

```
In [ ]: import pandas as pd  
  
df = pd.read_csv('../data/processed_data/master_spend_cleaned_data.csv')  
  
# Convert date back to datetime  
df['Date of Payment'] = pd.to_datetime(df['Date of Payment'])
```

## How does spending change month by month?

```
In [2]: # Group by month and sum spending  
df['Year-Month'] = df['Date of Payment'].dt.to_period('M')  
monthly_spend = df.groupby('Year-Month')['Amount'].sum().reset_index()  
  
print(f"\nHighest: {monthly_spend['Amount'].max():,.2f}")  
print(f"Lowest: {monthly_spend['Amount'].min():,.2f}")  
print(f"Average: {monthly_spend['Amount'].mean():,.2f}")  
  
print("Monthly Spending:")  
  
# ChatGPT used to add commas to these numbers.  
  
monthly_spend
```

Highest: 4,896,775,249.64  
Lowest: 7,813,383.10  
Average: 754,079,682.36  
Monthly Spending:

Out[2]:

	Year-Month	Amount
0	2024-01	4.896775e+09
1	2024-02	4.270621e+09
2	2024-03	1.274519e+09
3	2024-04	8.736380e+08
4	2024-05	6.897208e+08
5	2024-06	1.060150e+08
6	2024-07	4.241811e+07
7	2024-08	3.826718e+07
8	2024-09	1.635173e+07
9	2024-10	1.872280e+07
10	2024-11	1.914611e+07
11	2024-12	6.240248e+07
12	2025-01	1.821038e+09
13	2025-02	1.329143e+09
14	2025-03	1.965283e+09
15	2025-04	2.545400e+08
16	2025-05	1.051972e+08
17	2025-06	1.649399e+08
18	2025-07	2.698955e+07
19	2025-08	2.984112e+07
20	2025-09	7.813383e+06
21	2025-10	1.063271e+07
22	2025-11	9.757031e+06
23	2025-12	6.413953e+07

Make analysis to identify if there is any unusual spikes or drops?

In [ ]:

```
# Calculate mean and standard deviation
mean = monthly_spend['Amount'].mean()
std = monthly_spend['Amount'].std()
```

```

# Flag unusual spikes or drops (anything beyond 2 standard deviations)
monthly_spend['Status'] = 'Normal'
monthly_spend.loc[monthly_spend['Amount'] > mean + 2 * std, 'Status'] = '🔴 Spike'
monthly_spend.loc[monthly_spend['Amount'] < mean - 2 * std, 'Status'] = '🔵 Drop'

print(monthly_spend)
print(f"\nSpikes found: {monthly_spend['Status'] == '🔴 Spike'].sum()}")
print(f"Drops found: {monthly_spend['Status'] == '🔵 Drop'].sum()}")

```

# ChatGPT was used to assist with the calculations to identify spikes and drops.

	Year-Month	Amount	Status
0	2024-01	4.896775e+09	🔴 Spike
1	2024-02	4.270621e+09	🔴 Spike
2	2024-03	1.274519e+09	Normal
3	2024-04	8.736380e+08	Normal
4	2024-05	6.897208e+08	Normal
5	2024-06	1.060150e+08	Normal
6	2024-07	4.241811e+07	Normal
7	2024-08	3.826718e+07	Normal
8	2024-09	1.635173e+07	Normal
9	2024-10	1.872280e+07	Normal
10	2024-11	1.914611e+07	Normal
11	2024-12	6.240248e+07	Normal
12	2025-01	1.821038e+09	Normal
13	2025-02	1.329143e+09	Normal
14	2025-03	1.965283e+09	Normal
15	2025-04	2.545400e+08	Normal
16	2025-05	1.051972e+08	Normal
17	2025-06	1.649399e+08	Normal
18	2025-07	2.698955e+07	Normal
19	2025-08	2.984112e+07	Normal
20	2025-09	7.813383e+06	Normal
21	2025-10	1.063271e+07	Normal
22	2025-11	9.757031e+06	Normal
23	2025-12	6.413953e+07	Normal

Spikes found: 2

Drops found: 0