

# Mock Exam 1 - Questions

TOPIC: QUANTITATIVE METHODS

TOTAL POINT VALUE OF THIS QUESTION SET IS 12 POINTS

Austin Clark, CFA, has been asked to analyze White Goods Corporation (WGC), a \$9 billion company that owns a nationwide chain of stores selling appliances and other electronic goods. As part of his analysis of WGC, Clark's supervisor, David Horvath, asks Clark to forecast WGC's 2019 sales using multiple regression analysis. The following model was developed:

$$\text{sales} = 20.1 + 0.001 \text{ GDP} + 1,000.6 \text{ TR} + 0.1 \text{ CC} - 3.2 \text{ PC} - 40.3 \text{ UR}$$

VIF (5.2) (3.1) (5.3) (1.9) (4.7)

Number of observations: 76

Standard error estimate: 15.67

Unadjusted  $R^2$ : 0.96

Regression sum of squares: 412,522

Error sum of squares: 17,188

## Independent Variable Descriptions

GDP = gross domestic product

TR = average rate on 5-year US Treasury securities

CC = most recent quarter-end consumer confidence index value

PC = previous year's sales of personal computers

UR = most recent quarter-end unemployment rate

## Variable Estimates for 2019

GDP = 8,000

TR = 0.05

CC = 97

PC = 60,000

UR = 0.055

Dave Carington was recently hired by the same investment firm as a quantitative analyst. During Horvath's meeting with Carington, the two discussed the application of big data and machine learning to investing. Carington makes the following comments:

Comment 1: One has to be careful to avoid overfitting in these models. Overfitting occurs when noise in the data is perceived as relationships.

Comment 2: To reduce the risk of Type II error, choose a model with a high recall.

### Question 1 of 88

Using his multiple linear regression, Clark's sales forecast for 2019 is *closest* to:

- A) -\$191,914.
- B) \$180,502.
- C) \$192,090.

### Question 2 of 88

Based on the information provided, which of the following concerns about the model would be *most appropriate*?

- A) Low explanatory power.
- B) Type II error.
- C) Type I error.

### Question 3 of 88

Regarding Carington's comments:

- A) both comments are accurate.
- B) neither comments are accurate.
- C) only one comment is accurate.

**Question 4 of 88**

What is the  $F$ -value that tests the hypothesis that all of the coefficients are equal to zero?

- A) 42.
- B) 101.
- C) 336

TOPIC: QUANTITATIVE METHODS

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William Shears, CFA, has been assigned the task of predicting sales for the specialty retail industry. Shears finds that sales have been increasing at a fairly constant rate over time and decides to estimate the linear trend in sales for the industry using quarterly data over the past 15 years, starting with Quarter 1 of 2004 and ending with Quarter 4 of 2018. On January 1, 2019, Shears estimates the following model:

$$\text{sales}_t = b_0 + b_1t + e_t \quad (1)$$

where:

sales = quarterly sales (measured in \$ millions) for the specialty retail industry

$b_0$  = intercept term

$b_1$  = slope

$t$  = time variable (quarter number)

$e$  = random error

Exhibit 1 provides the results of the linear trend regression.

**Exhibit 1: Linear Trend Regression**

	<b>Coefficient</b>	<b>Standard Error</b>
Intercept	10.0	3.50
Trend	16.0	6.55

Shears also estimates an autoregressive model of order one, AR(1), using the changes in quarterly sales data for the industry from the first quarter of 2004 through the fourth quarter of 2018. He obtains the following results for his AR(1) model:

$$\Delta \text{sales}_t = b_0 + b_1 \Delta \text{sales}_{t-1} + e_t$$

The following is found in Exhibit 2.

**Exhibit 2: AR(1) Model for Changes in Industry Sales**

	<b>Coefficient</b>	<b>Standard Error</b>
Intercept	20.00	2.15

Lag 1	0.10	0.04
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The autocorrelations for the first four lags from Shears's AR(1) model are provided in Exhibit 3.

### Exhibit 3: Autocorrelations From the AR(1) Model

Lag	Autocorrelation	$p$ -Value
1	-0.032	0.38
2	-0.200	0.16
3	-0.065	0.23
4	0.470	0.02

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Quarterly sales for the specialty retail industry during 2018 are found in Exhibit 4.

### Exhibit 4: 2018 Quarterly Industry Sales

Quarter	Sales (in millions)
Quarter 1	900
Quarter 2	925
Quarter 3	950
Quarter 4	1,000

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### Question 5 of 88

Shears's supervisor, Sam Kite, expresses concern that equation (1) might be misspecified. Specifically, Kite refers to the finding that "sales have been increasing at a fairly constant rate over time."

Which of the following data transformations should be applied to the dependent variable in equation (1) to best address Kite's concern?

- A) Lagged transformation.
- B) Logarithmic transformation.
- C) First difference transformation.