$\label{thm:continuous} Visual analysis show important insights on return rates across different regions, product categories, and time periods.$ 

The lighter the state color, the less return rates. Utah has the highest return rate as the darkst colored state sitting at 0.5684. This indicates a possible issue with product satisfaction or quality in that area.

Return rates fluctuate throughout the year, with the West region consistently showing the highest return rates, peaking in August at 0.6252. The East region also experiences noticeable spikes, particularly in October, indicating potential seasonal trends or product issues. Addressing these patterns—especially in high-return months—could help reduce return rates and improve customer satisfaction.

Machines and fasteners have the highest return rates, exceeding 30%, making them key ar.

# Regional Return Analysis

Use the following visuals to help understand different return rate metrics by region and category.

Return Rates by State (Middle Left): Hover over a state to see return rate percentages for an individual state.

Return Rates by Product (Top Right)

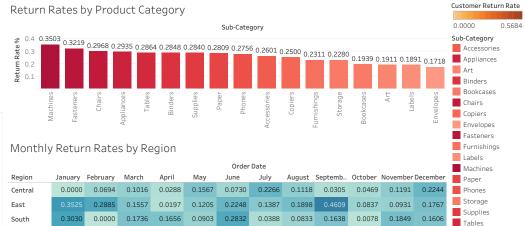
Monthly Reurn Rates by Region (Middle Right)

Use the filters to the far right to explore different return rates based on customer rates by state and category return rate

#### Return Rates by State

Total Sales vs. Total Return Rates (Below)



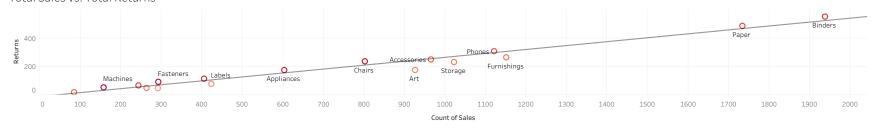


0.2407

0.2590

0.1754

#### Total Sales vs. Total Returns



West

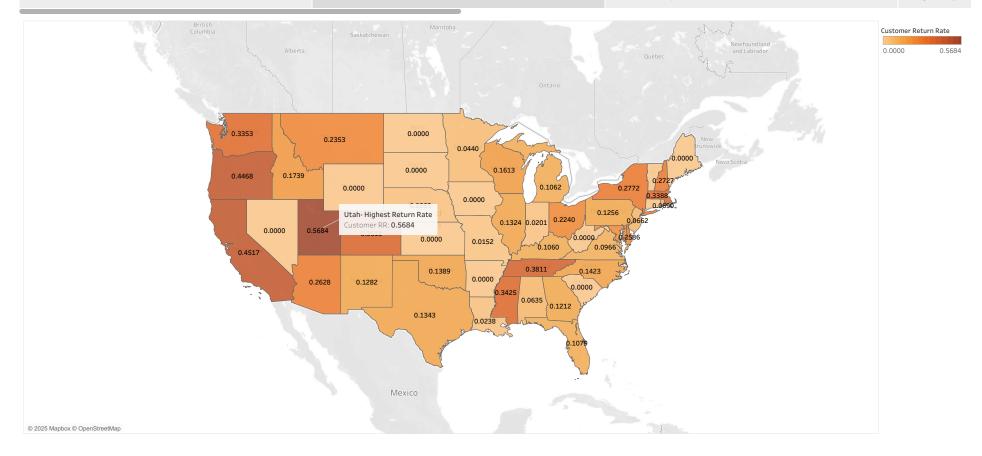
0.2479 0.4375

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Machines and fasteners have the highest return rates, exceeding 30%, making them key areas for further investigation. Chairs, appliances, and tables also show relatively high return rates, suggesting potential quality or customer satisfaction issues. Addressing the top-returned product categories could help reduce costs and improve customer retention.

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						Order	Date					
Region	January	February	March	April	May	June	July	August	Septemb	October	November	December
Central	0.0000	0.0694	0.1016	0.0288	0.1567	0.0730	0.2266	0.1118	0.0305	0.0469	0.1191	0.2244
East	0.3525	0.2885	0.1557	0.0197	0.1205	0.2248	0.1387	0.1898	0.4609	0.0837	0.0931	0.1767
South	0.3030	0.0000	0.1736	0.1656	0.0903	0.2832	0.0388	0.0833	0.1638	0.0078	0.1849	0.1606
West	0.2479	0.4375	0.3309	0.4491	0.3433	0.1754	0.2407	0.6252	0.3952	0.5359	0.2590	0.4883

Customer RR	

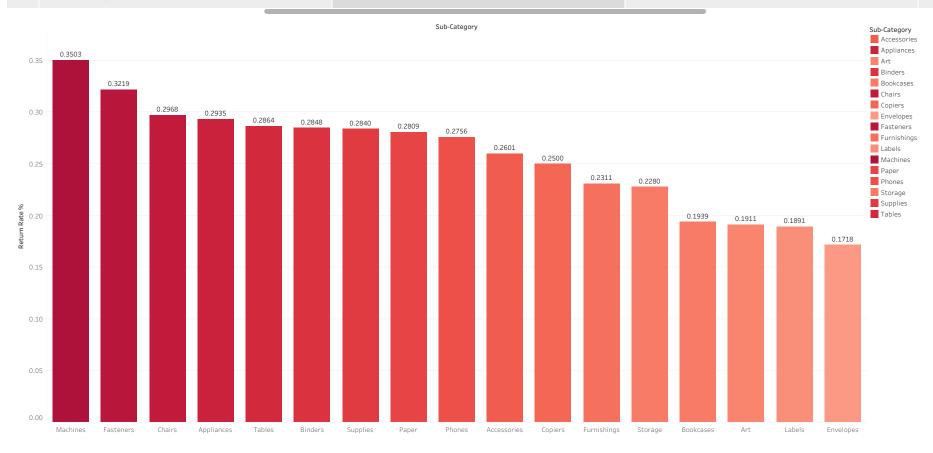
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This scatter plot illustrates that as sales increase, returns generally rise. While this trend is expected, it highlights the need to minimize returns for high-volume products.

Another important visual that didn't



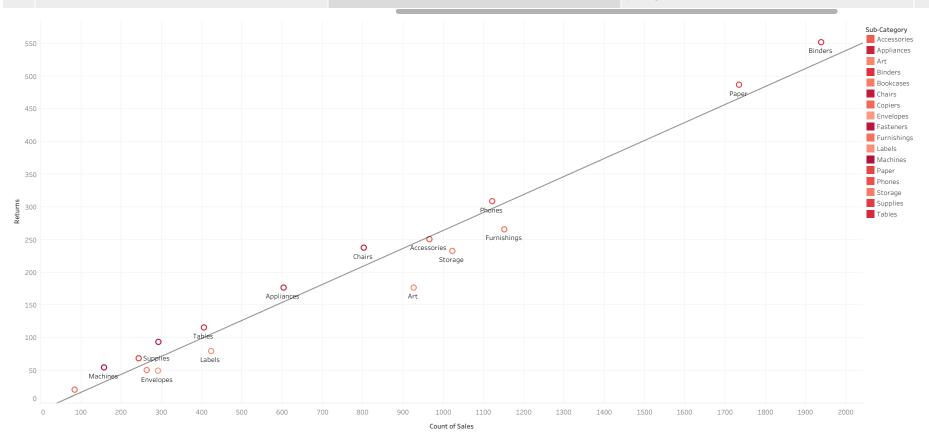
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Another important visual that didn't make it to the dashboard is the category state vs. customer returns chart. It highlights return patterns across different states and product sub-categories. Machines and Fasteners show consistently higher return rates across multiple states, with Utah and New Hampshire standing out for particularly high return percentages.

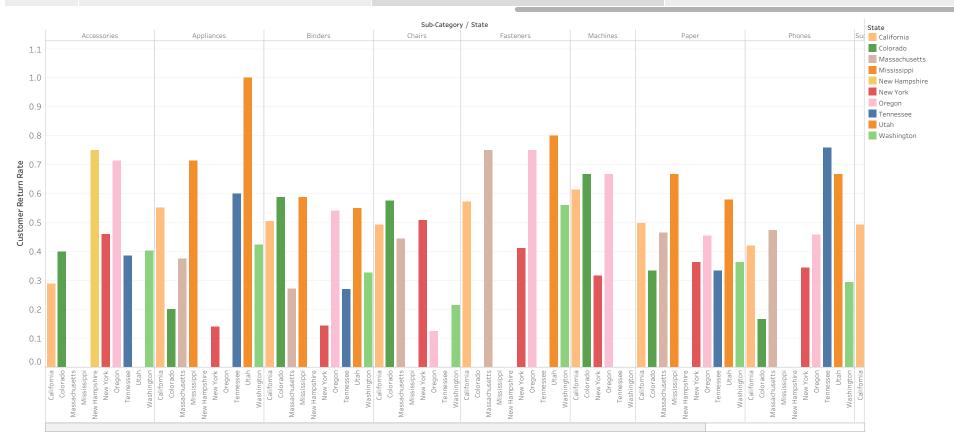
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Connecting all these points helps us see the complete picture, enabling us to identify areas needing attention. This brings us to the conclusion of our presentation, where we share final conclusions and recommendations.



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Return Rates by Product Category

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Customer Return Rate

#### **Final Conclusions and Recommendations**

The analysis of return data across regions, product categories, and time periods has identified key trends that highlight areas requiring improvement. Addressing these factors will help reduce return rates, enhance customer satisfaction, and optimize overall business operations.

#### Kev Findings

Regional Return Issues: Utah has the highest return rate, followed by California and Oregon. These returns could be linked to product quality issues, mismatched customer expectations, or shipping problems.

High-Return Product Categories: Machines and Fasteners have the highest return rates, with Chairs, Appliances, and Tables also showing frequent returns. This could be due to defective products, unclear descriptions, or customer dissatisfaction.

Seasonal Return Trends: Returns peak in August, October, and December particularly in the West and East regions. These fluctuations are likely influenced by sales cycles, promotions, or new product launches.

Sales and Return Correlation: High-sales categories like Paper, Furnishings, and Binders often experience higher return rates. This indicates a need for better sales and marketing strategies to handle returns effectively.

#### Recommendations:

Look into High-Return Areas: Survey customers and review feedback from Utah, California, and Oregon to understand issues and make necessary improvements.

Improve Product Quality and Descriptions: Focus on improving quality control and product descriptions for machines, fasteners, and chairs to better meet customer expectations.

Plan for High Return Times: Get ready for more returns in August, October, and December by improving return policies and boosting customer support.

Refine Sales Strategies for High-Return Products: Review promotions and bundle deals that may lead to impulsive buys and offer trial periods or warranties to reduce unnecessary returns.

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Return Rates by Product (Top Right)

Monthly Reurn Rates by Region (Middle Right)

Total Sales vs. Total Return Rates (Below)..

#### Return Rates by State



# Sub-Category 0.0000 0.5684 8 0.4 0.3503 0.3219 0.2968 0.2935 0.2864 0.2848 0.2849 0.2809 0.2756 0.2601 0.2500 0.2311 0.2280 0.1939 0.1911 0.1891 0.1718 Accessories Machi.. Faste.. Chairs Applia.. Tables Binde.. Suppli.. Paper Phones Acces.. Copiers Furnis.. Stora.. Bookc.. Art Labels Envel.. Binders Bookcases

#### Monthly Return Rates by Region Chairs Copiers Order Date January February March Envelopes Region May July August Septemb.. October Novemb.. December April June Central East Fasteners 0.0000 Furnishings South

#### Total Sales vs. Total Returns

