In [15]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score
```

In [16]:
```
boston = pd.read_csv("boston.csv")
```

In [17]:
```
print("------------Dataframe Info-----------------")
print(boston.info())
print("\n")
```

```
------------Dataframe Info-----------------
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 506 entries, 0 to 505
Data columns (total 14 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   CRIM     506 non-null    float64
 1   ZN       506 non-null    float64
 2   INDUS    506 non-null    float64
 3   CHAS     506 non-null    int64  
 4   NOX      506 non-null    float64
 5   RM       506 non-null    float64
 6   AGE      506 non-null    float64
 7   DIS      506 non-null    float64
 8   RAD      506 non-null    int64  
 9   TAX      506 non-null    float64
 10  PTRATIO  506 non-null    float64
 11  BLACK    506 non-null    float64
 12  LSTAT    506 non-null    float64
 13  MEDV     506 non-null    float64
dtypes: float64(12), int64(2)
memory usage: 55.5 KB
None
```

In [18]:
```
print("----------Dataframe Describe------------")
print(boston.describe())
print("\n")
```

```
----------Dataframe Describe------------
              CRIM          ZN       INDUS        CHAS         NOX
RM  \
count   506.000000  506.000000  506.000000  506.000000  506.000000  506.000
000
mean      3.613524   11.363636   11.136779    0.069170    0.554695    6.284
634
std       8.601545   23.322453    6.860353    0.253994    0.115878    0.702
617
min       0.006320    0.000000    0.460000    0.000000    0.385000    3.561
000
25%       0.082045    0.000000    5.190000    0.000000    0.449000    5.885
500
50%       0.256510    0.000000    9.690000    0.000000    0.538000    6.208
500
75%       3.677083   12.500000   18.100000    0.000000    0.624000    6.623
500
max      88.976200  100.000000   27.740000    1.000000    0.871000    8.780
000

              AGE         DIS         RAD         TAX     PTRATIO        BL
ACK  \
count  506.000000  506.000000  506.000000  506.000000  506.000000  506.000
000
mean    68.574901    3.795043    9.549407  408.237154   18.455534  356.674
032
std     28.148861    2.105710    8.707259  168.537116    2.164946   91.294
864
min      2.900000    1.129600    1.000000  187.000000   12.600000    0.320
000
25%     45.025000    2.100175    4.000000  279.000000   17.400000  375.377
500
50%     77.500000    3.207450    5.000000  330.000000   19.050000  391.440
000
75%     94.075000    5.188425   24.000000  666.000000   20.200000  396.225
000
max    100.000000   12.126500   24.000000  711.000000   22.000000  396.900
000

            LSTAT        MEDV
count  506.000000  506.000000
mean    12.653063   22.532806
std      7.141062    9.197104
min      1.730000    5.000000
25%      6.950000   17.025000
50%     11.360000   21.200000
75%     16.955000   25.000000
max     37.970000   50.000000
```

In [19]:
```
print("-----------Dataframe 5 Rows--------------")
print(boston.head())
print("\n")
```

```
-----------Dataframe 5 Rows--------------
      CRIM    ZN  INDUS  CHAS    NOX     RM   AGE     DIS  RAD    TAX  \
0  0.00632  18.0   2.31     0  0.538  6.575  65.2  4.0900    1  296.0
1  0.02731   0.0   7.07     0  0.469  6.421  78.9  4.9671    2  242.0
2  0.02729   0.0   7.07     0  0.469  7.185  61.1  4.9671    2  242.0
3  0.03237   0.0   2.18     0  0.458  6.998  45.8  6.0622    3  222.0
4  0.06905   0.0   2.18     0  0.458  7.147  54.2  6.0622    3  222.0

   PTRATIO   BLACK  LSTAT  MEDV
0     15.3  396.90   4.98  24.0
1     17.8  396.90   9.14  21.6
2     17.8  392.83   4.03  34.7
3     18.7  394.63   2.94  33.4
4     18.7  396.90   5.33  36.2
```

In [20]:
```
print("-----------Dataframe Columns List---------------")
print(boston.columns)
print("\n")
```

```
-----------Dataframe Columns List---------------
Index(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD', 'T
AX',
       'PTRATIO', 'BLACK', 'LSTAT', 'MEDV'],
      dtype='object')
```

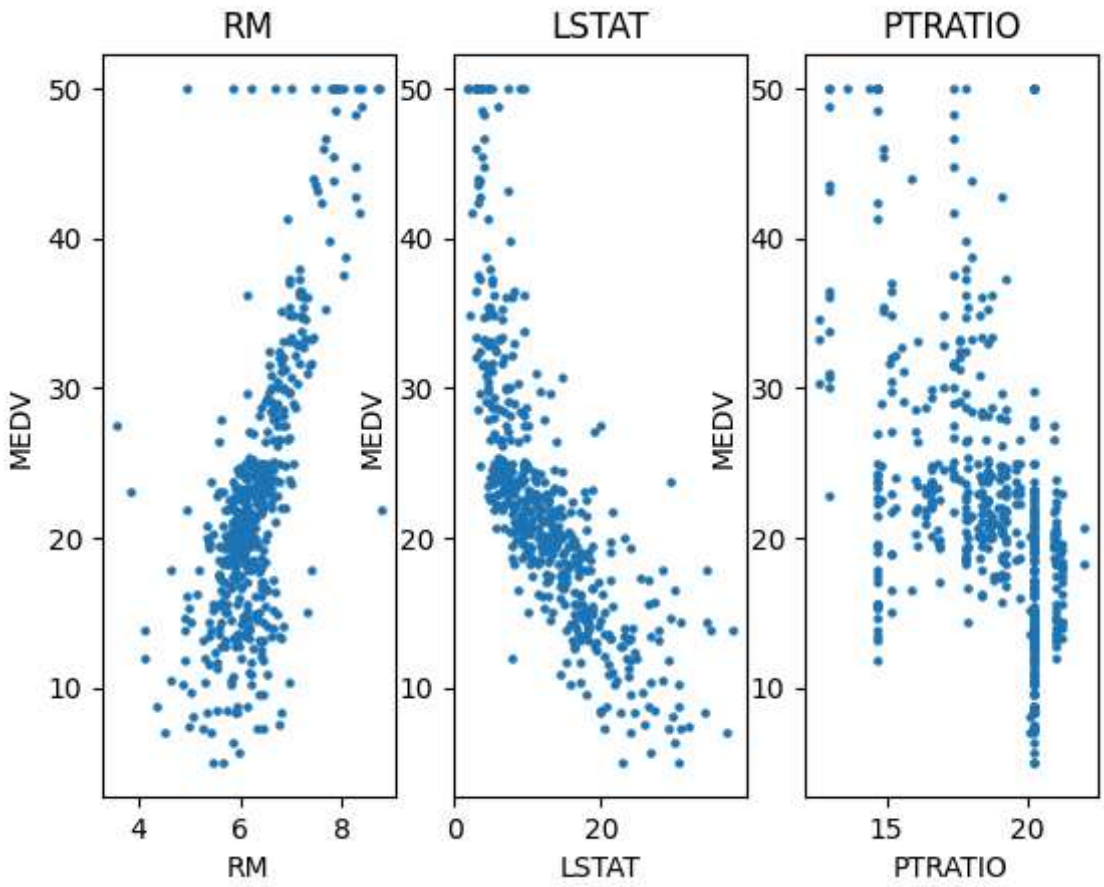
Selecting relevant features and target variable

In [21]:
```
X = boston[['RM', 'LSTAT', 'PTRATIO']]
y = boston['MEDV']
```

In [22]:
```
print("-------------Splitting data into training and test sets-------------
# Splitting the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, ra
print("X_train shape:", X_train.shape)
print("X_test shape:", X_test.shape)
print("y_train shape:", y_train.shape)
print("y_test shape:", y_test.shape)
print("\n")
```

```
-------------Splitting data into training and test sets------------------
X_train shape: (404, 3)
X_test shape: (102, 3)
y_train shape: (404,)
y_test shape: (102,)
```

In [23]:
```
for i, feature in enumerate(X.columns):
    plt.subplot(1, 3, i + 1)
    plt.scatter(X[feature], y, marker='o', s=5)
    plt.title(feature)
    plt.xlabel(feature)
    plt.ylabel('MEDV')
```



In [24]:
```
plt.tight_layout()
plt.show()
```

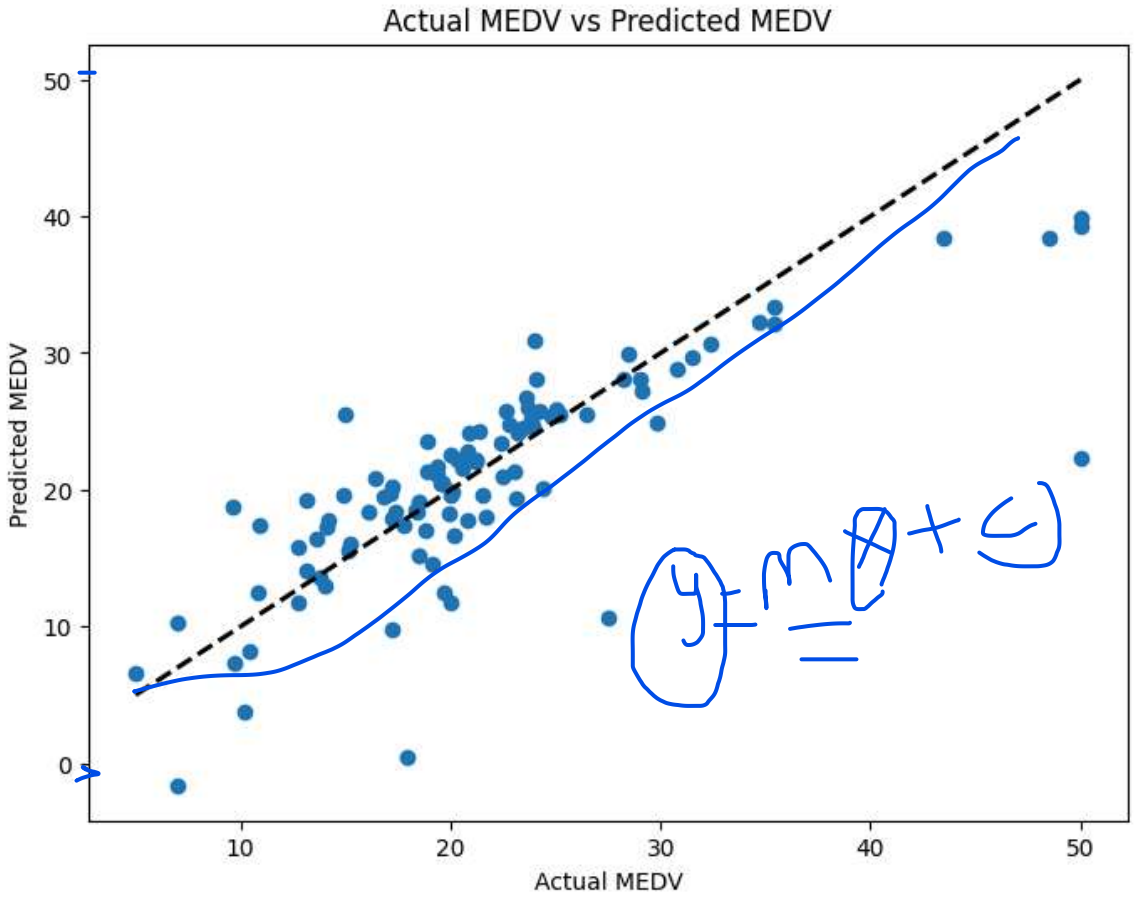
```
<Figure size 640x480 with 0 Axes>
```

Creating a linear regression model
Training the model
Making predictions

In [25]:
```
model = LinearRegression()
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
```

In [26]:
```
print("-------------Visualization after fitting model---------------")
# Visualization after fitting the model
plt.figure(figsize=(8, 6))
plt.scatter(y_test, y_pred)
plt.plot([y_test.min(), y_test.max()], [y_test.min(), y_test.max()], 'k--',
plt.xlabel('Actual MEDV')
plt.ylabel('Predicted MEDV')
plt.title('Actual MEDV vs Predicted MEDV')
plt.show()
print("\n")
```

```
-------------Visualization after fitting model---------------
```



Evaluating the model

In [27]:
```
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
print("-----------Evaluation Result----------------")
print("Mean Squared Error:", mse)
print("R^2 Score:", r2)
print('\n')
```

```
-----------Evaluation Result----------------
Mean Squared Error: 27.114957415580573
R^2 Score: 0.6302528487272828
```

This code selects the 'RM' (average number of rooms per dwelling), 'LSTAT' (percentage of lower status of the population), and 'PTRATIO' (pupil-teacher ratio by town) columns as features and 'MEDV' (median value of owner-occupied homes) as the target variable. It then visualizes each feature against the target variable 'MEDV' before fitting the model and shows the predicted versus actual 'MEDV' values after fitting the model. Finally, it evaluates the model's performance using mean squared error and R-squared score.

In conclusion, this code loads the Boston housing dataset, explores it, splits it into training and test sets, trains a linear regression model, makes predictions on the test set, and evaluates the model performance using MSE and R^2 score. The visualizations before and after fitting the model provide insights into the data and model performance.