BUS32120: Final Project

Analyzing Iowa Levy Rates

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Background: Levy Authority Rates in Iowa

Description:

- Historical levy trends for varied land parcels across the state, set by levy authorities

Importance:

- Identify trends & change drivers across levy rates to compare counties, land types, and project future rates

Audience:

- Current & **potential local land owners**
- Local & state policymakers
- Tax professionals
- Researchers / academic institutions

Analysis Process

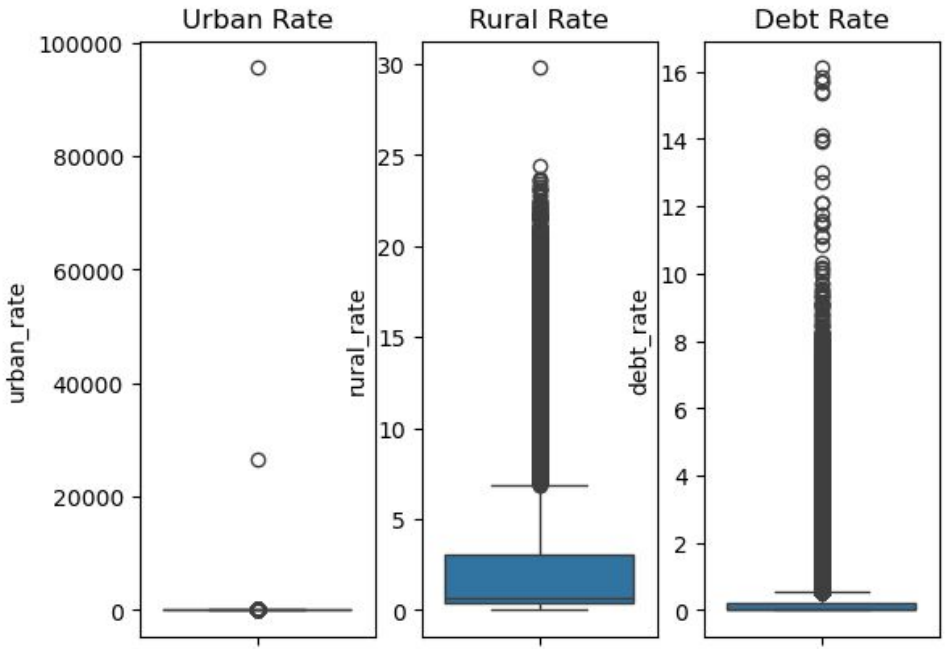
1. Understand data overview
2. Remove nulls
3. Re-categorize data types
4. Consolidate data syntax (i.e. special characters)
5. Remove outliers
6. Conduct EDA
    a. Average levy rates over time
    b. Top and bottom 10 counties for urban tax rates
    c. Rural / urban tax rate ratio over time
7. Linear Regression to study interaction of variables
8. Join relevant data sets for further analysis

Data Cleansing

```
# Get distinct values in levy_authority_2 column
distinct_counties = iowa_levy_rates['county_name'].unique()

distinct_counties
```

```
array(['ADAIR', 'ADAMS', 'ALLAMAKEE', 'APPANOOSE', 'AUDUBON', 'BENTON',
       'BLACK HAWK', 'BOONE', 'BREMER', 'BUCHANAN', 'BUENA VISTA',
       'BUTLER', 'CALHOUN', 'CARROLL', 'CASS', 'CEDAR', 'CERRO GORDO',
       'CHEROKEE', 'CHICKASAW', 'CLARKE', 'CLAY', 'CLAYTON', 'CLINTON',
       'CRAWFORD', 'DALLAS', 'DAVIS', 'DECATUR', 'DELAWARE', 'DES MOINES',
       'DICKINSON', 'DUBUQUE', 'EMMET', 'FAYETTE', 'FLOYD', 'FRANKLIN',
       'FREMONT', 'GREENE', 'GRUNDY', 'GUTHRIE', 'HAMILTON', 'HANCOCK',
       'HARDIN', 'HARRISON', 'HENRY', 'HOWARD', 'HUMBOLDT', 'IDA', 'IOWA',
       'JACKSON', 'JASPER', 'JEFFERSON', 'JOHNSON', 'JONES', 'KEOKUK',
       'KOSSUTH', 'LEE', 'LINN', 'LOUISA', 'LUCAS', 'LYON', 'MADISON',
       'MAHASKA', 'MARION', 'MARSHALL', 'MILLS', 'MITCHELL', 'MONONA',
       'MONROE', 'MONTGOMERY', 'MUSCATINE', 'O'BRIEN', 'OSCEOLA', 'PAGE',
       'PALO ALTO', 'PLYMOUTH', 'POCAHONTAS', 'POLK', 'POTTAWATTAMIE',
       'POWESHIEK', 'RINGGOLD', 'SAC', 'SCOTT', 'SHELBY', 'SIOUX',
       'STORY', 'TAMA', 'TAYLOR', 'UNION', 'VAN BUREN', 'WAPELLO',
       'WARREN', 'WASHINGTON', 'WAYNE', 'WEBSTER', 'WINNEBAGO',
       'WINNESHIEK', 'WOODBURY', 'WORTH', 'WRIGHT', "O'BRIEN",
       'Oâ€™BRIEN'], dtype=object)
```



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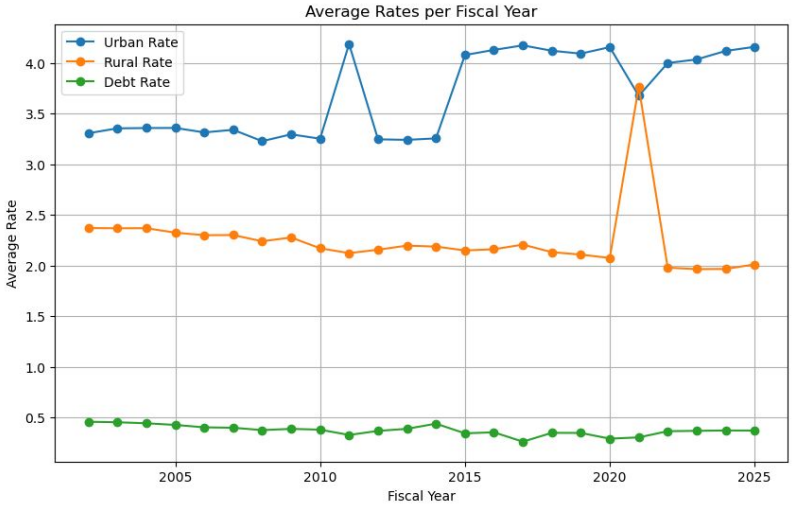
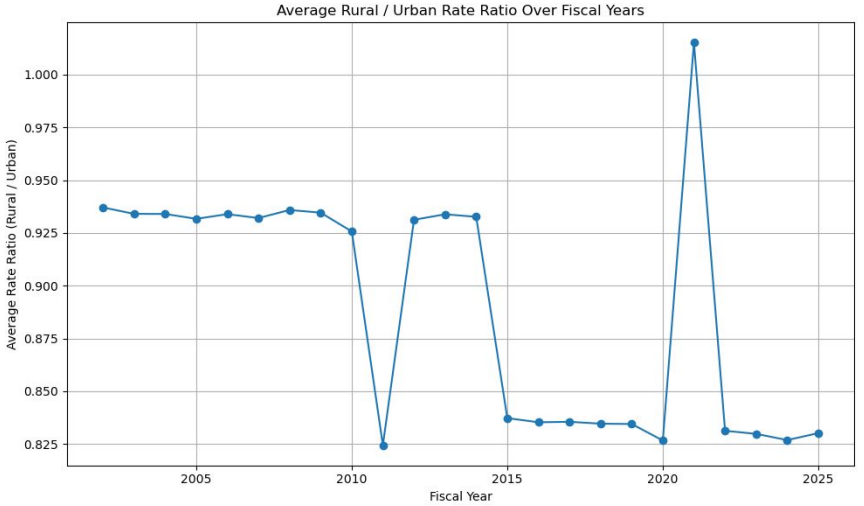
Exploratory Time-Series Analysis





Overall, urban rates have risen steadily while rural rates have dropped. COVID caused a significant spike in the rural levy rate.

Regression Analysis - Influence of Rural TIF & County Debt Rates

Y variables: urban levy rate, rural levy rate

X variables: fiscal year, rural TIF rate, county debt rate

**TIF rate = incremental tax financing rate for development in a specific area*

	Urban Levy Rates:	**Rural Levy Rates:**
	R-square = 0.558	R-square = 0.479
	Feature coefficients (aka slopes):	Feature coefficients (aka slopes):
	fiscal_year : -0.06	fiscal_year : 0.01
County debt rates have a much greater impact on urban levy rates	debt_rate : 2.33	debt_rate : 0.24
	county_fip : -0.02	county_fip : 0.00
While rural TIF rates are strongly correlated to rural levy rates, they are also somewhat correlated with urban levy rates	tif_rate_rural : 0.46	tif_rate_rural : 1.12

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Combining Data Sets

Iowa Retail Sales Tax Data

- This dataset offers quarterly retail sales tax information for 12 business groups in Iowa, including details like fiscal year, county, and business group classifications.
- It captures key metrics such as the number of returns filed, taxable sales, and computed tax.

Iowa Levy Authority Rates

- Different taxing districts each set their own annual levy rate to fund local entities like schools, cities, counties, and community colleges.
- The county auditor determines these rates to ensure adequate funding for each district's needs.

Combining Data Sets

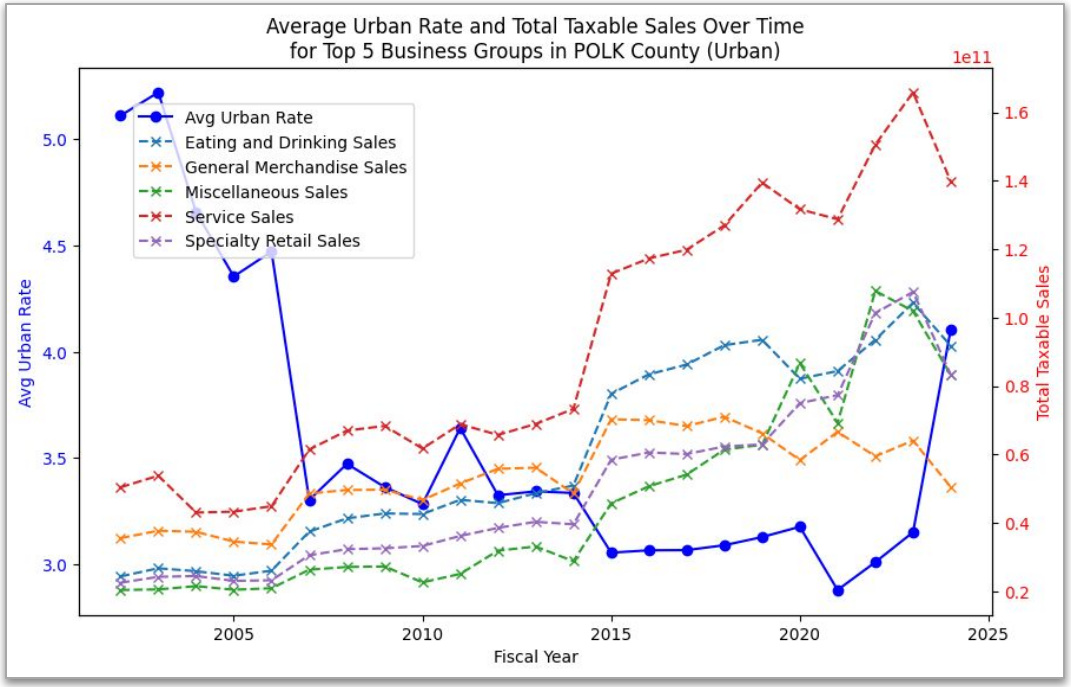
Iowa Retail Sales Tax Data

	fiscal_year	quarter_ending	county_number	county	business_group	number_of_returns	taxable_sales	computed_tax	percent_of_tax	suppressed
55477	2009	2009-06-01	3	Allamakee	Miscellaneous	69.0	1267949.0	76077.0	0.0002	False
4072	2023	2023-06-30	10	Buchanan	County Totals	1250.0	53539350.0	3207882.0	0.0041	False
76152	2013	2013-06-01	4	Appanoose	Utilities and Transportation	20.0	2906765.0	174406.0	0.0003	False
82809	2015	2014-09-01	16	Cedar	Home Furnishings	6.0	365966.0	21958.0	0.0000	False

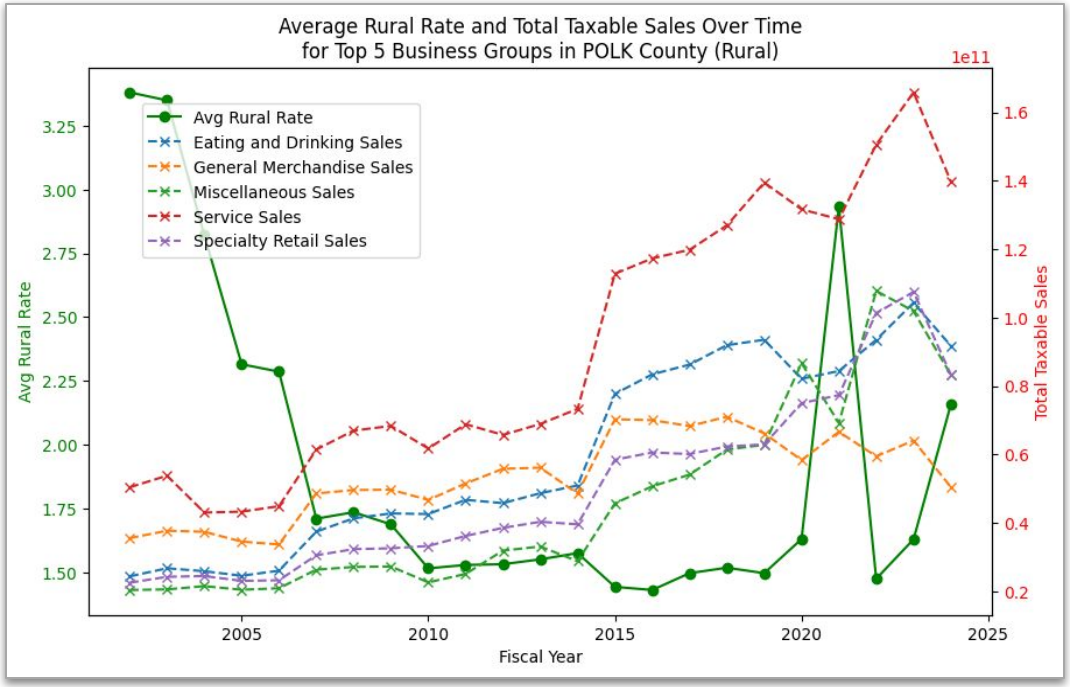
Iowa Levy Authority Rates

	unique_line_id	fiscal_year	type	levy_authority_1	levy_authority_2	county_fip	county_name	urban_rate	rural_rate	debt_rate	tif_rate_urban	tif_rate_rural	city_fips	city_name
0	2002_AG EXTENSIONS_01C001	2002	AG EXTENSIONS	01C001	ADAIR COUNTY AG EXTENSION	19001	ADAIR	0.24828	0.24828	0.24828	0.24828	0.24828	NaN	NaN
1	2002_AG EXTENSIONS_02C001	2002	AG EXTENSIONS	02C001	ADAMS COUNTY AG EXTENSION	19003	ADAMS	0.30000	0.30000	0.30000	0.30000	0.30000	NaN	NaN
2	2002_AG EXTENSIONS_03C001	2002	AG EXTENSIONS	03C001	ALLAMAKEE COUNTY AG EXTENSION	19005	ALLAMAKEE	0.16203	0.16203	0.16203	0.16203	0.16203	NaN	NaN

Combining Data Sets



Combining Data Sets



Conclusion & Next Steps

For potential Iowa land buyers:

- Understand how urban rates have been affected by rural development projects in your area, and what might be on the horizon.
- Explore how your tax dollars are being spent in the highest and lowest Iowa tax counties.
- Distill potential relationships between property tax rates and taxable sales across levy authorities and business groups, respectively.

Next steps:

- Overlay purchase price and history with historical levy data to understand the cause-effect relationship
- Project counties that will see levy rate increases going forward
- Identify counties with historically low tax rates that are unlikely to rise