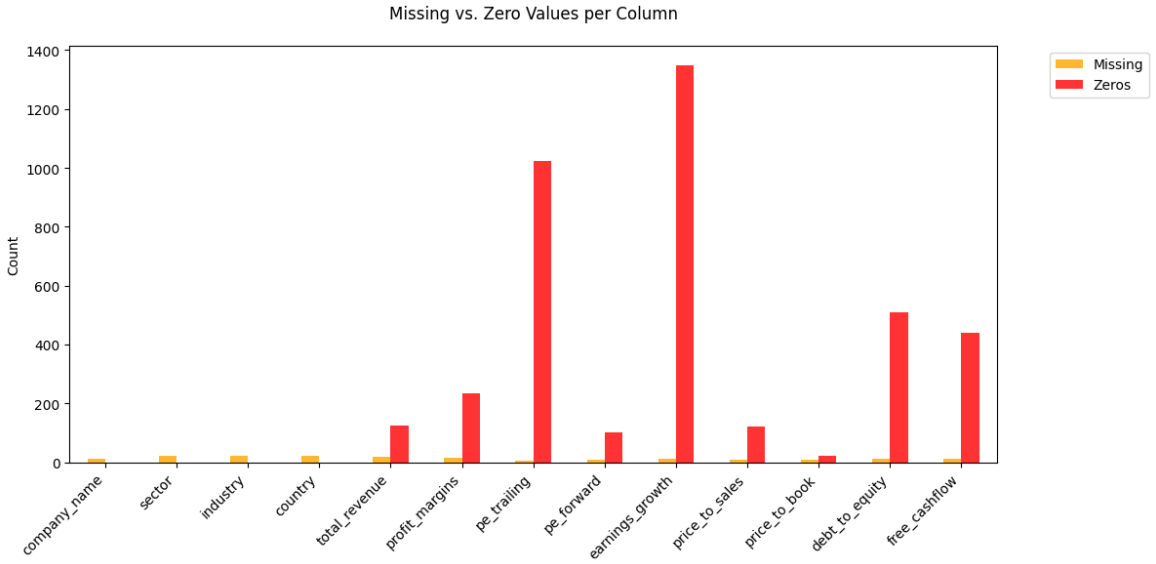
General info and Data preparation

Name: Thomas Alfio Drury

Company: PulteGroup, Inc.

In [85]:
```
##################################################
# Libraries
##################################################

import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

##################################################
# Preparing the datset
##################################################

original_df = pd.read_csv("Symbols_info_modified.csv", sep=",")

# Select relevant columns
selected_columns = [
    'symbol', 'company_name','sector','industry','country','market_
    'net_income', 'total_revenue', 'return_on_assets', 'return_on_e
    'profit_margins', 'pe_trailing', 'pe_forward', 'earnings_growth
    'price_to_sales', 'price_to_book', 'revenue_growth',
    'debt_to_equity', 'dividend_yield', 'payout_ratio', 'free_cashf
]

df = original_df[selected_columns]

# Counting the  useless info
missing = df.isnull().sum()
zeros = (df == 0).sum()


counts = pd.DataFrame({"Missing": missing, "Zeros": zeros}).loc[mis

##################################################
# Graphic rappresentation of null values
##################################################

fig, ax = plt.subplots(figsize=(12, 6))
counts.plot(kind="bar", ax=ax, color=["#FFA500", "#FF0000"], alpha=
plt.title("Missing vs. Zero Values per Column", pad=20)
plt.xticks(rotation=45, ha="right")
plt.ylabel("Count")
plt.legend(bbox_to_anchor=(1.05, 1), loc="upper left")
plt.tight_layout()
plt.show()
```

```
#####################################################
# Actually cleaning
#####################################################


df.dropna(inplace=True)  # Remove rows with any missing values

df = df[(df != 0).all(axis=1)]  # Drops rows with any zero
```




```
/var/folders/ly/bs3tr6xj7_l2c36k8x0nslhc0000gn/T/ipykernel_83558/154
4324476.py:52: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pand
as-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
py
```

In [86]:

```
#####################################################
# Company. PulteGroup
#####################################################

company_name = "PulteGroup, Inc."
company_data = df[df['company_name'] == company_name][selected_colu

print(company_data.info()) #  cheking if my comapny is in the datas


#####################################################
# Creating the metrics of interest
#####################################################

# Metric for Profitability
df['Net Profit Margin'] = df['net_income'] / df['total_revenue']
df['ROA'] = df['return_on_assets']
df['ROE'] = df['return_on_equity']
df['Profit Margins'] = df['profit_margins']
```

```python
# Metric for Valuation
df['P/E Trailing'] = df['pe_trailing']
df['P/E Forward'] = df['pe_forward']
df['PEG Ratio'] = df['pe_forward'] / df['earnings_growth']
df['Price/Sales'] = df['price_to_sales']
df['Price/Book'] = df['price_to_book']

# Metric for Efficiency
df['Revenue Growth'] = df['revenue_growth']
df['Earnings Growth'] = df['earnings_growth']

# Metric for Financial Strength
df['Debt/Equity'] = df['debt_to_equity']
df['Dividend Yield'] = df['dividend_yield']
df['Payout Ratio'] = df['payout_ratio']
df['Free Cash Flow'] = df['free_cashflow']

# Metrics requested
metrics_of_interest = [
    'symbol', 'company_name','sector','industry','country','market_
    'Net Profit Margin', 'ROA', 'ROE', 'Profit Margins',
    'P/E Trailing', 'P/E Forward', 'PEG Ratio', 'Price/Sales', 'Pri
    'Revenue Growth', 'Earnings Growth',
    'Debt/Equity', 'Dividend Yield', 'Payout Ratio', 'Free Cash Flo
]

# Final Dataframe
df_metrics = df[metrics_of_interest]
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 1 entries, 2230 to 2230
Data columns (total 21 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   symbol            1 non-null      object
 1   company_name      1 non-null      object
 2   sector            1 non-null      object
 3   industry          1 non-null      object
 4   country           1 non-null      object
 5   market_cap        1 non-null      int64
 6   net_income        1 non-null      uint64
 7   total_revenue     1 non-null      float64
 8   return_on_assets  1 non-null      float64
 9   return_on_equity  1 non-null      float64
 10  profit_margins    1 non-null      float64
 11  pe_trailing       1 non-null      float64
 12  pe_forward        1 non-null      float64
 13  earnings_growth   1 non-null      float64
 14  price_to_sales    1 non-null      float64
 15  price_to_book     1 non-null      float64
 16  revenue_growth    1 non-null      float64
 17  debt_to_equity    1 non-null      float64
 18  dividend_yield    1 non-null      float64
 19  payout_ratio      1 non-null      float64
 20  free_cashflow     1 non-null      float64
dtypes: float64(14), int64(1), object(5), uint64(1)
memory usage: 176.0+ bytes
None
```

In [87]:

```python
import plotly.express as px
import country_converter as coco # this library is used to convert c
# it is an alterative approach to 'TypeofChart2' in which we re-nam

# documentation: 'https://github.com/IndEcol/country_converter'



country_counts = df.groupby('country')['symbol'].nunique().reset_in

# Using the above library to convert the country names to ISO3 in o
cc = coco.CountryConverter()
country_counts['alpha-3'] = country_counts['country'].apply(
    lambda x: cc.convert(names=x, to='ISO3', not_found=None)
)
country_counts['region'] = country_counts['country'].apply(
    lambda x: cc.convert(names=x, to='continent', not_found=None)
)

# Remove country with no info
country_counts = country_counts[country_counts['alpha-3'].notna()]

#  Create a Choropleth Map for All Countries
fig = px.choropleth(
    country_counts,
    locations="alpha-3",
```

```
    color="ncompany",
    hover_name="country",
    custom_data=["region", "country"],
    color_continuous_scale=px.colors.sequential.Viridis,
    labels={'ncompany': 'Number of Companies'},
    title="Number of Companies by Country after Cleaning Dataset",
)

# Customize the coursor name  when click on a country
fig.update_traces(
    marker_line_color='black',
    marker_line_width=1,
    hovertemplate=(
        "<b>%{hovertext}</b><br>"
        "Companies: %{z}<br>"
        "Region: %{customdata[0]}<br>"
        "Country: %{customdata[1]}<extra></extra>"
    )
)

fig.update_geos(showcountries=True, showcoastlines=True)
fig.update_layout(margin={"r":0,"t":40,"l":0,"b":0})
fig.show()
```

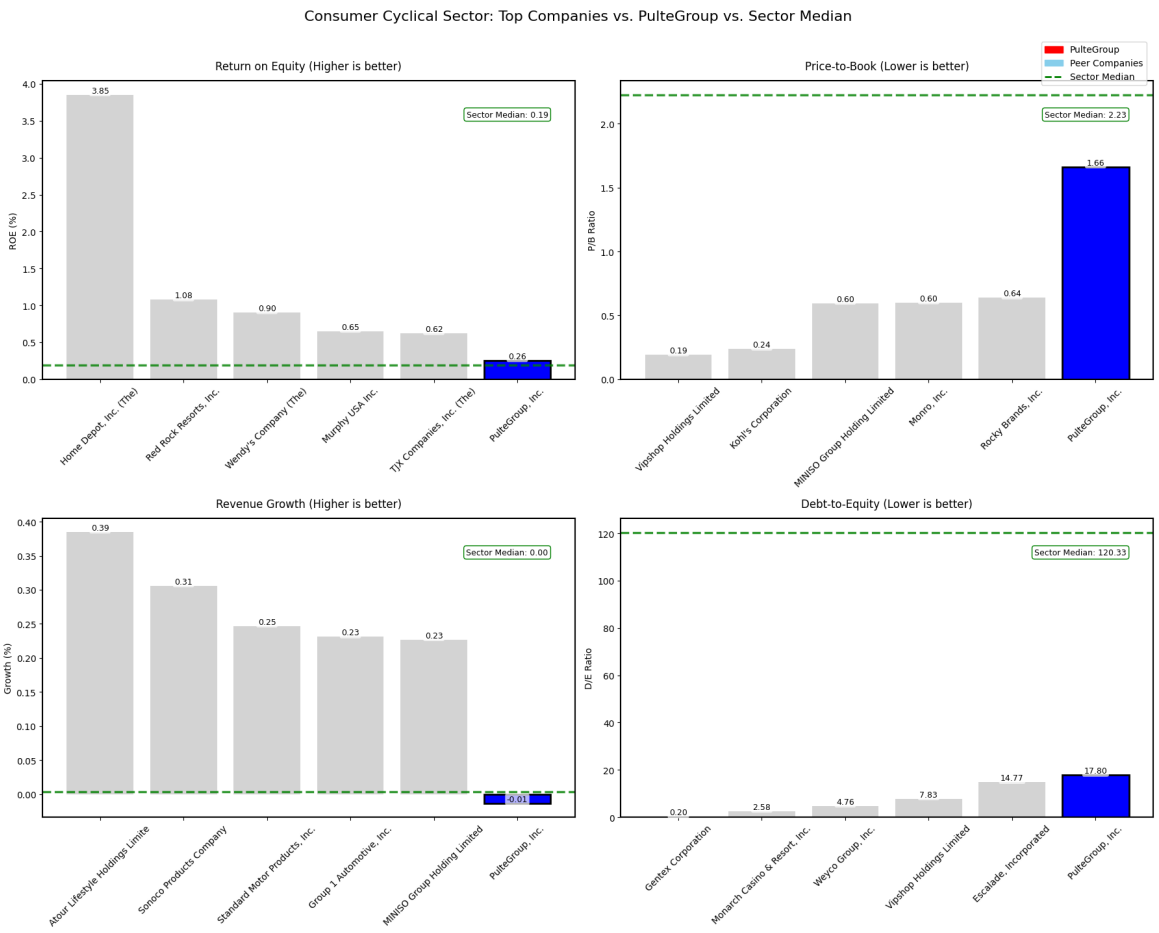
Creating Barcharts

In [88]:

```
#  company name of interest (id:473)
my_company_P = "PulteGroup, Inc."


# Metric that I choose for the analysis
metrics_for_analysis = ['ROE', 'Price/Book', 'Revenue Growth', 'Debt

# Filter the sector of interest (of Pultre)
sector_companies = df_metrics[df_metrics['sector'] == 'Consumer Cyc

# Computing the median for the graph of Consumer Cyclical Sector
sector_medians = sector_companies[metrics_for_analysis].median()

# getting the top 5 companies and adding Pultre
def add_P_if_need(sorted_df, metric, ascending=False, top_n=5):
    top_companies = sorted_df.sort_values(by=metric, ascending=asce
    my_company_P_row = sector_companies[sector_companies['company_na
    if not my_company_P_row.empty and my_company_P not in top_compa
        top_companies = pd.concat([top_companies, my_company_P_row]
    return top_companies.sort_values(by=metric, ascending=ascending

# Preparing data for each metric and ordering in ascending or desce
Roe_sector = add_P_if_need(sector_companies, 'ROE', ascending=False
Price_sector = add_P_if_need(sector_companies, 'Price/Book', ascend
Revenue_sector = add_P_if_need(sector_companies, 'Revenue Growth', a
Debt_sector = add_P_if_need(sector_companies, 'Debt/Equity', ascend

##################################################
```

```
# Graph
################################################
fig, axes = plt.subplots(2, 2, figsize=(18, 14))
fig.suptitle('Consumer Cyclical Sector: Top Companies vs. PulteGrou
             fontsize=16, y=1.02)



def create_metric_plot(ax, data, metric, title, ylabel, ascending_r
    data = data.sort_values(by=metric, ascending=ascending_rank)

    # Colors
    colors = ['blue' if x == my_company_P else 'lightgrey' for x in
    edgecolors = ['black' if x == my_company_P else 'none' for x in
    linewidths = [2 if x == my_company_P else 0.5 for x in data['co

    bars = ax.bar(data['company_name'], data[metric],
                  color=colors, edgecolor=edgecolors, linewidth=linew

    # Add median line
    median_value = sector_medians[metric]
    ax.axhline(y=median_value, color='green', linestyle='--', linew

    # Add median text in top right with box
    ax.text(0.95, 0.90, f'Sector Median: {median_value:.2f}',
            va='top', ha='right', transform=ax.transAxes,
            bbox=dict(facecolor='white', edgecolor='green', boxstyl
            fontsize=9)


    for spine in ax.spines.values():
        spine.set_edgecolor('black')
        spine.set_linewidth(1.5)

    ax.set_title(title, pad=12)
    ax.set_ylabel(ylabel)
    ax.tick_params(axis='x', rotation=45)



    for bar in bars:
        actual_value = bar.get_height()
        display_height = actual_value   # Adjustment for visual gra

        ax.text(bar.get_x() + bar.get_width()/2., display_height,
            f'{actual_value:.2f}',  # This displays the actual valu
            ha='center', va='bottom', fontsize=9,
            bbox=dict(facecolor='white', alpha=0.7, edgecolor='none

create_metric_plot(axes[0, 0], Roe_sector, 'ROE',
                   'Return on Equity (Higher is better)', 'ROE (%)')
create_metric_plot(axes[0, 1], Price_sector, 'Price/Book',
                   'Price-to-Book (Lower is better)', 'P/B Ratio', a
create_metric_plot(axes[1, 0], Revenue_sector, 'Revenue Growth',
                   'Revenue Growth (Higher is better)', 'Growth (%)'
```

```
create_metric_plot(axes[1, 1], Debt_sector, 'Debt/Equity',
                   'Debt-to-Equity (Lower is better)', 'D/E Ratio', a

#
legend_elements = [
    plt.Rectangle((0,0),1,1, color='red', label='PulteGroup'),
    plt.Rectangle((0,0),1,1, color='skyblue', label='Peer Companies
    plt.Line2D([0], [0], color='green', linestyle='--', linewidth=2
]
fig.legend(handles=legend_elements, loc='upper right', bbox_to_anch

plt.tight_layout()
plt.show()

##################################################
# Getting the values
##################################################
print("\nConsumer Cyclical Sector Median Values:")
print(sector_medians[metrics_for_analysis].to_string())

print("\nPulteGroup's Key Metrics:")
pulte_metrics = sector_companies[sector_companies['company_name'] ==
print(pulte_metrics.to_string(index=False))
```

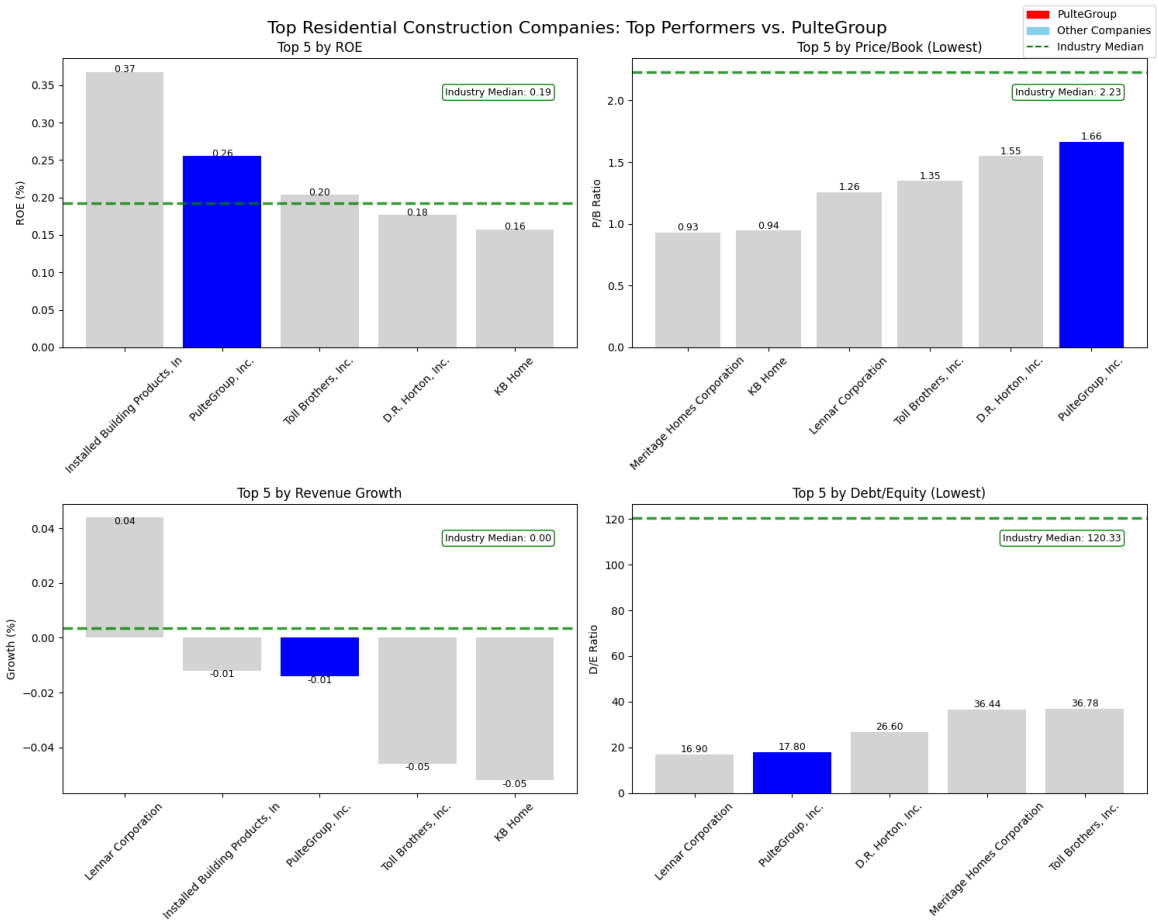


```
Consumer Cyclical Sector Median Values:
ROE                 0.192195
Price/Book          2.228358
Revenue Growth      0.003500
Debt/Equity       120.332500

PulteGroup's Key Metrics:
    ROE  Price/Book  Revenue Growth  Debt/Equity
0.25522    1.664058          -0.014       17.795
```

In [89]:

```
metrics_for_analysis = ['ROE','Price/Book','Revenue Growth','Debt/E
industry_companies = df_metrics[df_metrics['industry'] == 'Resident



# Handeling the problem that some graph will display only 4 compani
# is in the dataset twice.Lennar has actually two stocks with very

industry_companies = industry_companies.drop_duplicates(subset=['co

my_company_P = "PulteGroup, Inc."

def add_P_if_need(sorted_df, metric, ascending=False, top_n=5):
    top_companies = sorted_df.sort_values(by=metric, ascending=asce
    my_company_P_row = industry_companies[industry_companies['compa
    if not my_company_P_row.empty and my_company_P not in top_compa
        top_companies = pd.concat([top_companies, my_company_P_row]
    return top_companies.sort_values(by=metric, ascending=ascending

Roe_industry = add_P_if_need(industry_companies, metrics_for_analys
Price_industry = add_P_if_need(industry_companies, metrics_for_analy
Revenue_industry = add_P_if_need(industry_companies, metrics_for_an
Debt_industry = add_P_if_need(industry_companies, metrics_for_analy



fig, axes = plt.subplots(2, 2, figsize=(15, 12))
fig.suptitle('Top Residential Construction Companies: Top Performer


def create_metric_plot(ax, data, metric, title, ylabel, ascending_r

    data = data.sort_values(by=metric, ascending=ascending_rank)


    colors = ['blue' if x == my_company_P else 'lightgrey' for x in

    bars = ax.bar(data['company_name'], data[metric], color=colors)



    median_value = sector_medians[metric]
    ax.axhline(y=median_value, color='green', linestyle='--', linew


    ax.text(0.95, 0.90, f'Industry Median: {median_value:.2f}',
```

```
            va='top', ha='right', transform=ax.transAxes,
            bbox=dict(facecolor='white', edgecolor='green', boxstyl
            fontsize=9)

    ax.set_title(title)
    ax.set_ylabel(ylabel)
    ax.tick_params(axis='x', rotation=45)


    for bar in bars:
        actual_value = bar.get_height()
        display_height = actual_value - 0.0033

        ax.text(bar.get_x() + bar.get_width()/2., display_height,
                f'{actual_value:.2f}',  # This displays the actual
                ha='center', va='bottom', fontsize=9)


create_metric_plot(axes[0, 0], Roe_industry, metrics_for_analysis[0
                   f'Top 5 by {metrics_for_analysis[0]}', 'ROE (%)')
create_metric_plot(axes[0, 1], Price_industry, metrics_for_analysis
                   f'Top 5 by {metrics_for_analysis[1]} (Lowest)', '
create_metric_plot(axes[1, 0], Revenue_industry, metrics_for_analys
                   f'Top 5 by {metrics_for_analysis[2]}', 'Growth (%
create_metric_plot(axes[1, 1], Debt_industry, metrics_for_analysis[
                   f'Top 5 by {metrics_for_analysis[3]} (Lowest)', '


legend_elements = [
    plt.Rectangle((0,0),1,1, color='red', label='PulteGroup'),
    plt.Rectangle((0,0),1,1, color='skyblue', label='Other Companie
    plt.Line2D([0], [0], color='green', linestyle='--', label='Indu
]
fig.legend(handles=legend_elements, loc='upper right')

plt.tight_layout()
plt.show()


pulte_metrics = industry_companies[industry_companies['company_name
print("\nPulteGroup's Key Metrics in Residential Construction:")
print(pulte_metrics.to_string(index=False))


print("\nResidential Construction Industry Medians:")
print(sector_medians.to_string())
```




```
PulteGroup's Key Metrics in Residential Construction:
    ROE  Price/Book  Revenue Growth  Debt/Equity
0.25522    1.664058          -0.014       17.795

Residential Construction Industry Medians:
ROE                  0.192195
Price/Book           2.228358
Revenue Growth       0.003500
Debt/Equity        120.332500
```

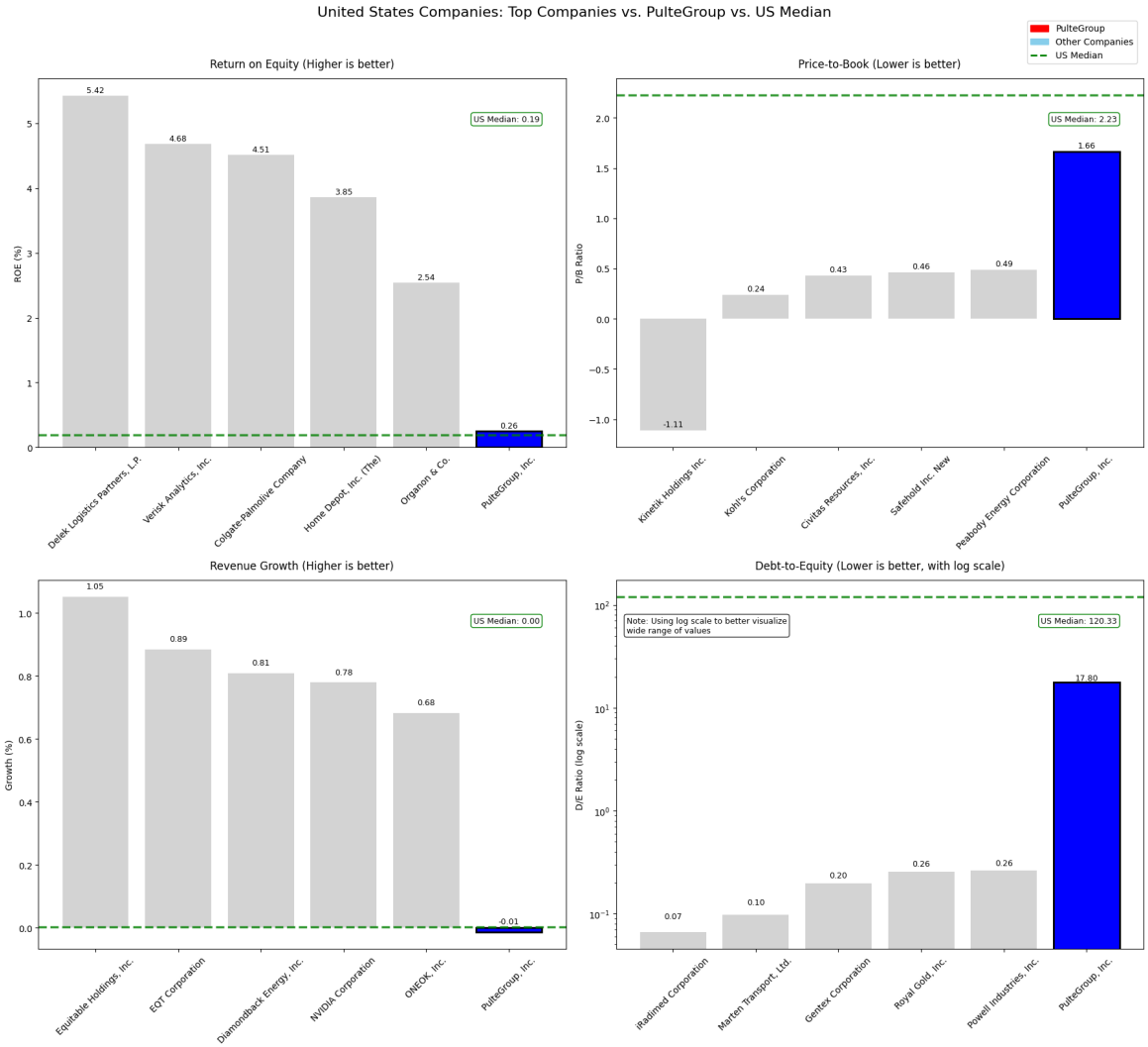
In [90]:
```
print(industry_companies['company_name'].value_counts())
```

```
company_name
D.R. Horton, Inc.                   1
Installed Building Products, In     1
KB Home                             1
Lennar Corporation                  1
Meritage Homes Corporation          1
PulteGroup, Inc.                    1
Toll Brothers, Inc.                 1
Name: count, dtype: int64
```

In [91]:
```
# United States (where is based Pultre Group)
us_companies = df_metrics[df_metrics['country'] == 'United States']
us_medians = us_companies[metrics_for_analysis].median()



def add_P_if_need(sorted_df, metric, ascending=False, top_n=5):
    top_companies = sorted_df.sort_values(by=metric, ascending=asce
    my_company_P_row = us_companies[us_companies['company_name'] ==
```

```
    if not my_company_P_row.empty and my_company_P not in top_compa
        top_companies = pd.concat([top_companies, my_company_P_row]
    return top_companies.sort_values(by=metric, ascending=ascending

Roe_us = add_P_if_need(us_companies, 'ROE', ascending=False)
Price_us = add_P_if_need(us_companies, 'Price/Book', ascending=True
Revenue_us = add_P_if_need(us_companies, 'Revenue Growth', ascendin
Debt_us = add_P_if_need(us_companies, 'Debt/Equity', ascending=True


fig, axes = plt.subplots(2, 2, figsize=(18, 16))
fig.suptitle('United States Companies: Top Companies vs. PulteGroup
             fontsize=16, y=1.02)

def create_metric_plot(ax, data, metric, title, ylabel, ascending_r
    data = data.sort_values(by=metric, ascending=ascending_rank)

    colors = ['blue' if x == my_company_P else 'lightgrey' for x in
    edgecolors = ['black' if x == my_company_P else 'none' for x in
    linewidths = [2 if x == my_company_P else 0.5 for x in data['co

    bars = ax.bar(data['company_name'], data[metric],
                  color=colors, edgecolor=edgecolors, linewidth=linew


    median_value = sector_medians[metric]
    ax.axhline(y=median_value, color='green', linestyle='--', linew


    ax.text(0.95, 0.90, f'US Median: {median_value:.2f}',
            va='top', ha='right', transform=ax.transAxes,
            bbox=dict(facecolor='white', edgecolor='green', boxstyl
            fontsize=9)

    # Set logarithmic scale needed to handle problem related to gra
    if log_scale:
        ax.set_yscale('log')
        ylabel += " (log scale)"

    ax.set_title(title, pad=12)
    ax.set_ylabel(ylabel)
    ax.tick_params(axis='x', rotation=45)


    for bar in bars:
        actual_value = bar.get_height()
        display_height = actual_value + 0.02  # Adjustment for visu

        ax.text(bar.get_x() + bar.get_width()/2., display_height,
                f'{actual_value:.2f}',  # This displays the actual
                ha='center', va='bottom', fontsize=9)


create_metric_plot(axes[0, 0], Roe_us, 'ROE',
                   'Return on Equity (Higher is better)', 'ROE (%)')
create_metric_plot(axes[0, 1], Price_us, 'Price/Book',
```

```
                  'Price-to-Book (Lower is better)', 'P/B Ratio', a
create_metric_plot(axes[1, 0], Revenue_us, 'Revenue Growth',
                  'Revenue Growth (Higher is better)', 'Growth (%)'


use_log_scale = (Debt_us['Debt/Equity'].max() / Debt_us['Debt/Equit
create_metric_plot(axes[1, 1], Debt_us, 'Debt/Equity',
                  'Debt-to-Equity (Lower is better, with log scale)
                  ascending_rank=True, log_scale=use_log_scale)


legend_elements = [
    plt.Rectangle((0,0),1,1, color='red', label='PulteGroup'),
    plt.Rectangle((0,0),1,1, color='skyblue', label='Other Companie
    plt.Line2D([0], [0], color='green', linestyle='--', linewidth=2
]
fig.legend(handles=legend_elements, loc='upper right', bbox_to_anch



axes[1,1].annotate('Note: Using log scale to better visualize\nwide
                   xy=(0.02, 0.90), xycoords='axes fraction',
                   fontsize=9, ha='left', va='top',
                   bbox=dict(boxstyle='round', facecolor='white', a

plt.tight_layout()
plt.show()




print("\nPulteGroup's Key Metrics:")
pulte_metrics = us_companies[us_companies['company_name'] == my_com
print(pulte_metrics.to_string(index=False))



print("\nUnited States Companies Median Values:")
print(us_medians.to_string())
```




```
PulteGroup's Key Metrics:
    ROE  Price/Book  Revenue Growth  Debt/Equity
0.25522    1.664058          -0.014       17.795

United States Companies Median Values:
ROE                0.14175
Price/Book         2.59528
Revenue Growth     0.03600
Debt/Equity       72.13000
```

In [92]:
```
# getting the values with market cap similar to Pultre Group

pulte_market_cap = df_metrics[df_metrics['company_name'] == "PulteG


df_metrics['market_cap_diff'] = abs(df_metrics['market_cap'] - pult

# Not including Pultre group
closest_companies = df_metrics[df_metrics['company_name'] != "Pulte



print('The companies with market cap closer to Pultre company are:\
print(closest_companies['symbol'])
```

```
The companies with market cap closer to Pultre company are:

67       AER
1490    INVH
2023    NTAP
649      CMS
1403    HUBB
Name: symbol, dtype: object
```

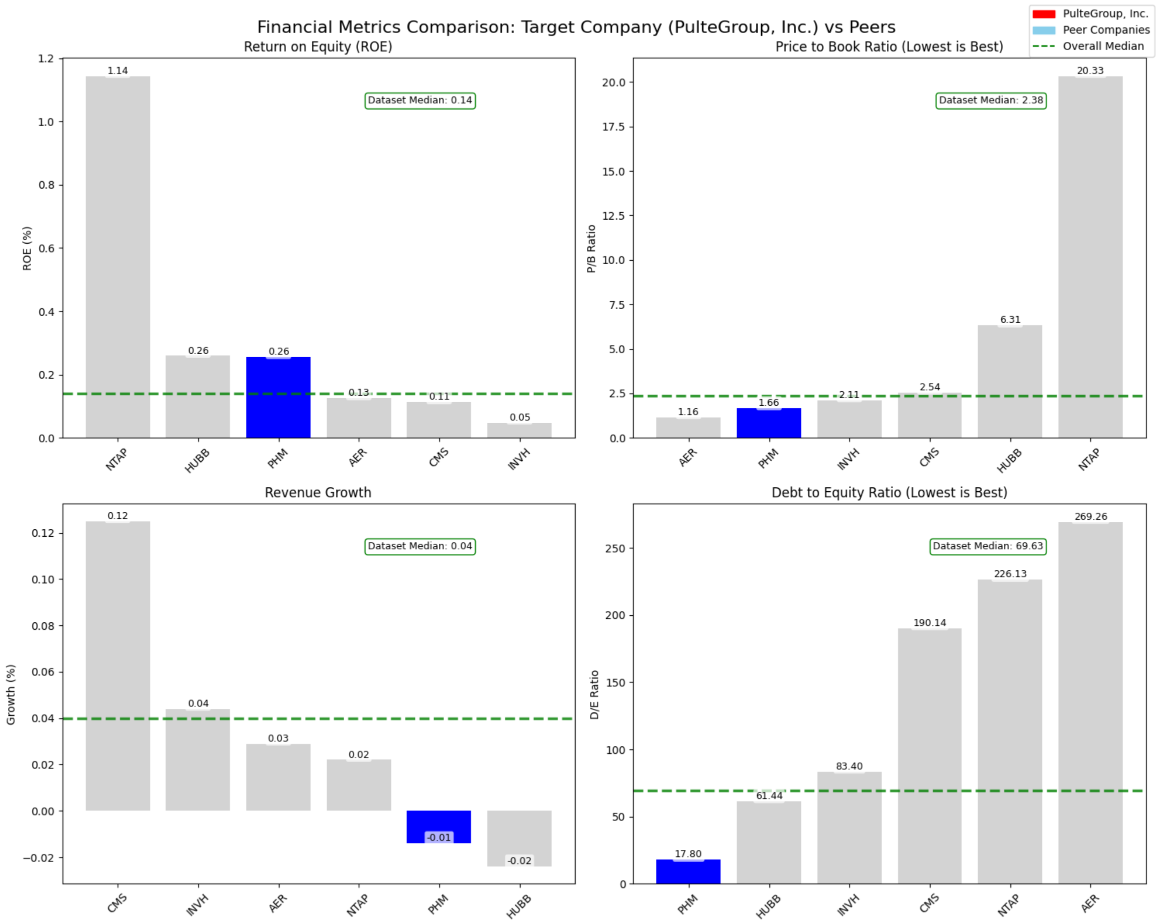
```
/var/folders/ly/bs3tr6xj7_l2c36k8x0nslhc0000gn/T/ipykernel_83558/904
654087.py:6: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pand
as-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
py
```

In [93]:

```python
# Using the above symbol in order to create this new dataset with m
target_companies = ['AER', 'INVH', 'NTAP', 'CMS', 'HUBB', 'PHM']
filtered_df_cl_P = df_metrics[df_metrics['symbol'].isin(target_compa

metrics_for_analysis = ['ROE', 'Price/Book', 'Revenue Growth', 'Deb
target_company = "PHM"
target_company_name = filtered_df_cl_P[filtered_df_cl_P['symbol'] ==

# Median in General (of the whole dataset)
overall_median = {
    'ROE': df_metrics['ROE'].median(),
    'Price/Book': df_metrics['Price/Book'].median(),
    'Revenue Growth': df_metrics['Revenue Growth'].median(),
    'Debt/Equity': df_metrics['Debt/Equity'].median()
}


sector_medians = overall_median

def get_sorted_companies(df, metric, ascending=False):
    return df.sort_values(by=metric, ascending=ascending)

Roe_companies = get_sorted_companies(filtered_df_cl_P, metrics_for_
Price_companies = get_sorted_companies(filtered_df_cl_P, metrics_fo
Revenue_companies = get_sorted_companies(filtered_df_cl_P, metrics_
Debt_companies = get_sorted_companies(filtered_df_cl_P, metrics_for_

fig, axes = plt.subplots(2, 2, figsize=(15, 12))
fig.suptitle(f'Financial Metrics Comparison: Target Company ({targe

def create_metric_plot(ax, data, metric, title, ylabel, ascending_r
    data = data.sort_values(by=metric, ascending=ascending_rank)
    colors = ['blue' if x == target_company else 'lightgrey' for x
    bars = ax.bar(data['symbol'], data[metric], color=colors)

    median_value = sector_medians[metric]
```

```
    ax.axhline(y=median_value, color='green', linestyle='--', linew

    ax.text(0.80, 0.90, f'Dataset Median: {median_value:.2f}',
            va='top', ha='right', transform=ax.transAxes,
            bbox=dict(facecolor='white', edgecolor='green', boxstyl
            fontsize=9)

    ax.set_title(title)
    ax.set_ylabel(ylabel)
    ax.tick_params(axis='x', rotation=45)

    for bar in bars:
        actual_value = bar.get_height()
        display_height = actual_value   # Adjustment for visual gra

        ax.text(bar.get_x() + bar.get_width()/2., display_height,
            f'{actual_value:.2f}',  # This displays the actual valu
            ha='center', va='bottom', fontsize=9,
            bbox=dict(facecolor='white', alpha=0.7, edgecolor='none

    for i, tick in enumerate(ax.get_xticklabels()):
        symbol = tick.get_text()
        company_name = data[data['symbol'] == symbol]['company_name
        tick.set_text(f"{symbol}\n({company_name})")
    ax.set_xticklabels(ax.get_xticklabels())

create_metric_plot(axes[0, 0], Roe_companies, metrics_for_analysis[
                   f'Return on Equity (ROE)', 'ROE (%)')
create_metric_plot(axes[0, 1], Price_companies, metrics_for_analysi
                   f'Price to Book Ratio (Lowest is Best)', 'P/B Rat
create_metric_plot(axes[1, 0], Revenue_companies, metrics_for_analy
                   f'Revenue Growth', 'Growth (%)')
create_metric_plot(axes[1, 1], Debt_companies, metrics_for_analysis
                   f'Debt to Equity Ratio (Lowest is Best)', 'D/E Ra

legend_elements = [
    plt.Rectangle((0,0),1,1, color='red', label=target_company_name
    plt.Rectangle((0,0),1,1, color='skyblue', label='Peer Companies
    plt.Line2D([0], [0], color='green', linestyle='--', label='Over
]
fig.legend(handles=legend_elements, loc='upper right')
plt.tight_layout()
plt.show()

print("\nKey Metrics Comparison:")
display_cols = ['symbol', 'company_name', ] + metrics_for_analysis
print(filtered_df_cl_P[display_cols].sort_values('symbol').to_strin



print("\nOverall Dataset Medians:")
for metric, value in overall_median.items():
    print(f"{metric}: {value:.2f}")
```

```
/var/folders/ly/bs3tr6xj7_l2c36k8x0nslhc0000gn/T/ipykernel_83558/851
552753.py:61: UserWarning:

set_ticklabels() should only be used with a fixed number of ticks,
i.e. after set_ticks() or using a FixedLocator.

/var/folders/ly/bs3tr6xj7_l2c36k8x0nslhc0000gn/T/ipykernel_83558/851
552753.py:61: UserWarning:

set_ticklabels() should only be used with a fixed number of ticks,
i.e. after set_ticks() or using a FixedLocator.

/var/folders/ly/bs3tr6xj7_l2c36k8x0nslhc0000gn/T/ipykernel_83558/851
552753.py:61: UserWarning:

set_ticklabels() should only be used with a fixed number of ticks,
i.e. after set_ticks() or using a FixedLocator.

/var/folders/ly/bs3tr6xj7_l2c36k8x0nslhc0000gn/T/ipykernel_83558/851
552753.py:61: UserWarning:

set_ticklabels() should only be used with a fixed number of ticks,
i.e. after set_ticks() or using a FixedLocator.
```



```
Key Metrics Comparison:
symbol           company_name     ROE  Price/Book  Revenue Growth  D
ebt/Equity
   AER   AerCap Holdings N.V. 0.12518    1.157658           0.029
269.263
   CMS CMS Energy Corporation 0.11234    2.536691           0.125
190.138
  HUBB            Hubbell Inc 0.25917    6.311655          -0.024
61.442
  INVH  Invitation Homes Inc. 0.04807    2.110740           0.044
83.399
  NTAP           NetApp, Inc. 1.14329   20.332586           0.022
226.131
   PHM       PulteGroup, Inc. 0.25522    1.664058          -0.014
17.795

Overall Dataset Medians:
ROE: 0.14
Price/Book: 2.38
Revenue Growth: 0.04
Debt/Equity: 69.63
```

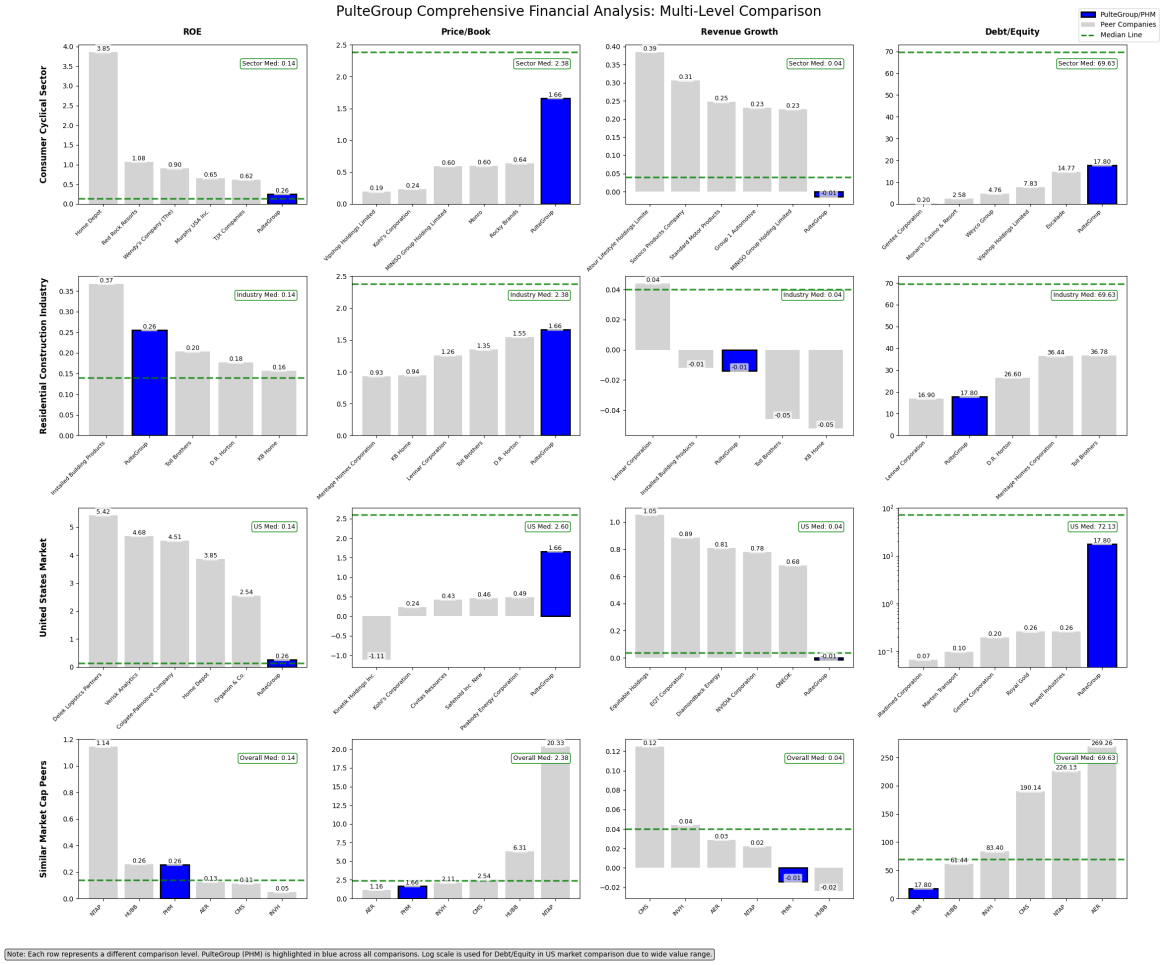
Recap and Consideration

In [94]:

```
# Using the above information I create a summary of all the info



fig, axes = plt.subplots(4, 4, figsize=(24, 20))
fig.suptitle('PulteGroup Comprehensive Financial Analysis: Multi-Le
             fontsize=20, y=0.98)

# Row and Col
row_labels = ['Consumer Cyclical Sector', 'Residential Construction
              'United States Market', 'Similar Market Cap Peers']
metric_labels = ['ROE (%)', 'Price/Book', 'Revenue Growth (%)', 'De


def create_metric_plot(ax, data, metric, median_value, median_label
                       log_scale=False, is_peer_comparison=False):
    data = data.sort_values(by=metric, ascending=ascending_rank)


    if is_peer_comparison:
        colors = ['blue' if x == 'PHM' else 'lightgrey' for x in da
        labels = data['symbol']
    else:
        colors = ['blue' if x == my_company_P else 'lightgrey' for
        labels = [name.split(',')[0] if ',' in name else name for n

    edgecolors = ['black' if c == 'blue' else 'none' for c in color
    linewidths = [2 if c == 'blue' else 0.5 for c in colors]

    bars = ax.bar(range(len(data)), data[metric],
                  color=colors, edgecolor=edgecolors, linewidth=line
```

```
    ax.axhline(y=median_value, color='green', linestyle='--', linew


    ax.text(0.95, 0.90, f'{median_label}: {median_value:.2f}',
            va='top', ha='right', transform=ax.transAxes,
            bbox=dict(facecolor='white', edgecolor='green', boxstyl
            fontsize=9)

    if log_scale:
        ax.set_yscale('log')


    for bar in bars:
        actual_value = bar.get_height()
        ax.text(bar.get_x() + bar.get_width()/2., actual_value,
                f'{actual_value:.2f}',
                ha='center', va='bottom', fontsize=9,
                bbox=dict(facecolor='white', alpha=0.7, edgecolor='
                          boxstyle='round,pad=0.2'))

    ax.set_xticks(range(len(data)))
    ax.set_xticklabels(labels, rotation=45, ha='right', fontsize=8)

# Use the existing info
data_sets = [
    # Row 0: Consumer Cyclical Sector
    [(Roe_sector, 'ROE', sector_medians['ROE'], 'Sector Med', False
     (Price_sector, 'Price/Book', sector_medians['Price/Book'], 'Se
     (Revenue_sector, 'Revenue Growth', sector_medians['Revenue Gro
     (Debt_sector, 'Debt/Equity', sector_medians['Debt/Equity'], 'S

    # Row 1: Residential Construction Industry
    [(Roe_industry, 'ROE', sector_medians['ROE'], 'Industry Med', Fa
     (Price_industry, 'Price/Book', sector_medians['Price/Book'], '
     (Revenue_industry, 'Revenue Growth', sector_medians['Revenue G
     (Debt_industry, 'Debt/Equity', sector_medians['Debt/Equity'],

    # Row 2: United States Market
    [(Roe_us, 'ROE', us_medians['ROE'], 'US Med', False, False, Fals
     (Price_us, 'Price/Book', us_medians['Price/Book'], 'US Med', T
     (Revenue_us, 'Revenue Growth', us_medians['Revenue Growth'], '
     (Debt_us, 'Debt/Equity', us_medians['Debt/Equity'], 'US Med',

    # Row 3: Similar Market Cap Peers
    [(filtered_df_cl_P.sort_values('ROE', ascending=False), 'ROE',
     (filtered_df_cl_P.sort_values('Price/Book', ascending=True), '
     (filtered_df_cl_P.sort_values('Revenue Growth', ascending=Fals
     (filtered_df_cl_P.sort_values('Debt/Equity', ascending=True),
]


for row_idx, row_data in enumerate(data_sets):
    for col_idx, (data, metric, median_val, median_label, ascending
        ax = axes[row_idx, col_idx]
```

```
        create_metric_plot(ax, data, metric, median_val, median_lab
                           ascending, log_scale, is_peer)


        if col_idx == 0:
            ax.text(-0.15, 0.5, row_labels[row_idx],
                    transform=ax.transAxes, rotation=90,
                    va='center', ha='center', fontsize=12, fontweigh


        if row_idx == 0:
            ax.text(0.5, 1.05, f'{metrics_for_analysis[col_idx]}',
                    transform=ax.transAxes, ha='center', va='bottom'
                    fontsize=12, fontweight='bold')


legend_elements = [
    plt.Rectangle((0,0),1,1, facecolor='blue', edgecolor='black', l
                  label='PulteGroup/PHM'),
    plt.Rectangle((0,0),1,1, facecolor='lightgrey', label='Peer Com
    plt.Line2D([0], [0], color='green', linestyle='--', linewidth=2
]
fig.legend(handles=legend_elements, loc='upper right', bbox_to_anch


fig.text(0.02, 0.02,
         'Note: Each row represents a different comparison level. '
         'PulteGroup (PHM) is highlighted in blue across all compar
         'Log scale is used for Debt/Equity in US market comparison
         fontsize=10, ha='left', va='bottom',
         bbox=dict(boxstyle='round', facecolor='lightgray', alpha=0

plt.tight_layout()
plt.subplots_adjust(top=0.94, bottom=0.08, left=0.08, right=0.96)
plt.show()
```



PulteGroup Performance Analysis

Sector Comparison

When compared to leading companies in the Consumer Cycle sector, PulteGroup demonstrates mixed performance. The company underperforms notably in return on equity and sales growth metrics, recording negative revenue growth while sector leaders maintain positive performance. However, regarding price-to-book ratio and debt-to-equity metrics, PulteGroup shows stronger performance than the sector median, despite lagging behind the top five companies.

Industry Position

Within the Residential Construction industry, PulteGroup performs well in certain key metrics:

Return on Equity: Ranks second in the industry and performs better than the industry median

Debt-to-Equity: Shows strong financial health, outperforming the industry median

Price-to-Book: Significantly underperforms compared to the industry median

Revenue Growth: Ranks third among industry peers but shows negative growth, indicating broader industry challenges

U.S. Market Comparison

PulteGroup does not appear in the top five companies in any of the analyzed metrics when comparing all U.S. companies. The company underperforms compared to the U.S. median in Return on Equity and Revenue Growth. However, it performs better than the U.S. median in Price-to-Book and Debt-to-Equity ratios.

Peer & Capitalization Performance

When analyzing PulteGroup against its direct peers and in terms of capitalization: **Return on Equity**: Performs above the median of all companies in the dataset, demonstrating effective use of equity investment.

Price-to-Book: Maintains performance near the dataset median

Debt-to-Equity: Differs substantially from the dataset median, showing a distinctive approach to financial leverage

Revenue Growth: Shows a significant weakness with negative growth while the overall dataset median shows positive growth, suggesting efficiency challenges in generating new revenue despite otherwise sound financial metrics

Overall performance

In summary, PulteGroup demonstrates strong financial fundamentals through effective equity utilization, but faces notable challenges in driving revenue growth compared to both its direct peers and broader market benchmarks

Scatter plots

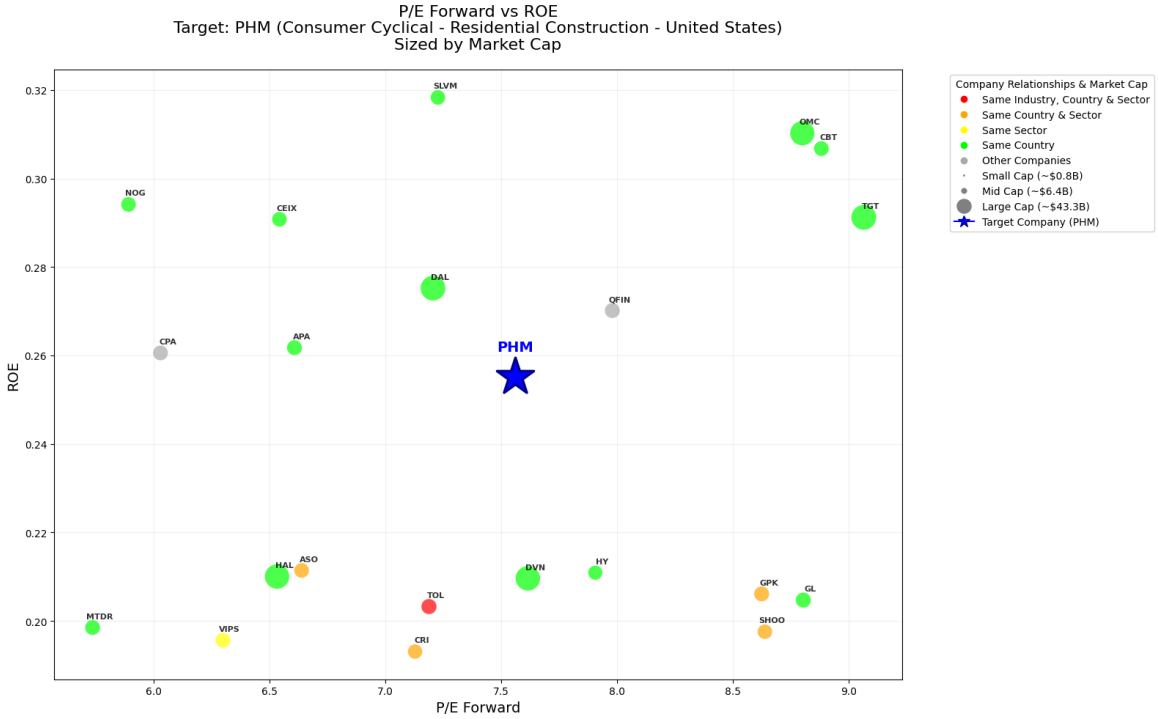
In [95]:
```
##################################################
# Configuration
##################################################
target_symbol = 'PHM'  # company of interest
metric_pairs = [
    ('P/E Forward', 'ROE'),
    ('Price/Sales', 'Net Profit Margin'),
    ('Debt/Equity', 'ROE'),
    ('Dividend Yield', 'Free Cash Flow')
]

# Get target company details (Pultre group, PHM)
target_data = df_metrics[df_metrics['symbol'] == target_symbol].ilo
target_sector = target_data['sector']
```

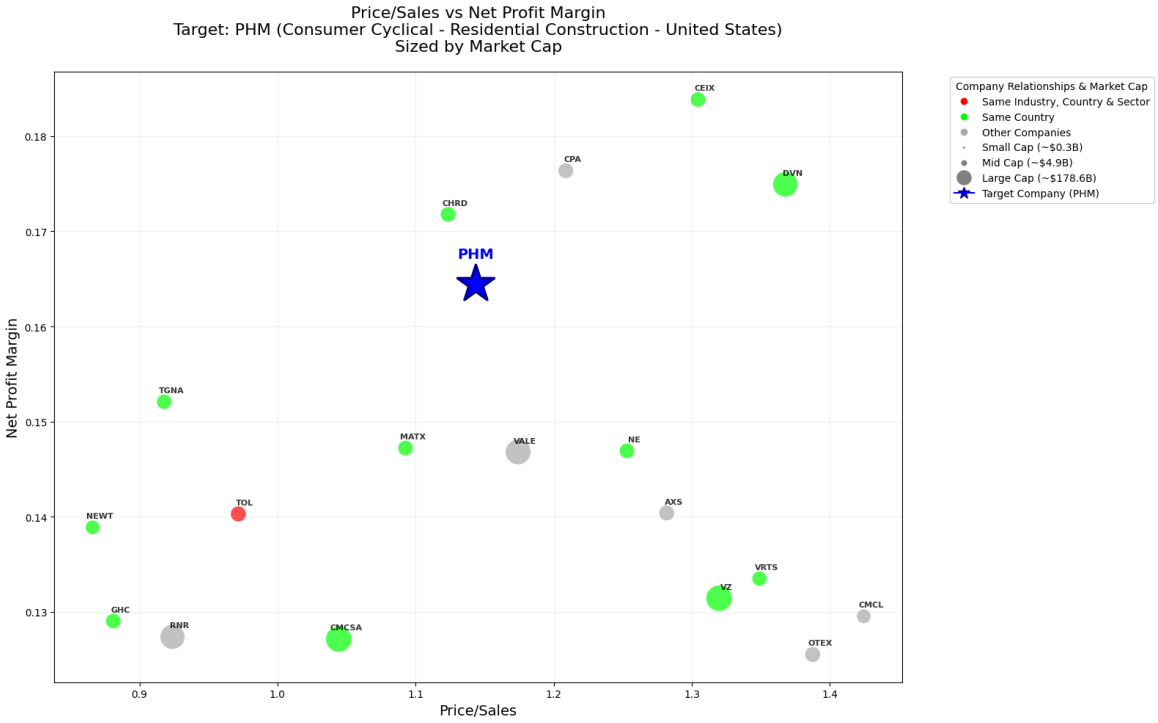
```
target_country = target_data['country']
target_industry = target_data['industry']

for metric1, metric2 in metric_pairs:

    m1_val = target_data[metric1]
    m2_val = target_data[metric2]


    m1_low, m1_high = m1_val * 0.75, m1_val * 1.25
    m2_low, m2_high = m2_val * 0.75, m2_val * 1.25

    # Filter dataframe according to the info above  and exclude the
    filtered_df = df_metrics[
        (df_metrics[metric1].between(m1_low, m1_high)) &
        (df_metrics[metric2].between(m2_low, m2_high)) &
        (df_metrics['symbol'] != target_symbol)
    ].copy()

    ###################################################
    # Marker Size Calculation (market cap)
    ###################################################
    min_size = 30
    mid_size = 150
    max_size = 800

    filtered_df['marker_size'] = np.where(
        filtered_df['market_cap'] > filtered_df['market_cap'].quant
        np.log(filtered_df['market_cap']) * 25,
        np.log(filtered_df['market_cap']) * 10
    )
    filtered_df['marker_size'] = filtered_df['marker_size'].clip(mi

    plt.figure(figsize=(16, 10))

    # Categorize companies based on their relationship to target
    filtered_df['relationship'] = 'Other Companies'


    # mask documentation : 'https://pandas.pydata.org/docs/referenc


    # Same industry, country and sector (closest peers)
    mask = (filtered_df['industry'] == target_industry) & \
           (filtered_df['country'] == target_country) & \
           (filtered_df['sector'] == target_sector)
    filtered_df.loc[mask, 'relationship'] = 'Same Industry, Country

    # Same country and sector
    mask = (filtered_df['country'] == target_country) & \
           (filtered_df['sector'] == target_sector) & \
           (filtered_df['relationship'] != 'Same Industry, Country &
    filtered_df.loc[mask, 'relationship'] = 'Same Country & Sector'

    # Same country only
    mask = (filtered_df['country'] == target_country) & \
```

```
        (filtered_df['relationship'] == 'Other Companies')
filtered_df.loc[mask, 'relationship'] = 'Same Country'

# Same sector only
mask = (filtered_df['sector'] == target_sector) & \
       (filtered_df['relationship'] == 'Other Companies')
filtered_df.loc[mask, 'relationship'] = 'Same Sector'

# Same industry only (but different country/sector)
mask = (filtered_df['industry'] == target_industry) & \
       (filtered_df['relationship'] == 'Other Companies')
filtered_df.loc[mask, 'relationship'] = 'Same Industry'

# Define colors for each relationship category
relationship_colors = {
    'Same Industry, Country & Sector': '#FF0000',
    'Same Country & Sector': '#FFA500',
    'Same Sector': '#FFFF00',
    'Same Country': '#00FF00',
    'Same Industry': '#00CED1',
    'Other Companies': '#A9A9A9'
}


# Plot all companies by relationship category
for relationship, color in relationship_colors.items():
    subset = filtered_df[filtered_df['relationship'] == relatio
    if len(subset) > 0:
        plt.scatter(
            subset[metric1], subset[metric2],
            color=color, alpha=0.7, label=relationship,
            s=subset['marker_size'],
            edgecolors='white', linewidths=0.5
        )


        for _, row in subset.iterrows():
            plt.annotate(
                row['symbol'],
                (row[metric1], row[metric2]),
                textcoords="offset points",
                xytext=(7, 9),
                ha='center', fontsize=8,
                alpha=0.8, weight='bold'
            )

##################################################
# Highlight target company (PUltre)
##################################################
target_marker_size = max_size * 1.8
plt.scatter(
    [m1_val], [m2_val],
    color='blue', marker='*',
    s=target_marker_size,
    edgecolors='darkblue', linewidths=2.5,
    label=f'Target Company ({target_symbol})',
```

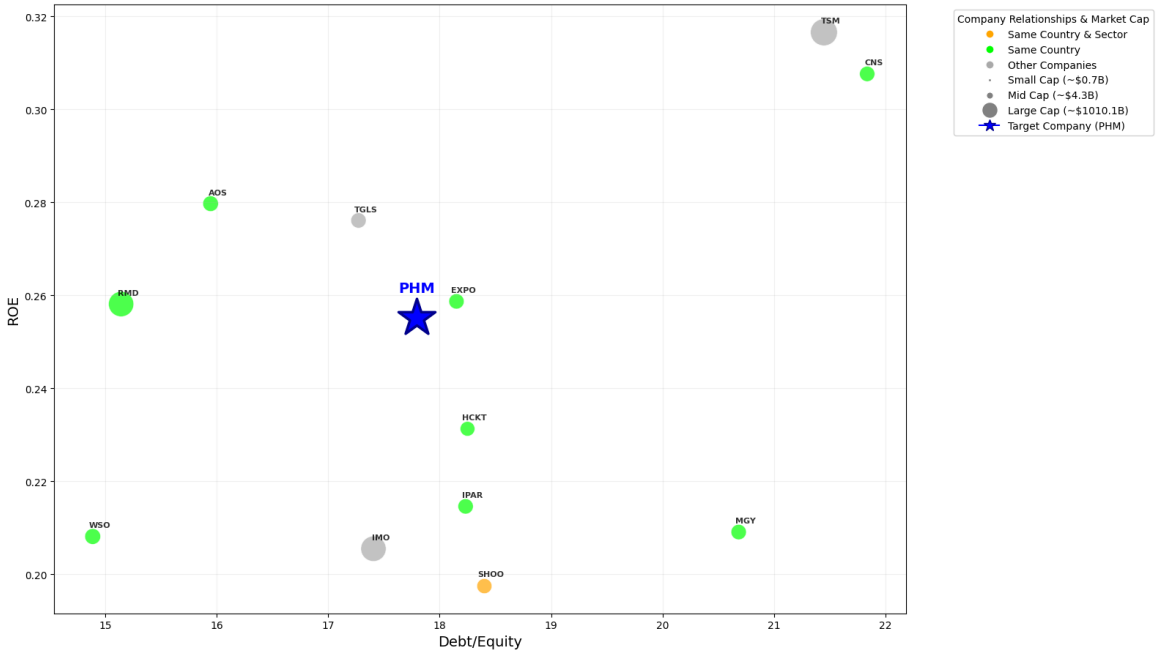
```
        zorder=10
    )

    plt.annotate(
        f"{target_symbol}",
        (m1_val, m2_val),
        textcoords="offset points",
        xytext=(0, 25),
        ha='center', fontsize=14,
        weight='bold', color='blue'
    )




    legend_elements = []

    # Add relationship categories to legend (colors)
    for relationship, color in relationship_colors.items():
        if len(filtered_df[filtered_df['relationship'] == relationsl
            legend_elements.append(
                plt.Line2D([0], [0], marker='o', color='w', label=r
                           markerfacecolor=color, markersize=8)
            )


    if len(filtered_df) > 0:
        cap_tiers = [
            ('Small Cap', min_size, filtered_df["market_cap"].min()
            ('Mid Cap', mid_size, filtered_df["market_cap"].median(
            ('Large Cap', max_size, filtered_df["market_cap"].max()
        ]

        for label, size, value in cap_tiers:
            legend_elements.append(
                plt.Line2D([0], [0], marker='o', color='w',
                           label=f'{label} (~${value/1e9:.1f}B)',
                           markerfacecolor='gray', markersize=np.sqr
            )

    # info of my company
    legend_elements.append(
        plt.Line2D([0], [0], marker='*', color='blue',
                   label=f'Target Company ({target_symbol})',
                   markersize=12, markeredgecolor='darkblue')
    )

    # Add the legend
    plt.legend(
        handles=legend_elements,
        bbox_to_anchor=(1.05, 1),
        loc='upper left',
        title="Company Relationships & Market Cap",
        framealpha=0.9
    )
```

```
    ##################################################
    # Final formatting
    ##################################################
    plt.xlabel(metric1, fontsize=14)
    plt.ylabel(metric2, fontsize=14)
    plt.title(f'{metric1} vs {metric2}\nTarget: {target_symbol} ({ta
              fontsize=16, pad=20)
    plt.grid(True, alpha=0.2)
    plt.tight_layout()
    plt.show()
```





Debt/Equity vs ROE
Target: PHM (Consumer Cyclical - Residential Construction - United States)
Sized by Market Cap



Dividend Yield vs Free Cash Flow
Target: PHM (Consumer Cyclical - Residential Construction - United States)
Sized by Market Cap