# Python_Bank_Loan_Project

August 30, 2025

## 1 Bank Loan Analysis Project

### 1.1 Importing Libraries

[2]:
```
import pandas as pd
import numpy as pn
import matplotlib.pyplot as plt
import seaborn as sb
import warnings
import plotly.express as px
```

### 1.2 Importing Data

[3]:
```
df = pd.read_excel("C:/Users/vivid/OneDrive/Desktop/Data Analysis Projects/
 ↪Python Project/financial_loan.xlsx")
```

[3]:
```
df.head()
```

[3]:
```
        id address_state application_type emp_length              emp_title  \
0  1077430            GA       INDIVIDUAL   < 1 year                  Ryder
1  1072053            CA       INDIVIDUAL    9 years         MKC Accounting
2  1069243            CA       INDIVIDUAL    4 years  Chemat Technology Inc
3  1041756            TX       INDIVIDUAL   < 1 year    barnes distribution
4  1068350            IL       INDIVIDUAL  10+ years          J&J Steel Inc

  grade home_ownership issue_date last_credit_pull_date last_payment_date  \
0     C           RENT 2021-02-11            2021-09-13        2021-04-13
1     E           RENT 2021-01-01            2021-12-14        2021-01-15
2     C           RENT 2021-01-05            2021-12-12        2021-01-09
3     B       MORTGAGE 2021-02-25            2021-12-12        2021-03-12
4     A       MORTGAGE 2021-01-01            2021-12-14        2021-01-15

   … sub_grade        term  verification_status annual_income     dti  \
0  …        C4   60 months      Source Verified       30000.0  0.0100
1  …        E1   36 months      Source Verified       48000.0  0.0535
2  …        C5   36 months         Not Verified       50000.0  0.2088
3  …        B2   60 months      Source Verified       42000.0  0.0540
4  …        A1   36 months             Verified       83000.0  0.0231
```

```
  installment  int_rate  loan_amount  total_acc  total_payment
0       59.83    0.1527         2500          4           1009
1      109.43    0.1864         3000          4           3939
2      421.65    0.1596        12000         11           3522
3       97.06    0.1065         4500          9           4911
4      106.53    0.0603         3500         28           3835

[5 rows x 24 columns]
```

### 1.3 Metadata of Data

[4]:

```
print("No of Rows:", df.shape[0]) # for column: shape[1]
```

```
No of Rows: 38576
```

### 1.4 Data type

[5]:

```
df.dtypes
```

[5]:

```
id                                int64
address_state                    object
application_type                 object
emp_length                       object
emp_title                        object
grade                            object
home_ownership                   object
issue_date               datetime64[ns]
last_credit_pull_date    datetime64[ns]
last_payment_date        datetime64[ns]
loan_status                      object
next_payment_date        datetime64[ns]
member_id                         int64
purpose                          object
sub_grade                        object
term                             object
verification_status              object
annual_income                   float64
dti                             float64
installment                     float64
int_rate                        float64
loan_amount                       int64
total_acc                         int64
total_payment                     int64
dtype: object
```

[6]:

```
df.describe()
```

```
[6]:                    id                     issue_date  \
     count  3.857600e+04                          38576   
     mean   6.810371e+05  2021-07-16 02:31:35.562007040   
     min    5.473400e+04            2021-01-01 00:00:00   
     25%    5.135170e+05            2021-04-11 00:00:00   
     50%    6.627280e+05            2021-07-11 00:00:00   
     75%    8.365060e+05            2021-10-11 00:00:00   
     max    1.077501e+06            2021-12-12 00:00:00   
     std    2.113246e+05                            NaN   

                    last_credit_pull_date              last_payment_date  \
     count                          38576                          38576   
     mean   2021-06-08 13:36:34.193280512  2021-06-26 09:52:08.909166080   
     min              2021-01-08 00:00:00            2021-01-08 00:00:00   
     25%              2021-04-15 00:00:00            2021-03-16 00:00:00   
     50%              2021-05-16 00:00:00            2021-06-14 00:00:00   
     75%              2021-08-13 00:00:00            2021-09-15 00:00:00   
     max              2022-01-20 00:00:00            2021-12-15 00:00:00   
     std                              NaN                            NaN   

                        next_payment_date     member_id  annual_income  \
     count                          38576  3.857600e+04   3.857600e+04   
     mean   2021-07-26 20:42:20.605557760  8.476515e+05   6.964454e+04   
     min              2021-02-08 00:00:00  7.069900e+04   4.000000e+03   
     25%              2021-04-16 00:00:00  6.629788e+05   4.150000e+04   
     50%              2021-07-14 00:00:00  8.473565e+05   6.000000e+04   
     75%              2021-10-15 00:00:00  1.045652e+06   8.320050e+04   
     max              2022-01-15 00:00:00  1.314167e+06   6.000000e+06   
     std                              NaN  2.668105e+05   6.429368e+04   

                     dti   installment      int_rate   loan_amount     total_acc  \
     count  38576.000000  38576.000000  38576.000000  38576.000000  38576.000000   
     mean       0.133274    326.862965      0.120488  11296.066855     22.132544   
     min        0.000000     15.690000      0.054200    500.000000      2.000000   
     25%        0.082100    168.450000      0.093200   5500.000000     14.000000   
     50%        0.134200    283.045000      0.118600  10000.000000     20.000000   
     75%        0.185900    434.442500      0.145900  15000.000000     29.000000   
     max        0.299900   1305.190000      0.245900  35000.000000     90.000000   
     std        0.066662    209.092000      0.037164   7460.746022     11.392282   

            total_payment  
     count   38576.000000  
     mean    12263.348533  
     min        34.000000  
     25%      5633.000000  
     50%     10042.000000  
     75%     16658.000000  
```

```
max     58564.000000
std      9051.104777
```

## 1.5 1. Total Loan Applications

[7]:

```python
total_loan_applications = df['id'].count()
print('Total Loan Applications:', total_loan_applications)
```

```
Total Loan Applications: 38576
```

## 1.6 Month-To-Date Total Loan Applications

[9]:

```python
latest_issue_date = df['issue_date'].max()
latest_year = latest_issue_date.year
latest_month = latest_issue_date.month

mtd_data = df[(df['issue_date'].dt.year == latest_year) & (df['issue_date'].dt.
  ↪month == latest_month)]

mtd_loan_applications = mtd_data['id'].count()

print(f"MTD Loan Applications for {latest_issue_date.strftime('%B %Y')} :
  ↪{mtd_loan_applications}")
```

```
MTD Loan Applications for December 2021 :4314
```

## 1.7 2. Total Funded Amount

[10]:

```python
total_funded_amount = df['loan_amount'].sum()
print('Total Funded Amount:', total_funded_amount)
```

```
Total Funded Amount 435757075
```

### 1.7.1 Formatting

[14]:

```python
total_funded_amount = df['loan_amount'].sum()
total_funded_amount_millions = total_funded_amount / 1000000
print('Total Funded Amount: ${:.2f}M'.format(total_funded_amount_millions))
```

```
Total Funded Amount: $435.76M
```

## 1.8 Month-To-Date Total Funded Amount

[18]:

```python
latest_issue_date = df['issue_date'].max()
latest_year = latest_issue_date.year
latest_month = latest_issue_date.month

mtd_data = df[(df['issue_date'].dt.year == latest_year) & (df['issue_date'].dt.
  ↪month == latest_month)]
```

```
mtd_total_funded_amount = mtd_data['loan_amount'].sum()
mtd_total_funded_amount_millions = mtd_total_funded_amount / 1000000

print('MTD Total Funded Amount: ${:.2f}M'.
  ↪format(mtd_total_funded_amount_millions))
```

```
MTD Total Funded Amount: $53.98M
```

## 1.9 3. Total Amount Received

[19]:
```
total_amount_received = df['total_payment'].sum()
total_amount_received_millions = total_amount_received / 1000000
print('Total Amount Received: ${:.2f}M'.format(total_amount_received_millions))
```

```
Total Amount Received: $473.07M
```

## 1.10 MTD Total Amount Received

[20]:
```
latest_issue_date = df['issue_date'].max()
latest_year = latest_issue_date.year
latest_month = latest_issue_date.month

mtd_data = df[(df['issue_date'].dt.year == latest_year) & (df['issue_date'].dt.
  ↪month == latest_month)]

mtd_total_amount_received = mtd_data['total_payment'].sum()
mtd_total_amount_received_millions = mtd_total_amount_received / 1000000

print('MTD Total Amount Received: ${:.2f}M'.
  ↪format(mtd_total_amount_received_millions))
```

```
MTD Total Amount Received: $58.07M
```

## 1.11 4. Average Interest Rate

[21]:
```
avg_int_rate = df['int_rate'].mean()
print('Average Interest Rate: ',  avg_int_rate)
```

```
Average Interest Rate:  0.12048831397760265
```

### 1.11.1 Formatting

[23]:
```
avg_int_rate = df['int_rate'].mean() * 100
print('Average Interest Rate: {:.2f}%'.format(avg_int_rate))
```

```
Average Interest Rate: 12.05%
```

## 1.12 5. Average Debt-To-Income Ratio

[24]:

```
avg_dti_rate = df['dti'].mean()* 100
print('Average DTI Rate: {:.2f}%'.format(avg_dti_rate))
```

```
Average DTI Rate: 13.33%
```

## 1.13 6. Good Loan Metrics

[6]:

```
good_loans = df[df['loan_status'].isin(['Fully Paid', 'Current'])] # getting␣
  ↪good loan values

total_loan_applications = df['id'].count()

good_loan_applications = good_loans['id'].count()
good_loan_funded_amount = good_loans['loan_amount'].sum()
good_loan_received = good_loans['total_payment'].sum()

good_loan_funded_amount_millions = good_loan_funded_amount / 1000000
good_loan_received_millions = good_loan_received / 1000000

good_loan_percentage = (good_loan_applications/total_loan_applications) * 100

print('Good Loan Applications:', good_loan_applications)
print('Good Loan Funded Amount: ${:.2f}M'.
  ↪format(good_loan_funded_amount_millions))
print('Good Loan Received: ${:.2f}M'.format(good_loan_received_millions))
print('Good Loan Percentage: {:.2f}%'.format(good_loan_percentage))
```

```
Good Loan Applications: 33243
Good Loan Funded Amount: $370.22M
Good Loan Received: $435.79M
Good Loan Percentage: 86.18%
```

## 1.14 7. Bad Loan Metrics

[7]:

```
bad_loans = df[df['loan_status'].isin(['Charged Off'])] # getting bad loan␣
  ↪values

total_loan_applications = df['id'].count()

bad_loan_applications = bad_loans['id'].count()
bad_loan_funded_amount = bad_loans['loan_amount'].sum()
bad_loan_yet_to_receive = bad_loans['total_payment'].sum()

bad_loan_funded_amount_millions = bad_loan_funded_amount / 1000000
bad_loan_yet_to_receive_millions = bad_loan_yet_to_receive / 1000000
```

```
bad_loan_percentage = (bad_loan_applications/total_loan_applications)*100

print('Bad Loan Applications: ', bad_loan_applications)
print('Bad Loan Funded Amount: ${:.2f}M'.
 ↪format(bad_loan_funded_amount_millions))
print('Bad Loan Yet to Receive: ${:.2f}M'.
 ↪format(bad_loan_yet_to_receive_millions))
print('Bad Loan Percentage: {:.2f}%'.format(bad_loan_percentage))
```

```
Bad Loan Applications:  5333
Bad Loan Funded Amount: $65.53M
Bad Loan Yet to Receive: $37.28M
Bad Loan Percentage: 13.82%
```

# 2 Charts

## 2.1 1. Monthly Trends

### 2.1.1 a. Monthly Trends by Issue Date for Total Funded Amount

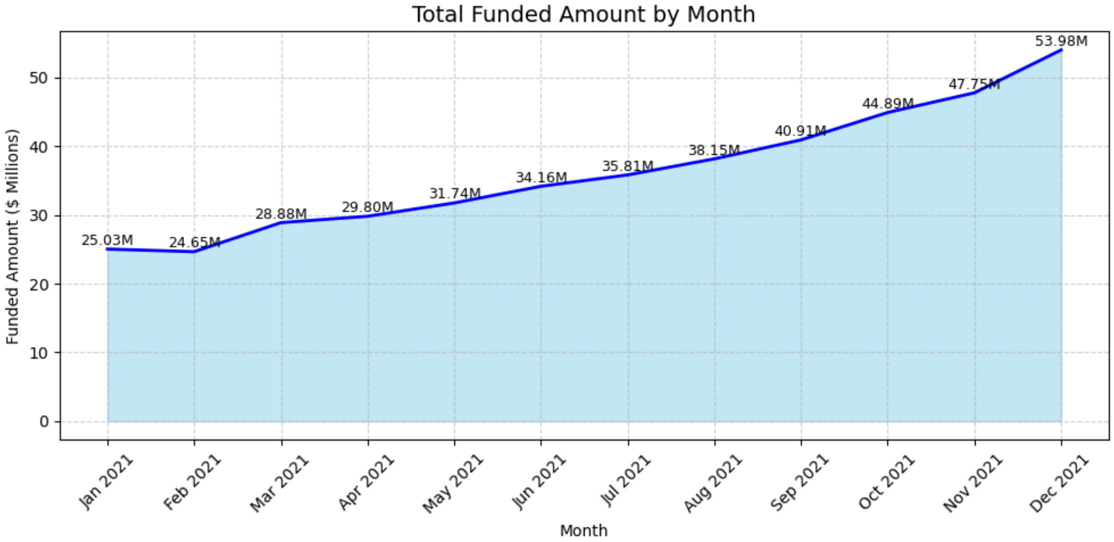
[21]:

```
monthly_funded = (
    df.sort_values('issue_date')
    .assign(month_name=lambda x:x['issue_date'].dt.strftime('%b %Y'))
    .groupby('month_name', sort=False)['loan_amount']
    .sum()
    .div(1000000)
    .reset_index(name='loan_amount_millions')
)

plt.figure(figsize=(10,5))
plt.fill_between(monthly_funded['month_name'],␣
 ↪monthly_funded['loan_amount_millions'], color = 'skyblue', alpha=0.5)
plt.plot(monthly_funded['month_name'], monthly_funded['loan_amount_millions'],␣
 ↪color = 'blue', linewidth=2)

for i, row in monthly_funded.iterrows():
    plt.text(i,row['loan_amount_millions']+0.1, f"{row['loan_amount_millions']:.
 ↪2f}M",
            ha='center', va='bottom', fontsize=9, rotation=0, color='black')

plt.title('Total Funded Amount by Month', fontsize=14)
plt.xlabel('Month')
plt.ylabel('Funded Amount ($ Millions)')
plt.xticks(ticks=range(len(monthly_funded)),␣
 ↪labels=monthly_funded['month_name'], rotation=45)
plt.grid(True, linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



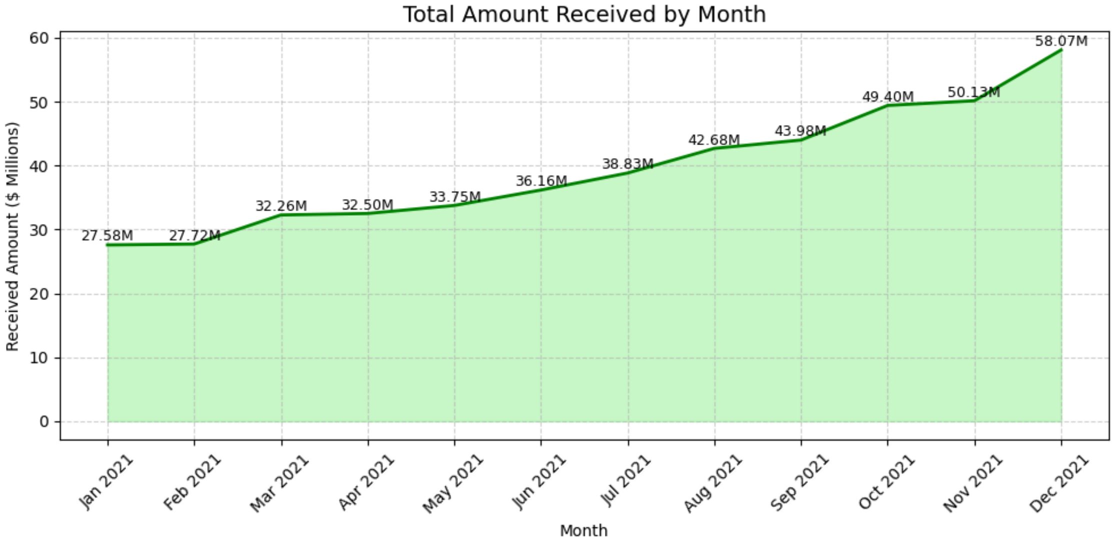
### 2.1.2 b. Monthly Trends by Issue Date for Total Amount Received

[22]:
```
monthly_received = (
    df.sort_values('issue_date')
    .assign(month_name=lambda x:x['issue_date'].dt.strftime('%b %Y'))
    .groupby('month_name', sort=False)['total_payment']
    .sum()
    .div(1000000)
    .reset_index(name='amount_received_millions')
)

plt.figure(figsize=(10,5))
plt.fill_between(monthly_received['month_name'],␣
 ↪monthly_received['amount_received_millions'], color = 'lightgreen', alpha=0.
 ↪5)
plt.plot(monthly_received['month_name'],␣
 ↪monthly_received['amount_received_millions'], color = 'green', linewidth=2)

for i, row in monthly_received.iterrows():
    plt.text(i,row['amount_received_millions']+0.1,␣
 ↪f"{row['amount_received_millions']:.2f}M",
             ha='center', va='bottom', fontsize=9, rotation=0, color='black')

plt.title('Total Amount Received by Month', fontsize=14)
plt.xlabel('Month')
plt.ylabel('Received Amount ($ Millions)')
plt.xticks(ticks=range(len(monthly_received)),␣
↪labels=monthly_received['month_name'], rotation=45)
plt.grid(True, linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



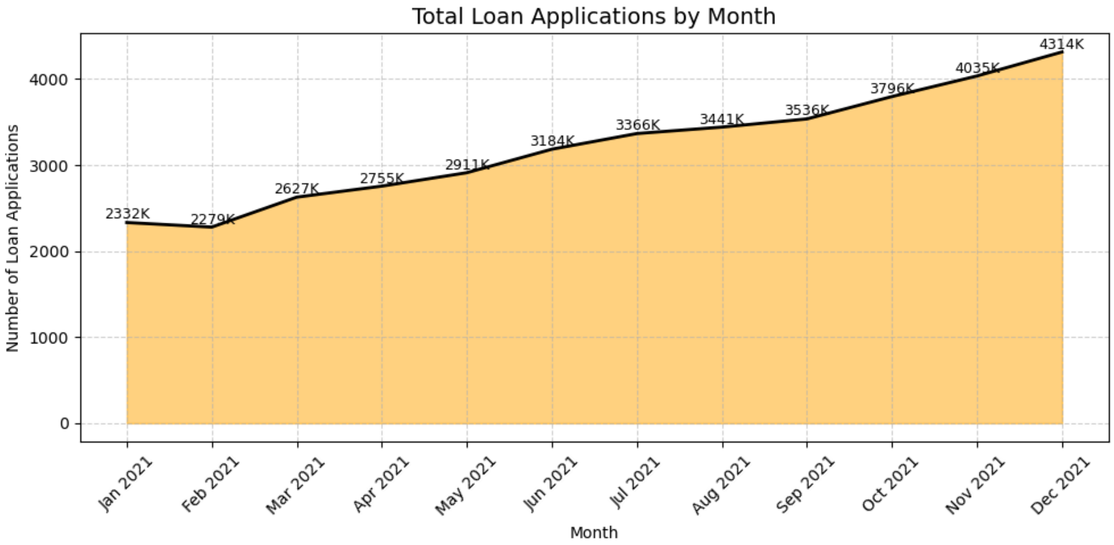
### 2.1.3 c. Monthly Trends by Issue Date for Total Loan Applications

[23]:
```
monthly_applications = (
    df.sort_values('issue_date')
     .assign(month_name=lambda x:x['issue_date'].dt.strftime('%b %Y'))
     .groupby('month_name', sort=False)['id']
     .count()
     .reset_index(name='loan_applications_count')
)

plt.figure(figsize=(10,5))
plt.fill_between(monthly_applications['month_name'],␣
↪monthly_applications['loan_applications_count'], color = 'orange', alpha=0.5)
plt.plot(monthly_applications['month_name'],␣
↪monthly_applications['loan_applications_count'], color = 'black',␣
↪linewidth=2)

for i, row in monthly_applications.iterrows():
    plt.text(i,row['loan_applications_count']+0.5,␣
↪f"{row['loan_applications_count']}K",
            ha='center', va='bottom', fontsize=9, rotation=0, color='black')
```

```
plt.title('Total Loan Applications by Month', fontsize=14)
plt.xlabel('Month')
plt.ylabel('Number of Loan Applications')
plt.xticks(ticks=range(len(monthly_applications)),␣
 ↪labels=monthly_applications['month_name'], rotation=45)
plt.grid(True, linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



## 2.2 2. Regional Analysis

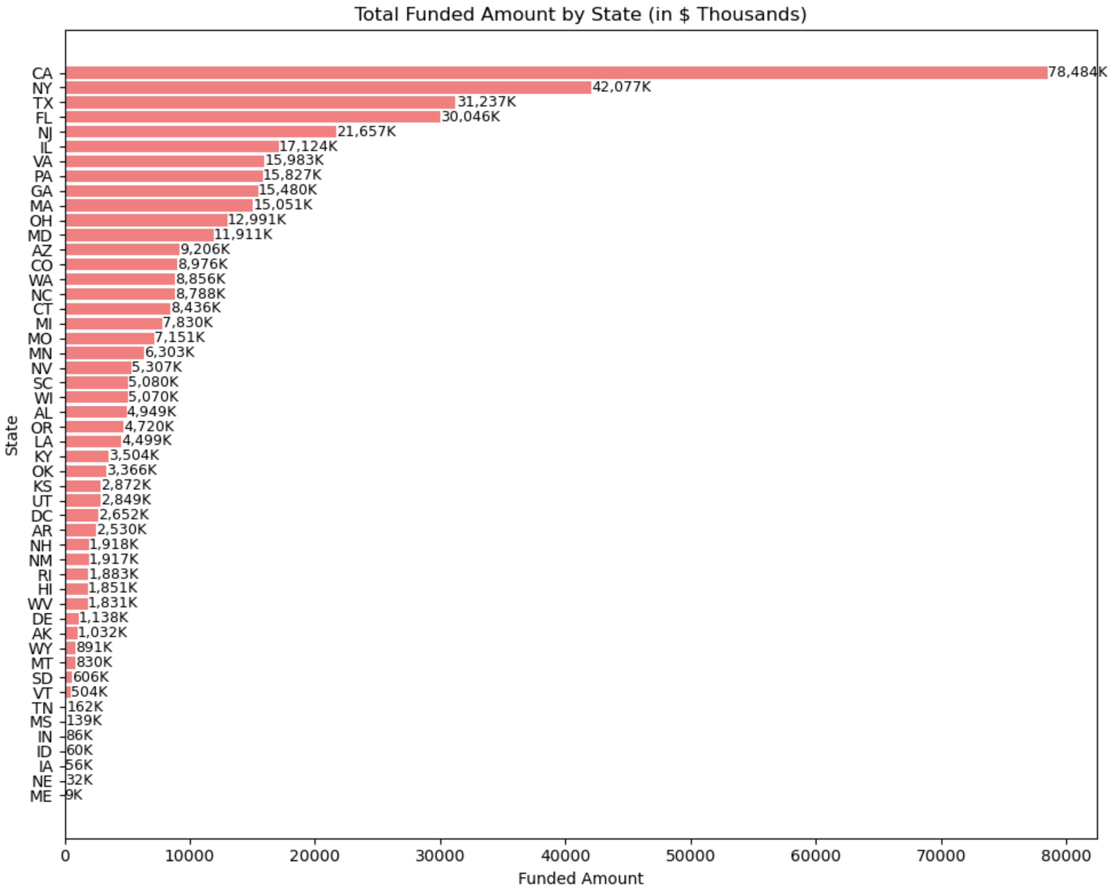
### 2.2.1 a. Regional Analysis by State for Total Funded Amount

[27]:
```
state_funding = df.groupby('address_state')['loan_amount'].sum().
 ↪sort_values(ascending=True)
state_funding_thousands = state_funding / 1000

plt.figure(figsize=(10, 8))
bars = plt.barh(state_funding_thousands.index, state_funding_thousands.values,␣
 ↪color='lightcoral')

for bar in bars:
    width = bar.get_width()
    plt.text(width + 10, bar.get_y() + bar.get_height()/2,
             f'{width:,.0f}K', va='center', fontsize=9)

plt.title('Total Funded Amount by State (in $ Thousands)')
plt.xlabel('Funded Amount')
plt.ylabel('State')
plt.tight_layout()
plt.show()
```



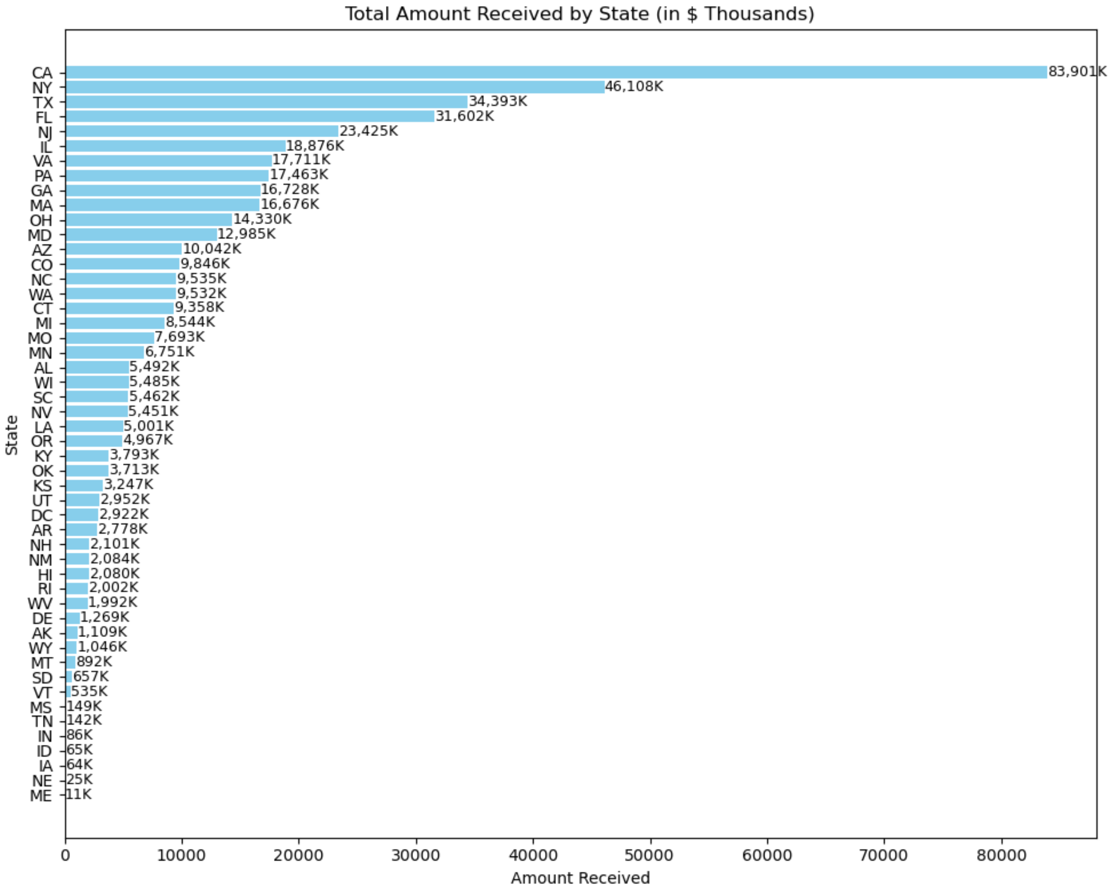
### 2.2.2 b. Regional Analysis by State for Total Amount Received

[35]:
```
state_amount_received = df.groupby('address_state')['total_payment'].sum().sort_values(ascending=True)
state_amount_received_thousands = state_funding / 1000

plt.figure(figsize=(10, 8))
bars = plt.barh(state_amount_received_thousands.index, state_amount_received_thousands.values, color='skyblue')

for bar in bars:
    width = bar.get_width()
    plt.text(width + 10, bar.get_y() + bar.get_height()/2,
             f'{width:,.0f}K', va='center', fontsize=9)
```

```
plt.title('Total Amount Received by State (in $ Thousands)')
plt.xlabel('Amount Received')
plt.ylabel('State')
plt.tight_layout()
plt.show()
```

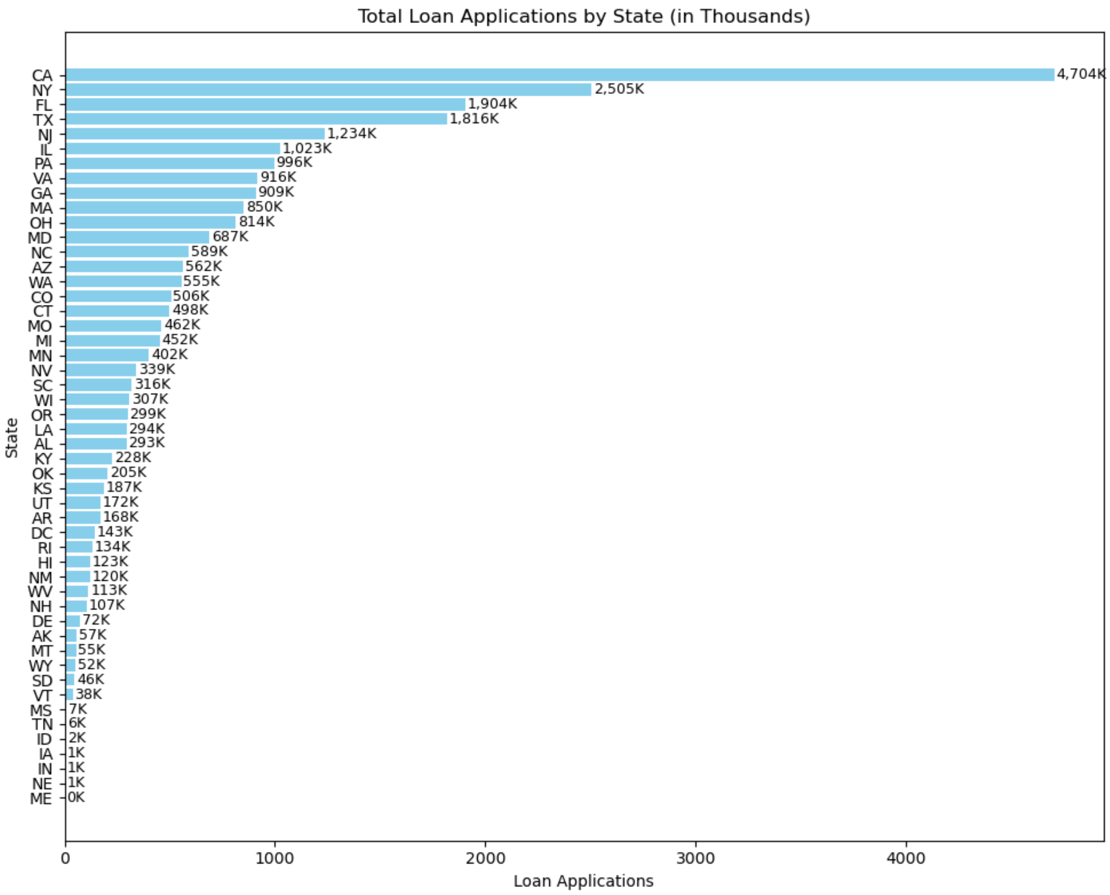


### 2.2.3 c. Regional Analysis by State for Total Loan Applications

[6]:
```
loan_applications = df.groupby('address_state')['id'].sum().
↪sort_values(ascending=True)
loan_applications_thousands = loan_applications/1000000
plt.figure(figsize=(10, 8))
bars = plt.barh(loan_applications_thousands.index, loan_applications_thousands.
↪values, color='skyblue')

for bar in bars:
    width = bar.get_width()
    plt.text(width + 10, bar.get_y() + bar.get_height()/2,
             f'{width:,.0f}K', va='center', fontsize=9)

plt.title('Total Loan Applications by State (in Thousands)')
plt.xlabel('Loan Applications')
plt.ylabel('State')
plt.tight_layout()
plt.show()
```



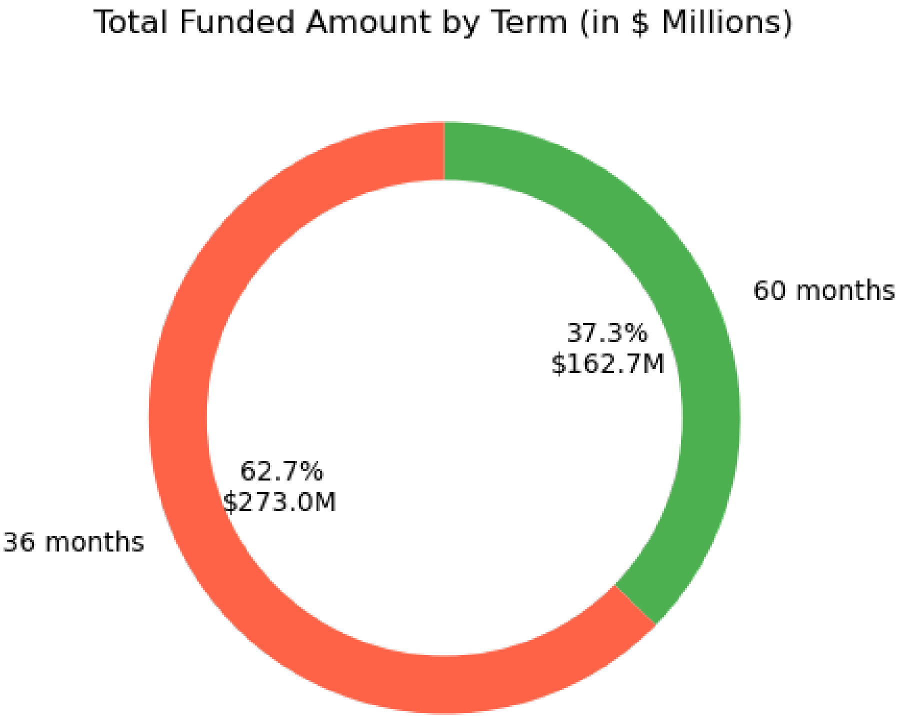
## 2.3 3. Loan Term Analysis

### 2.3.1 c. Loan Term Analysis by Total Funded Amount

[95]:
```
term_funding_millions = df.groupby('term')['loan_amount'].sum()/1000000

colors = ['#FF6347', '#4CAF50', '#FFEB3B', '#2196F3']

plt.figure(figsize=(5,5))
plt.pie(
    term_funding_millions,
    labels=term_funding_millions.index,
    autopct=lambda p:f'{p:.1f}%\n${p*sum(term_funding_millions)/100:.1f}M',
    startangle=90, wedgeprops={'width':0.4},
    colors=colors
)
plt.gca().add_artist(plt.Circle((0, 0), 0.80, color='white'))
plt.title('Total Funded Amount by Term (in $ Millions)')
plt.show()
```



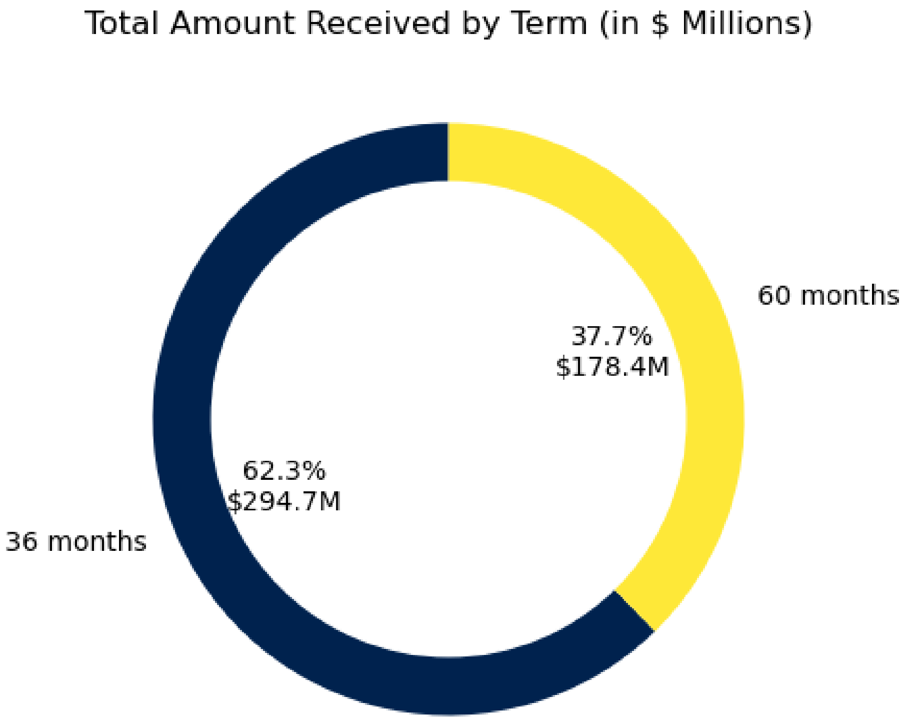
### 2.3.2 b. Loan Term Analysis by Total Amount Received

[93]:
```
term_funding_millions = df.groupby('term')['total_payment'].sum()/1000000

colors = plt.cm.cividis(pn.linspace(0,1,len(loan_applications_thousands)))
plt.figure(figsize=(5,5))

plt.figure(figsize=(5,5))
plt.pie(
    term_funding_millions,
    labels=term_funding_millions.index,
    autopct=lambda p:f'{p:.1f}%\n${p*sum(term_funding_millions)/100:.1f}M',
    startangle=90, wedgeprops={'width':0.4},
    colors=colors
)
plt.gca().add_artist(plt.Circle((0, 0), 0.80, color='white'))
plt.title('Total Amount Received by Term (in $ Millions)')
plt.show()
```

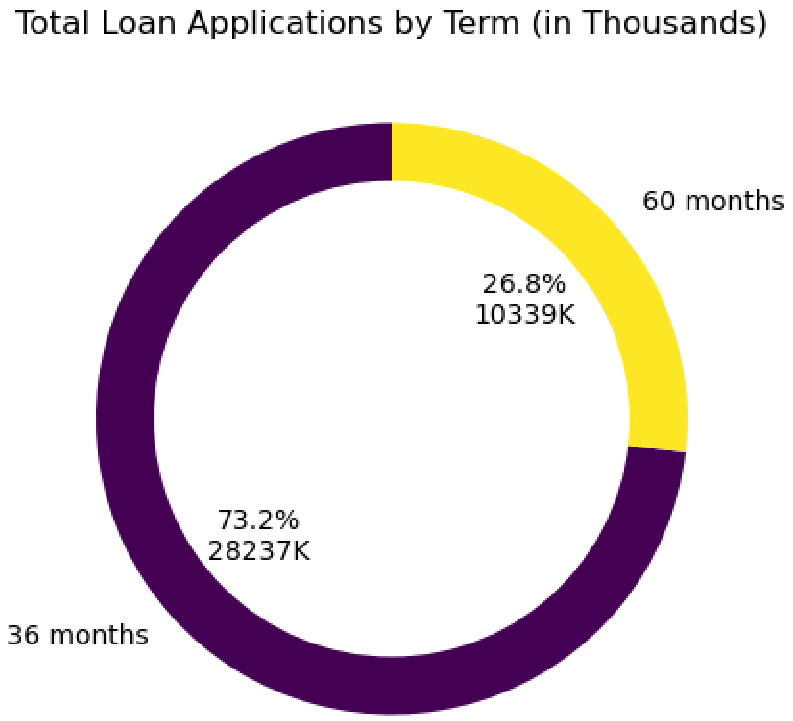
```
<Figure size 500x500 with 0 Axes>
```



### 2.3.3 c. Loan Term Analysis by Total Loan Applications

[91]:
```
loan_applications_thousands = df.groupby('term')['id'].count()

colors = plt.cm.viridis(pn.linspace(0,1,len(loan_applications_thousands)))
plt.figure(figsize=(5,5))
plt.pie(
    loan_applications_thousands,
    labels=loan_applications_thousands.index,
    autopct=lambda p:f'{p:.1f}%\n{p*sum(loan_applications_thousands)/100:.0f}K',
    startangle=90, wedgeprops={'width':0.4},
    colors=colors
)
plt.gca().add_artist(plt.Circle((0, 0), 0.80, color='white'))
plt.title('Total Loan Applications by Term (in Thousands)')
plt.show()
```



## 2.4 4. Employment Length Analysis

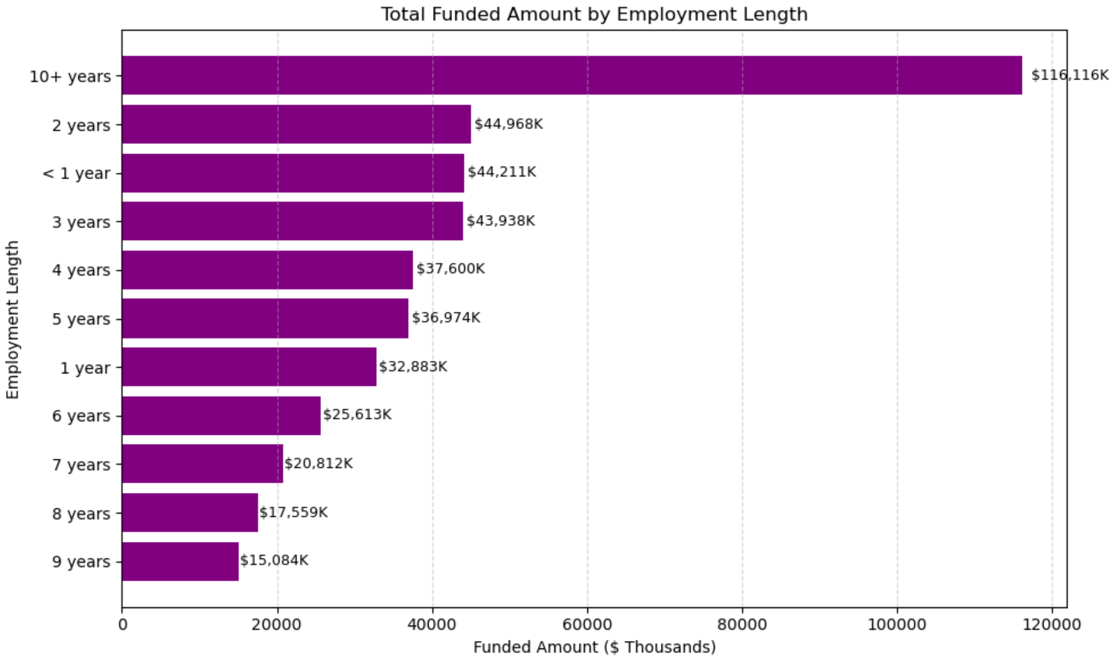
### 2.4.1 a. Employment Length Analysis by Total Funded Amount

[66]:
```
emp_funding = df.groupby('emp_length')['loan_amount'].sum().sort_values()/1000

plt.figure(figsize=(10,6))
bars = plt.barh(emp_funding.index, emp_funding, color='purple')

for bar in bars:
    width = bar.get_width()
    plt.text(width + width * 0.01, bar.get_y()+ bar.get_height()/2,
            f'${width:,.0f}K', va='center', fontsize=9)

plt.xlabel('Funded Amount ($ Thousands)')
plt.ylabel('Employment Length')
plt.title('Total Funded Amount by Employment Length')
plt.grid(axis='x', linestyle='--', alpha=0.5)
plt.tight_layout()
plt.show()
```



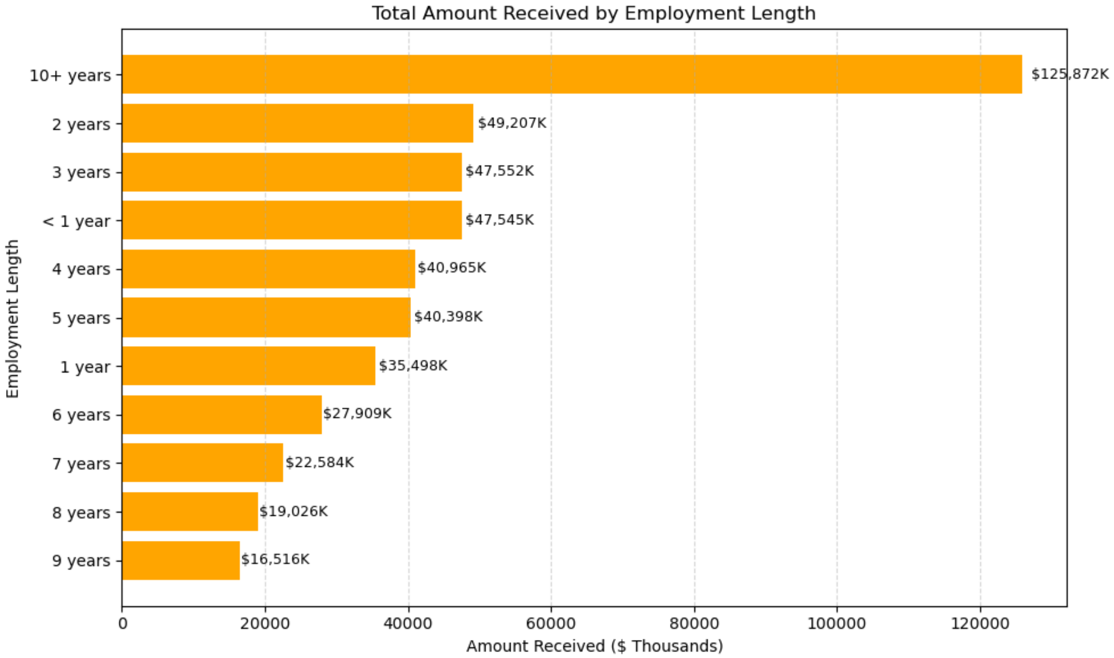
### 2.4.2 b. Employment Length Analysis by Total Amount Received

[64]:
```
emp_amt_received = df.groupby('emp_length')['total_payment'].sum().
 ↪sort_values()/1000

plt.figure(figsize=(10,6))
bars = plt.barh(emp_amt_received.index, emp_amt_received, color='orange')

for bar in bars:
    width = bar.get_width()
    plt.text(width + width * 0.01, bar.get_y()+ bar.get_height()/2,
            f'${width:,.0f}K', va='center', fontsize=9)

plt.xlabel('Amount Received ($ Thousands)')
plt.ylabel('Employment Length')
plt.title('Total Amount Received by Employment Length')
plt.grid(axis='x', linestyle='--', alpha=0.5)
plt.tight_layout()
plt.show()
```



### 2.4.3 c. Employment Length Analysis by Total Loan Applications

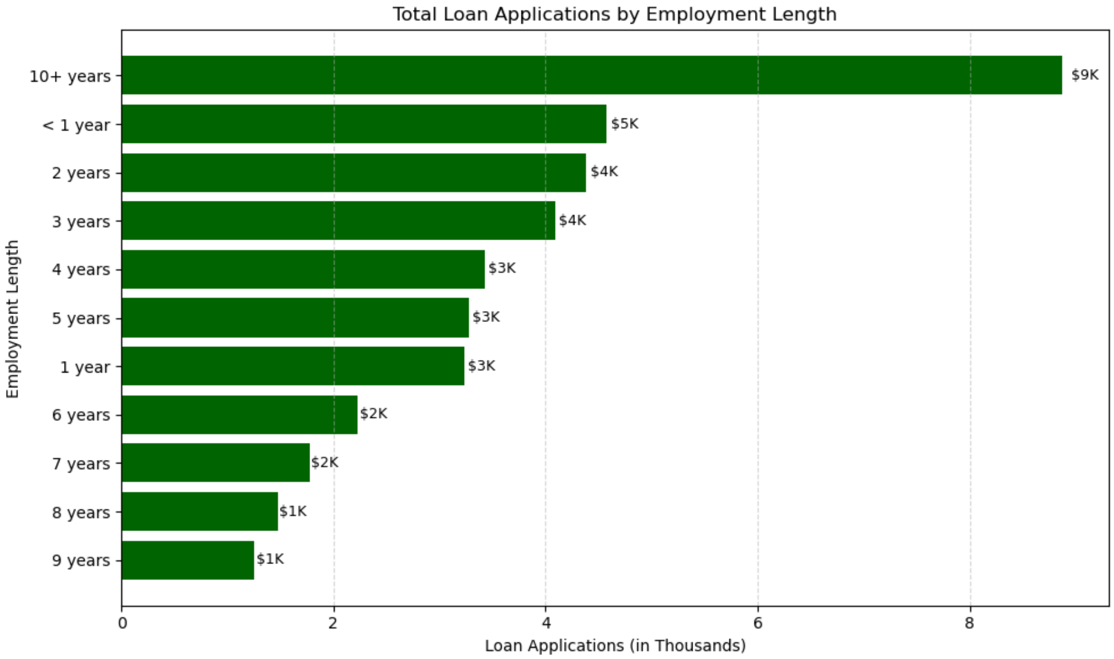
[67]:

```
emp_loan_app = df.groupby('emp_length')['id'].count().sort_values()/1000

plt.figure(figsize=(10,6))
bars = plt.barh(emp_loan_app.index, emp_loan_app, color='darkgreen')

for bar in bars:
    width = bar.get_width()
    plt.text(width + width * 0.01, bar.get_y()+ bar.get_height()/2,
            f'${width:,.0f}K', va='center', fontsize=9)

plt.xlabel('Loan Applications (in Thousands)')
plt.ylabel('Employment Length')
plt.title('Total Loan Applications by Employment Length')
plt.grid(axis='x', linestyle='--', alpha=0.5)
plt.tight_layout()
plt.show()
```



## 2.5 5. Loan Purpose Analysis

### 2.5.1 a. Loan Purpose by Total Funded Amount

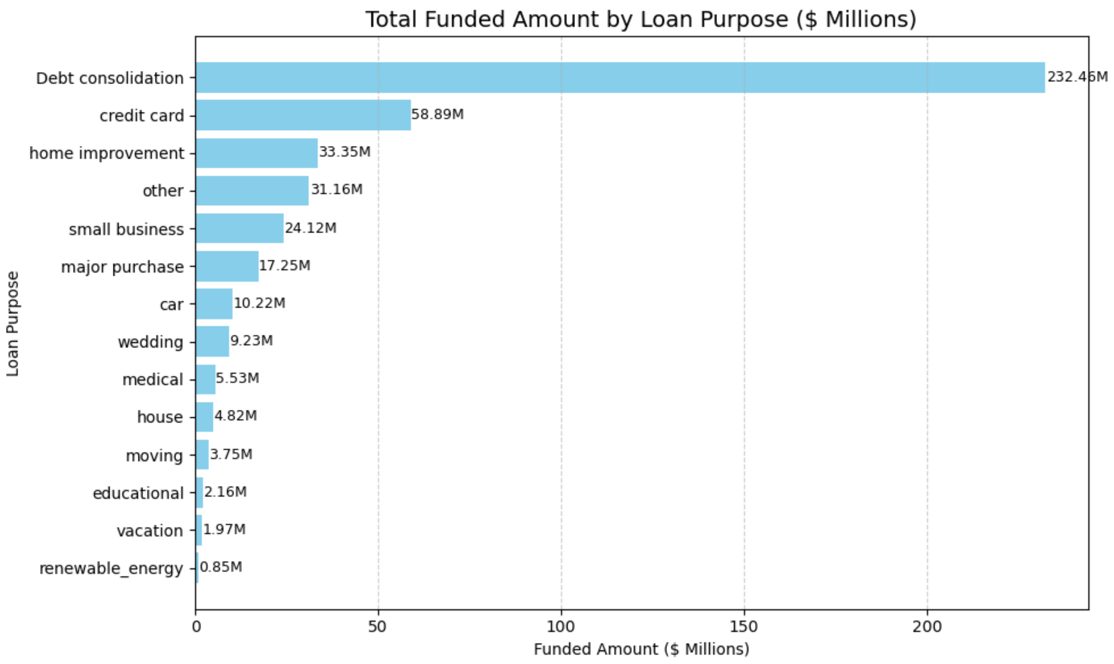
[68]:

```
purpose_funding_millions = (df.groupby('purpose')['loan_amount'].sum().
 ↪sort_values()/1000000)

plt.figure(figsize=(10, 6))
bars = plt.barh(purpose_funding_millions.index, purpose_funding_millions.
 ↪values, color='skyblue')

for bar in bars:
    width = bar.get_width()
    plt.text(width + 0.1, bar.get_y()+ bar.get_height()/2,
            f'{width:.2f}M', va='center', fontsize=9)

plt.title('Total Funded Amount by Loan Purpose ($ Millions)', fontsize=14)
plt.xlabel('Funded Amount ($ Millions)')
plt.ylabel('Loan Purpose')
plt.grid(axis='x', linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



### 2.5.2 b. Loan Purpose by Total Amount Received

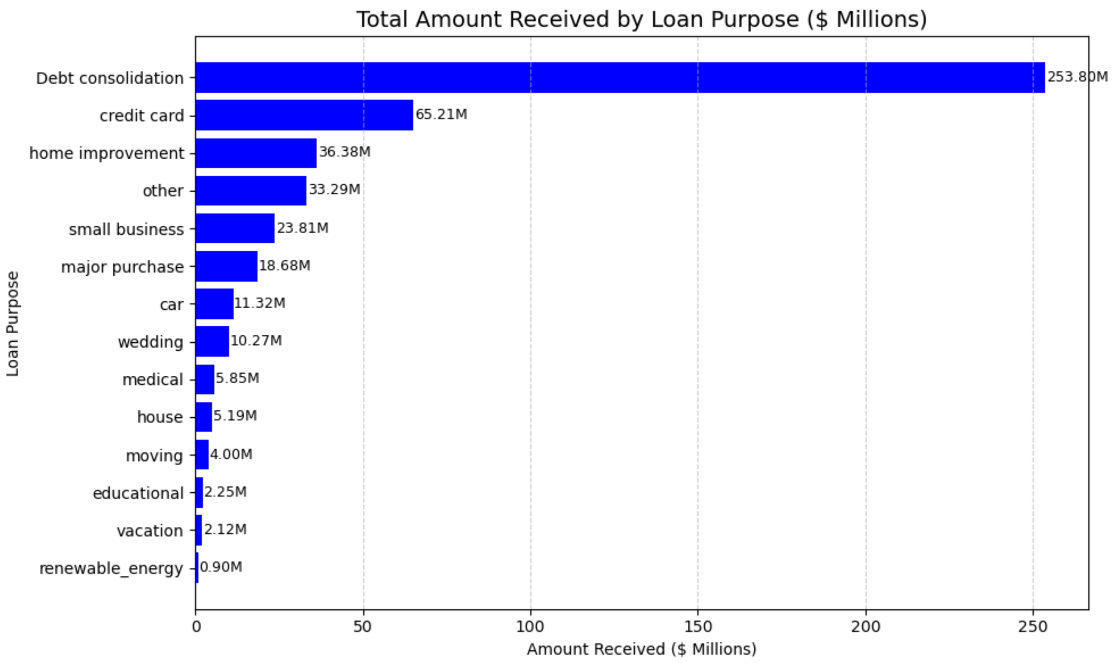
[70]:

```
purpose_amt_millions = (df.groupby('purpose')['total_payment'].sum().
 ↪sort_values()/1000000)

plt.figure(figsize=(10, 6))
bars = plt.barh(purpose_amt_millions.index, purpose_amt_millions.values,␣
 ↪color='blue')

for bar in bars:
    width = bar.get_width()
    plt.text(width + 0.1, bar.get_y()+ bar.get_height()/2,
            f'{width:.2f}M', va='center', fontsize=9)

plt.title('Total Amount Received by Loan Purpose ($ Millions)', fontsize=14)
plt.xlabel('Amount Received ($ Millions)')
plt.ylabel('Loan Purpose')
plt.grid(axis='x', linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



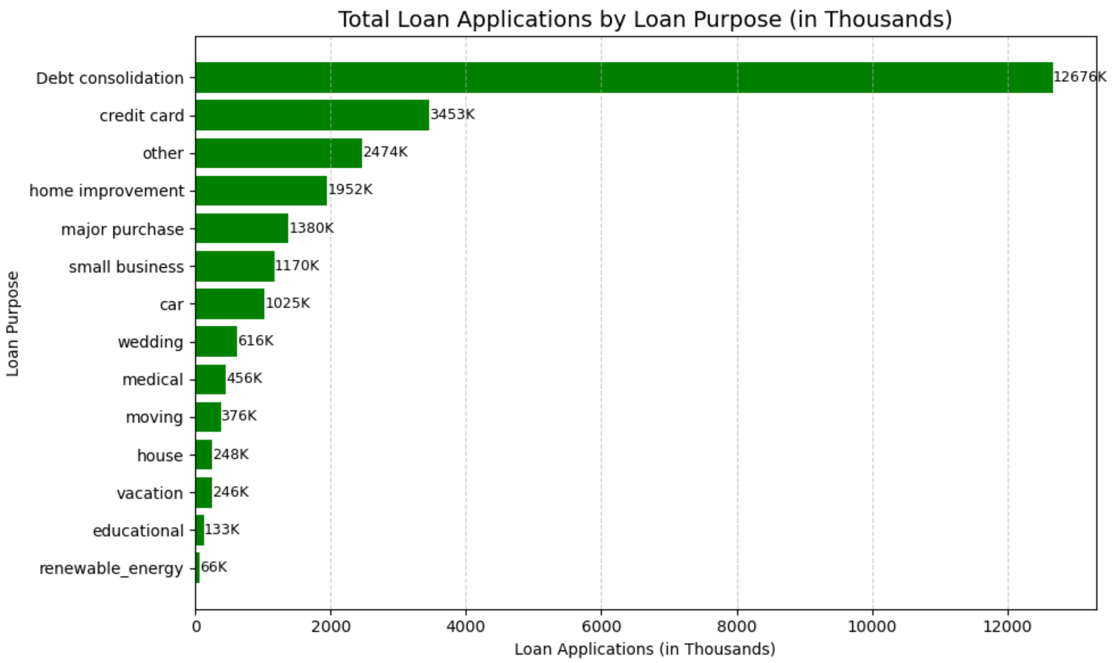
### 2.5.3 c. Loan Purpose by Total Loan Applications

[74]:
```
purpose_app_thousands = (df.groupby('purpose')['id'].sum().sort_values()/
  ↪1000000)

plt.figure(figsize=(10, 6))
bars = plt.barh(purpose_app_thousands.index, purpose_app_thousands.values,␣
  ↪color='green')

for bar in bars:
    width = bar.get_width()
    plt.text(width + 0.1, bar.get_y()+ bar.get_height()/2,
            f'{width:.0f}K', va='center', fontsize=9)

plt.title('Total Loan Applications by Loan Purpose (in Thousands)', fontsize=14)
plt.xlabel('Loan Applications (in Thousands)')
plt.ylabel('Loan Purpose')
plt.grid(axis='x', linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



## 2.6 6. Home-ownership Analysis

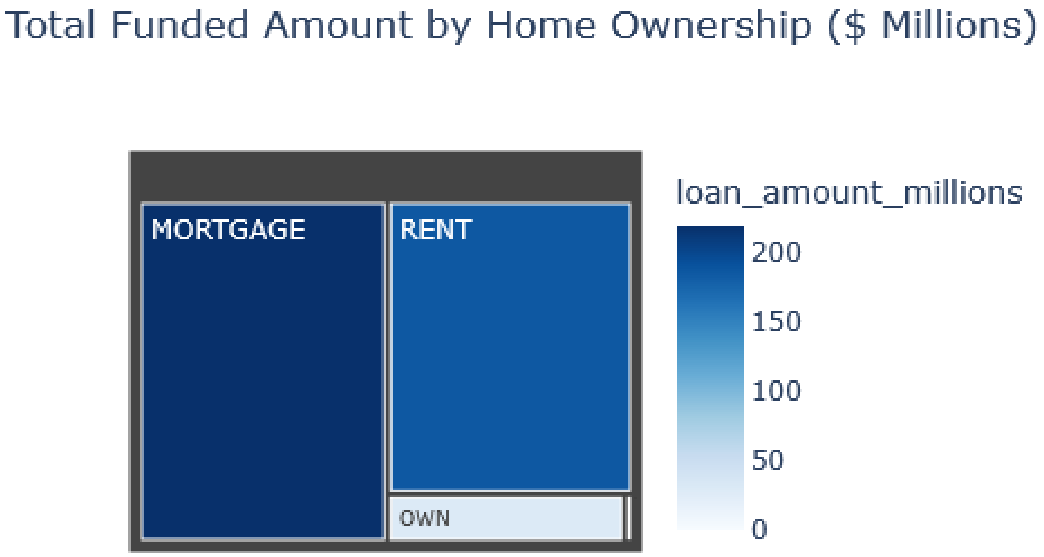
### 2.6.1 a. Home-ownership by Total Funded Amount

[81]:

```
home_funding = df.groupby('home_ownership')['loan_amount'].sum().reset_index()
home_funding['loan_amount_millions'] = home_funding['loan_amount']/1000000

fig = px.treemap(
    home_funding,
    path=['home_ownership'],
    values='loan_amount_millions',
    color='loan_amount_millions',
    color_continuous_scale='Blues',
    title='Total Funded Amount by Home Ownership ($ Millions)',
    hover_data={'loan_amount_millions': ':,.2f'}
)
fig.update_traces(
    hovertemplate='%{label}: $%{value:.2f}M<extra></extra>'
)

fig.show()
```



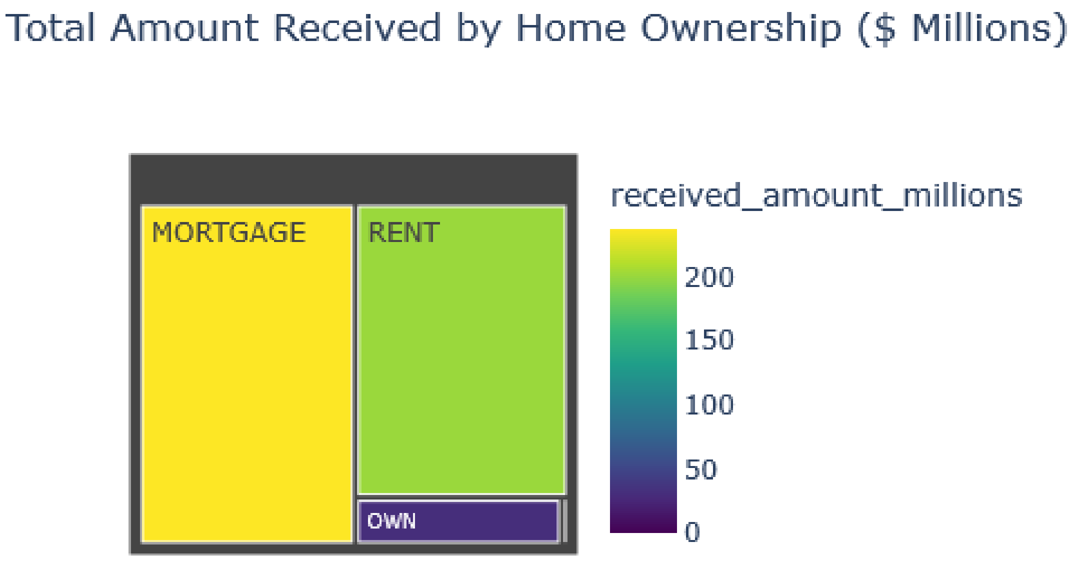
### 2.6.2 b. Home Ownership by Total Amount Received

[82]:

```
home_funding = df.groupby('home_ownership')['total_payment'].sum().reset_index()
home_funding['received_amount_millions'] = home_funding['total_payment']/1000000

fig = px.treemap(
    home_funding,
    path=['home_ownership'],
    values='received_amount_millions',
    color='received_amount_millions',
    color_continuous_scale='Viridis',
    title='Total Amount Received by Home Ownership ($ Millions)',
    hover_data={'received_amount_millions': ':,.2f'}
)
fig.update_traces(
    hovertemplate='%{label}: $%{value:.2f}M<extra></extra>'
)

fig.show()
```



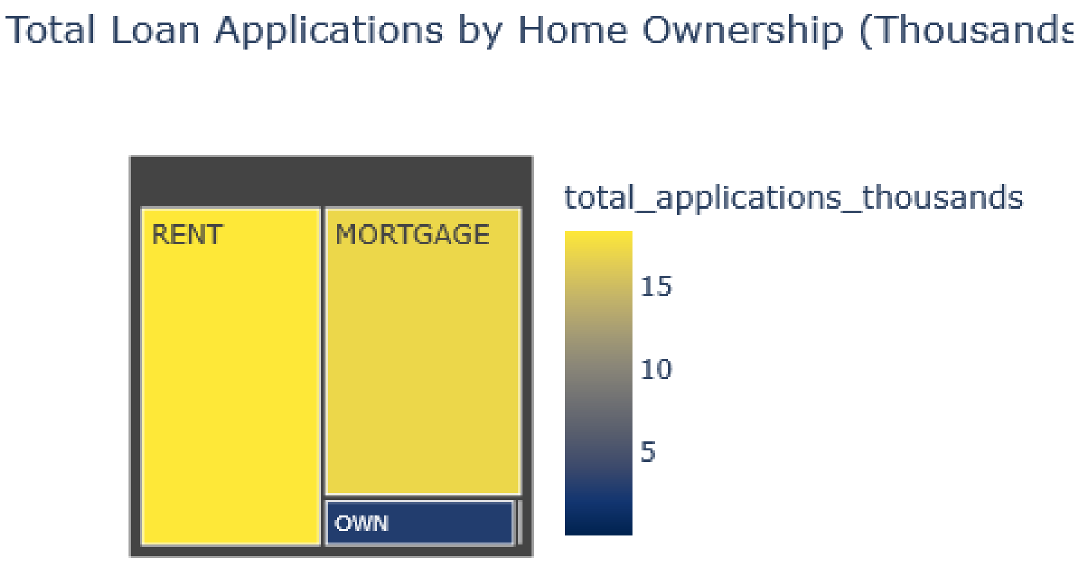
### 2.6.3 c. Home Ownership by Total Loan Applications

[88]:

```
home_funding_app = df.groupby('home_ownership')['id'].count().reset_index()
home_funding_app['total_applications_thousands'] = home_funding_app['id']/1000

fig = px.treemap(
    home_funding_app,
    path=['home_ownership'],
    values='total_applications_thousands',
    color='total_applications_thousands',
    color_continuous_scale='Cividis',
    title='Total Loan Applications by Home Ownership (Thousands)',
    hover_data={'total_applications_thousands': ':,.2f'}
)
fig.update_traces(
    hovertemplate='%{label}: %{value:.0f}K<extra></extra>'
)

fig.show()
```



Total Loan Applications by Home Ownership (Thousands

[ ]: