

Project Title

Shelf Life: Inventory Turnover & Overstock Risk in Retail Operations

Project Objective

To evaluate inventory efficiency, identify overstocked or underperforming SKUs, and support better working capital allocation through data-driven insights. The focus is on improving retail inventory performance across product categories and suppliers.

Key Business Questions

- Are we holding excess inventory that isn’t converting into sales?
 - Which SKUs have the slowest inventory turnover and highest Days Inventory Outstanding (DIO)?
 - How can we reduce overstock costs without affecting product availability?
 - Which suppliers consistently deliver products with low turnover rates?
 - Are there trends by category (e.g., Beer vs. Wine) that reveal inventory inefficiencies?
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Analytical Goals & Metrics

Goal	Metric(s)
Measure inventory efficiency	Inventory Turnover Ratio
Identify slow-moving stock	DIO, zero-sales flags
Detect overstock risk	End Inventory vs. Average Sales Volume
Evaluate supplier/product impact	Sales and Inventory metrics by Supplier and Category
Provide actionable insights	SKU-level flags for clearance or delisting

Tools & Technologies

Tool	Use
Excel	Data cleaning, exploration, and quick checks
SQL	Data validation, KPI calculation, filtering
Tableau	Visualization and dashboard development

Dataset Summary

Alcohol retail inventory and sales data

Approx. **44,000 records**

Columns include:

- SKU
 - Supplier
 - Category (Item Type)
 - Sales Figures
 - Beginning & Ending Inventory
 - Cost per Unit
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Target Stakeholders

- Inventory Managers
 - Merchandising Teams
 - Category Buyers
 - Supply Chain & Finance Analysts
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Data Preparation Workflow

Excel Tasks:

1. Validated numeric fields in retail_sales
2. Standardized text formats in item_type (e.g., "beer" → "Beer")
3. Replaced 'missing' and blank sales values using category-wise averages
4. Replaced missing cost_per_unit values with the category average (\$27)
5. Applied correct data types for all key columns

SQL Tasks:

Removed trailing spaces and standardized casing:

```
UPDATE inventory_analytics
SET item_type = INITCAP(TRIM(item_type)),
    supplier = TRIM(supplier),
    item_code = UPPER(TRIM(item_code));
```

Used regex to validate and clean numerical fields:

```
SELECT *
FROM inventory_analytics
WHERE
    NOT retail_sales::TEXT ~ '^\\d+(\\.\\d+)?$'
    OR NOT cost_per_unit::TEXT ~ '^\\d+(\\.\\d+)?$'
    OR NOT retail_transfers::TEXT ~ '^\\d+$'
    OR NOT beg_inventory::TEXT ~ '^-?\\d+$'
    OR NOT end_inventory::TEXT ~ '^-?\\d+$';
```

Replaced invalid cost_per_unit entries (e.g., 0) with NULL

Addressed negative inventory values appropriately

KPI Calculation: Inventory Turnover

Formula:

Inventory Turnover = Units Sold / Average Inventory

Calculated turnover for each item_type per year:

```
CREATE TABLE inventory_kpis AS
SELECT
    item_type,
    year,
    ROUND(
        (
            (SUM(retail_sales / NULLIF(cost_per_unit, 0)) /
              NULLIF(SUM((beg_inventory + end_inventory) / 2.0), 0)
            ) * 12
        )::NUMERIC, 2
    ) AS inventory_turnover
FROM inventory
WHERE cost_per_unit IS NOT NULL
GROUP BY item_type, year
ORDER BY item_type, year;
```

Additional KPIs (with logic)

KPI	Purpose
Units Sold	Estimated from retail_sales / cost_per_unit
Avg Inventory Value	Avg inventory × unit cost
Revenue per Unit	Total revenue ÷ units sold
DIO (Days Inventory)	365 / inventory_turnover
Stock Status	Flags SKUs as Overstock Risk if low sales + high end inventory

Example logic for flagging risk:

CASE

WHEN end_inventory > beg_inventory

AND (retail_sales / NULLIF(cost_per_unit, 0)) < 10

THEN 'Overstock Risk'

ELSE 'Healthy'

END

Tableau Dashboard Summary

1. **Inventory Turnover:** Bar chart with conditional color for risk
2. **Days Inventory on Hand:** Flipped axis bar chart for comparison
3. **Units Sold Trend:** Line chart over time
4. **Revenue per Unit:** Combined bar + text visual
5. **Inventory Value:** Numeric summary

Interactive filters added for **year** and **product category** to allow dynamic analysis.
