135	383,810	387,929
	Dedicated Taxes	131,125	138,297	153,373	152,925
	Percentage Dedicated	35.33%	37.36%	39.96%	39.42%
Other Tax	OCFO Gross Revenues	489,988	585,255	746,537	618,273
	Dedicated Taxes	69,019	81,161	99,988	85,133
	Percentage Dedicated	14.09%	13.87%	13.39%	13.77%
Total Dedicated Taxes		647,865	622,273	767,092	792,169

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

Note: FY 2020 and FY 2021 values are actuals whereas FY 2022 and FY 2023 values are estimated by the OCFO.

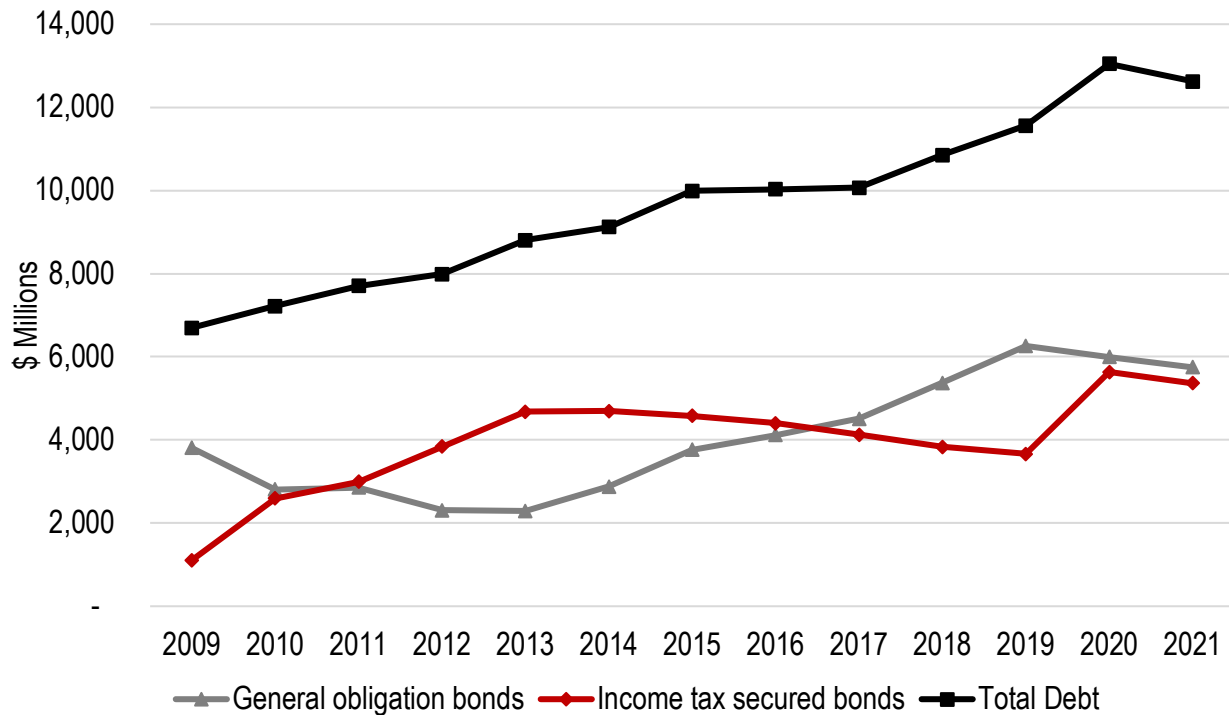
In FY 2022, twenty-one programs and organizations were allocated dedicated revenues from the District's gross revenue - including the Washington Metropolitan Area Transit Authority, the Convention Center, and the Housing Production Trust Fund – amounting to \$767.1 million, which is 23.27% greater than the \$622.3 million dedicated in FY 2021. Notably, most dedicated revenues are from sales and excise tax collections; however, as noted in the District's Annual 2021 Comprehensive Financial Report (ACFR), due to the continued impacts of the COVID-19 pandemic, the dedicated sales and excise tax revenues were slightly lower in FY 2021 compared with FY 2020; however, in FY 2022, the dedicated sales and excise tax revenues surpass the FY 2020 and FY 2021 levels.

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. The figure is based on data from the FY 2021 D.C. Annual Comprehensive Financial Report (ACFR), which is the most recent ACFR published by the OCFO. These amounts will be updated upon release of the FY 2022 ACFR. Notably, the amount of total and general obligation outstanding debt has 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, while 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 these amounts are 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

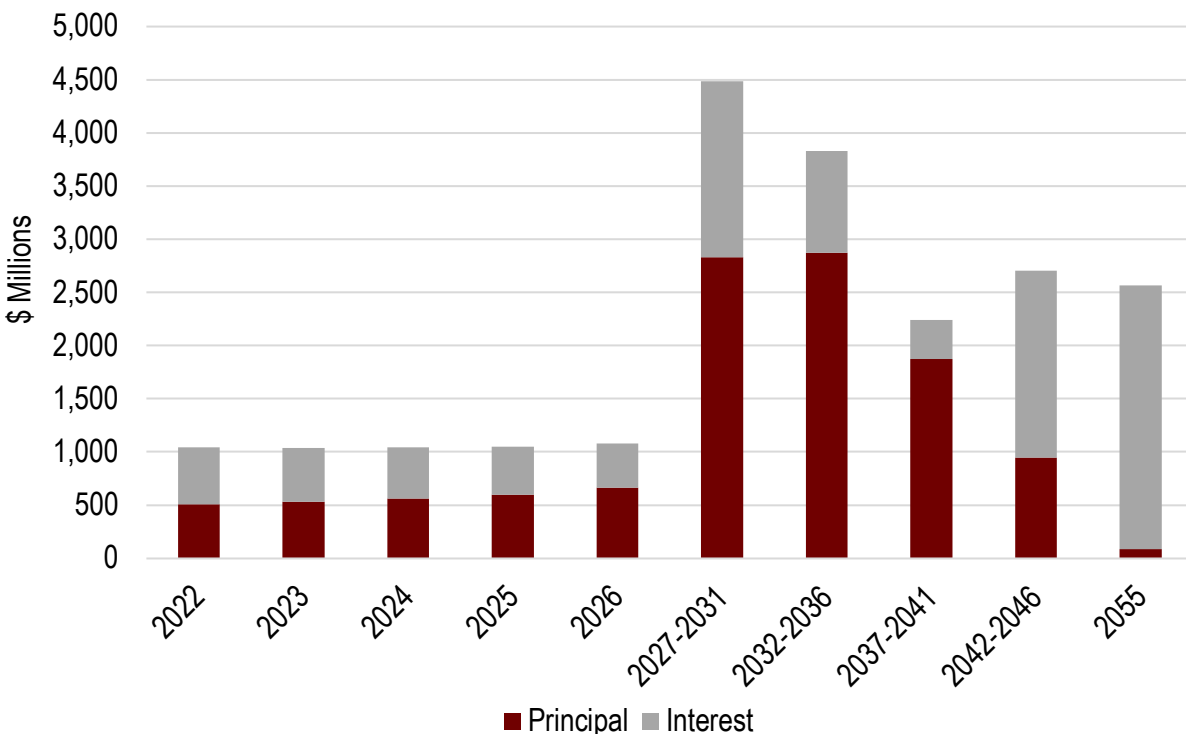


Source: FY 2021 D.C. Annual Comprehensive Financial Report (ACFR), Exhibit S-3C.

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, which is also based upon the FY 2021 D.C. ACFR, 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 November 2022 FY 2023 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 11.¹¹ DEG's November 2022 estimate of the District's Total Local Source, General Fund Revenue for FY 2023 is \$9.57 billion. Table 12 details the District's potential debt service for FY 2023 on GO and ITS bonds, incorporating principal and interest payment data received from the ODCA in May 2022 prior to certification of the Series 2022 General Obligation

¹¹ DEG nets out the District's dedicated revenues for FY 2023 which are detailed in Table 1 of the OCFO's September 2022 Revised Revenue Estimates: under each individual revenue source, any dedicated revenues are titled as "Dedicated to other funds."

Commercial Paper issuance. DEG's estimate of the 17 percent test statistic – the ratio of the District's FY 2023 obligations on GO and ITS bonds to DEG's FY 2023 General Fund Revenue Estimate – is 10.01%.

Table 11. FY 2023 Total Local Source, General Fund Revenue Estimate (Net of Dedicated Taxes) by DEG dated November 22, 2022 (\$ Thousands)

Revenue Source	DEG's FY 2023 Total Local Source, General Fund Revenue Estimate (Net of Dedicated Taxes)
Income Taxes	\$4,138,876
Property Taxes	\$2,763,422
Sales and Excise Taxes	\$1,432,650
Gross Receipts Taxes	\$224,798
Other Taxes	\$473,766
Total Taxes	\$9,033,511
Total Non-Tax and Lottery Revenues	\$533,273
Total Local Source, General Fund Revenue Estimate	\$9,566,783

Sources: DEG November 2022 gross revenue stream estimates for FY 2023 and OCFO September 2022 estimates of dedicated revenues for FY 2023.

Table 12: FY 2023 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 May 18, 2022.

Principal and Interest From:	FY 2023 Principal and Interest Payments	FY 2023 Payments as Percent of General Fund Revenue Estimate
General Obligation (GO) bonds	\$534,942,101	5.59%
Income Tax Secured (ITS) bonds	\$422,326,105	4.41%
Total	\$957,268,206	10.01%

Sources: FY 2023 debt service on GO and ITS bond obligations from data provided by the OCFO and ODCA prior to issuance of the General Obligation Commercial Paper, Series 2022 in May 2022.

Table 13 provides details of the components of the data necessary for this certification through the FY 2023 – FY 2026 forecast period. The debt service obligations of the District's GO and ITS bonds in each fiscal year are shown in the first panel. 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 \$957

million in annual debt service obligations for FY 2023 on its outstanding GO and ITS bond debt and it could undertake an additional \$669 million in principal and interest obligations for FY 2023 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 on general obligation and income tax secured revenue bonds shown in this table reflect the District's current obligations as of May 18, 2022.

Table 13. Principal and Interest Payments on GO and ITS bonds due with FY Debt Service Limitation for FY 2023 – 2026 as of May 18, 2022. (\$ Millions)

	FY 2023	FY 2024	FY 2025	FY 2026
Annual debt service (principal and interest)	957	951	963	973
DEG gross revenues forecast	10,359	10,393	10,658	10,920
OCFO estimated dedicated revenues	792	821	845	863
Local fund revenue	9,567	9,572	9,813	10,057
FY annual debt service as share of local fund revenue (17% test statistic)	10.01%	9.94%	9.81%	9.67%
Debt service cost limitation on local fund revenue (17% of Local Fund Revenue)	1,626	1,627	1,668	1,710
Additional debt service that could be issued within the 17% limit on local fund revenue	669	676	705	737

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About ODCA

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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