

TOPIC: QUANTITATIVE METHODS

THE TOTAL POINT VALUE FOR THIS QUESTION SET IS 12 POINTS

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

	Coefficient	Standard Error
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:

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

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

	Coefficient	Standard Error
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Intercept	20.00	2.15
Lag 1	0.10	0.04

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

Shears also derives a regression using the residuals from the AR(1) model. He regresses the squared residuals (or estimated errors) against the lagged squared residuals. The results of this regression are reported in Exhibit 4.

Exhibit 4: Squared Residuals Regression

	Coefficient	Standard Error	p-Value
Intercept	3.00	0.577	0.01
Lagged residual squared	0.28	0.185	0.31

Quarterly sales for the Specialty Retail Industry during 2018 were:

Exhibit 5: 2018 Quarterly Industry Sales

Quarter	Sales (in millions)
Quarter 1, 2018	900
Quarter 2, 2018	925
Quarter 3, 2018	950
Quarter 4, 2018	1,000

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.
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Question #2 of 88

Question ID: 1415396

Using the results for the linear trend equation in Exhibit 1, the specialty retail industry sales forecast for Quarter 1 of 2019 is *closest* to:

- A) \$26 million.
 - B) \$976 million.
 - C) \$986 million.
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Question #3 of 88

Question ID: 1415397

Assuming the AR(1) model in Exhibit 2 is appropriate, Shears should conclude that the Quarter 1, 2019, change in sales is *most likely* to:

- A) fall from Quarter 4, 2018, change in sales.
 - B) rise from Quarter 4, 2018, change in sales.
 - C) remain unchanged from Quarter 4, 2018, change in sales.
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Question #4 of 88

Question ID: 1415398

Regarding seasonality, given a 5% level of significance, Shears should use Exhibit 3 to conclude he should add the following lag to his autoregressive model:

- A) no lag.
 - B) the 3rd lag.
 - C) the 4th lag.
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Overview for Questions #5-10 of 88

Question ID: 1415404

TOPIC: ECONOMICS

THE TOTAL POINT VALUE FOR THIS QUESTION SET IS 18 POINTS

Tristanya is a developed country with three states, West Tristanya (West), Central Tristanya (Central), and East Tristanya (East). Tristanya is a stable democracy with elected representatives, appointed judges, and an elected prime minister. All three states have approximately the same population and geographical area. Tristanya's savings rates are above the global average, and economic development has been mostly financed with domestic savings. The currency in Tristanya is the Tristanya dollar with a symbol of T\$. The financial markets are highly liquid and function efficiently. Tristanya's foreign trade is a significant part of the economy, and because of this, Tristanya has continued to push for lower trade barriers. Similar to other developed nations, population growth rate in Tristanya is low and capital stock is high.

The three states adhere to all federal regulations but differ significantly on some policies that are not covered by federal laws. The states also have their own agencies for regional administration of state-specific regulations. Any jurisdictional issue is resolved in federal courts.

The government of Tristanya is increasing its efforts to boost labor productivity. Some of the proposals under consideration include:

1. Increased education funding for elementary and middle schools.
2. Increased tax credits for private research and development expenditures.
3. Increased depreciation allowances for tax purposes.

At a recent congressional hearing, Mr. Adel Mahi, the chief economic advisor to the prime minister, stated that Tristanya's capital accumulation affects the size of the Tristanyan GDP but not its growth rate.

All commercial and financial market regulations are the domain of federal agencies and government recognized self-regulatory organizations (SROs). In this regard, the

federal government tends to set minimum standards and allows each state to create agencies to enforce their regulations.

Fuel costs have become an issue in Tristanya as demand for gasoline is expected to increase. Mandated fuel additives, specifically corn ethanol, are used to increase supply, and minimum fuel economy standards have been imposed to curtail demand.

East has the highest obesity rates among the three states. To control the state government's health care expenditure, East's government is implementing an additional tax on all sweet snack foods manufactured in the state. The tax is also known as the "sweet tax." Another regulation, the "supersize drinks ban," will prohibit restaurants in East from selling large portion sizes of carbonated beverages.

The most common form of sweetener in Tristanya is corn syrup. The agricultural industry has benefited from excess demand for corn to produce corn syrup and ethanol. Even after implementation of the "sweet tax," the demand for corn is expected to remain high.

West has the highest gasoline usage per capita, and reducing gasoline consumption is a policy goal for that state's government. West also has the most stringent environmental regulations and has recently raised their standards for minimum fuel economy for automobiles.

Juanita Estrada, an analyst, is assigned to assess the impact of all the regulatory changes on economic growth. Estrada lists the following findings from her analysis:

Finding 1: The snack food industry is in the process of relocating manufacturing of sweet snack foods to West and Central and relocating manufacturing of salty snack foods to East.

Finding 2: After West raised that state's fuel economy standards, the average miles driven per capita increased.

Question #5 of 88

Question ID: 1415405

Based on finding 1, the snack food industry is engaging in regulatory:

- A)** capture.
 - B)** arbitrage.
 - C)** competition.
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