

6.4 Exponential Regression

Student Activity Packet

UNIT: INVESTING STRATEGIES & EXPONENTIAL FUNCTIONS

Name:

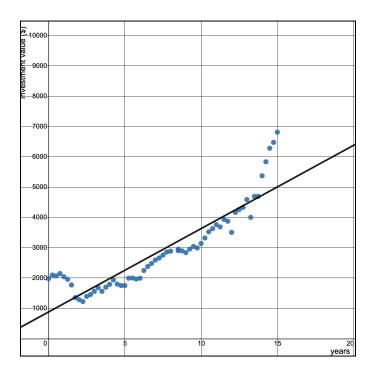
IN THIS LESSON, YOU WILL:

- Use technology to find the exponential function that best fits a data set
- Analyze how well a regression model fits a data set using r² values
- Use regression models to summarize trends and make predictions
- Analyze long-term trends in the stock market
- Use exponential regression to summarize trends for different portfolios, funds, and asset types



GRAPH: Fahad's Investment

The data points below represent the value of Fahad's investment account over the last 15 years. Fahad wants to summarize the trends in his account, so he finds the line of best fit.



- 1. Based on his regression, Fahad wrote the equation for the line of best fit: y = 275x + 881.
 - a. What is the slope of the line of best fit?
 - b. What does the slope represent in this scenario?

- 2. Estimate Fahad's investment value after 15 years...
 - a. Using the data points.
 - b. Using the line of best fit.
- 3. Do you think the line of best fit gives you a good prediction? Why or why not?



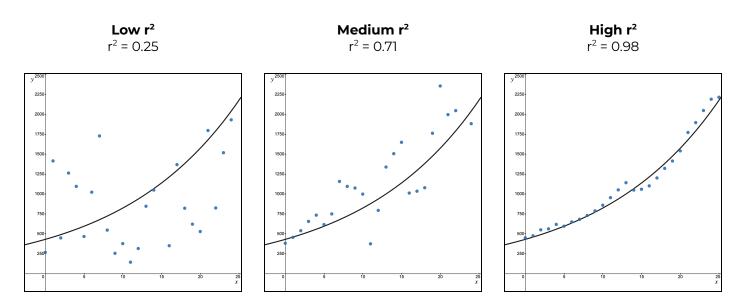
Measuring Goodness of Fit

We can measure how well a model, like Fahad's line of best fit, matches the data points given by using a statistical measure called "r2". Read the notes below and answer the questions that follow.

What is r²?

We can use a value called r^2 (read as "r-squared") as one measure of how well a model fits the data.

- r² is a number between 0 and 1
- r² measures how well the model can predict the data points. This is sometimes called the model's "goodness of fit".



- 1. In your own words, what does r² tell you?
- 2. Summarize: Looking at a graph, how might you know if a model had an r^2 value close to 1?

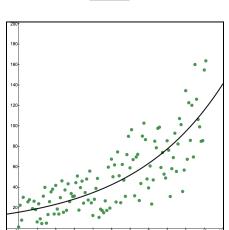


Part I: Matching

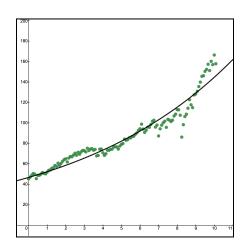
1. Match each regression model with a corresponding r² value from the answer bank.

$$r^2 = -0.21$$
 $r^2 = 0.10$ $r^2 = 0.45$ $r^2 = 0.65$ $r^2 = 0.93$

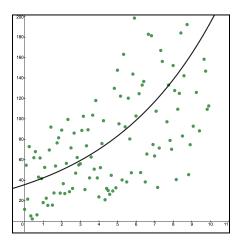
Model A: $r^2 =$ _____



Model B: r² = _____

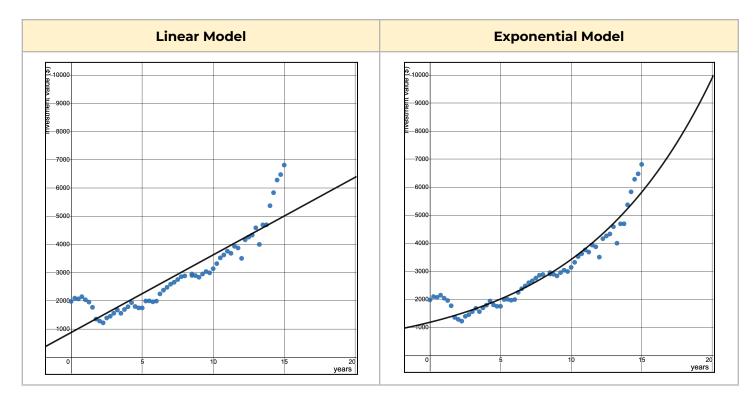


Model C: $r^2 =$ _____



Part II: Fahad's Investments and r²

Let's return to Fahad's investment from the start of the lesson. Fahad used a linear regression model to explain his investment's value, but we could also use an exponential model. Compare the models and answer the questions.



$y_1 \sim mx_1 + b$		$y_1 \sim a \cdot b^{x_1}$	
STATISTICS	RESIDUALS	<i>y</i> ₁ u c	
$r^2 = 0.8144$	e_1 plot	Log Mode ②	
r = 0.9024		STATISTICS	RESIDUALS
PARAMETERS $m=275.007$	b = 881.17	$R^2 = 0.9181$	e_2 plot
		PARAMETERS 7	
		a = 1183.32	b = 1.11205

- 1. What is the r² value of the linear model? What does that tell you?
- 2. Write the equation for the exponential model by substituting in the provided values for a and b. Round to the nearest hundredth.
- 3. Predict Fahad's investment value after 20 years...
 - a. Using the linear model.
 - b. Using the exponential model.
- 4. Which model is a better fit for the data set? Justify your response.



DESMOS: Exponential Regression in Investing

In earlier lessons, you learned how to find the line that best fits a data set using a linear regression model. We can do the same thing with exponential functions. Follow your teacher's instructions to complete this Desmos activity.



Follow your teacher's directions to complete the Application Problems.

Teachers, you can find the Application problems linked in the Lesson Guide.