



# statistics, modeling, & finance

APPRAISAL  
certified residential





# statistics, modeling, & finance

Rick Walkenhorst

HONDROS LEARNING™  
4140 Executive Parkway  
Westerville, Ohio 43081  
www.hondroslearning.com

© 2007 by Hondros Learning™. All rights reserved  
Published 2007. Printed in the United States of America

11 10 09 08 07      1 2 3 4 5

ISBN: 978-1-59844-104-8

No part of this book may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, or stored in database or retrieval system, including but not limited to, in any network or other electronic storage or transmission, or broadcast for distance learning, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without the prior written permission from the publisher. The publisher makes every reasonable effort to ensure the accuracy and completeness of the information in this book. Due to the dynamic nature of the material and the possibility of human or mechanical error, the reader is encouraged to refer to original sources as the ultimate authority on this subject. Please keep in mind that the examples presented in this text are for demonstration purposes only. Actual values may vary greatly in different regions, states, and cities. Hondros Learning™ and the Hondros Learning logo are trademarks or registered trademarks of Hondros Learning, LLC in the United States and/or other countries. Other registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by the law.

*For more information on or to purchase our products, please call 1-866-84LEARN or visit [www.hondroslearning.com](http://www.hondroslearning.com).*

# TABLE OF CONTENTS

---

<b>CHAPTER 1: WHAT-WHY-WHEN</b> .....	<b>1</b>
<b>I. WHAT IS THE SCIENCE OF STATISTICS?</b> .....	<b>2</b>
HISTORICAL BACKGROUND OF STATISTICS .....	2
STATISTICS 101 .....	3
RELIABILITY OF STATISTICS .....	4
<b>II. WHY ARE STATISTICS IMPORTANT TO THE APPRAISER?</b> .....	<b>5</b>
<b>III. WHEN SHOULD STATISTICAL ANALYSIS BE USED?</b> .....	<b>6</b>
CONSULTING SERVICES .....	6
MASS APPRAISING FOR AD VALOREM TAXATION .....	7
AUTOMATED VALUATION MODELS .....	7
GENERAL SUPPORT OF THE APPRAISER'S OPINIONS AND CONCLUSIONS .....	8
<b>IV. WHEN SHOULD YOU NOT USE STATISTICAL ANALYSIS?</b> .....	<b>8</b>
<b>CHAPTER SUMMARY</b> .....	<b>9</b>
<b>CHAPTER QUIZ</b> .....	<b>10</b>
<b>CHAPTER 2: THE MEASUREMENT OF CENTRAL TENDENCY</b> .....	<b>13</b>
<b>I. MEASUREMENT OF CENTRAL TENDENCY</b> .....	<b>14</b>
DATA .....	15
DOING THE MATH .....	17
<b>II. MEAN</b> .....	<b>18</b>
ADVANTAGES AND DISADVANTAGES OF MEAN .....	19
<b>III. MEDIAN</b> .....	<b>20</b>
ADVANTAGES AND DISADVANTAGES OF MEDIAN .....	21
<b>IV. MODE</b> .....	<b>22</b>
ADVANTAGES AND DISADVANTAGES OF MODE .....	23
SKILL BUILDERS .....	23
<b>CHAPTER SUMMARY</b> .....	<b>24</b>
<b>CHAPTER QUIZ</b> .....	<b>26</b>
<b>CHAPTER 3: GATHERING DATA AND CHECKING DISPERSION</b> .....	<b>29</b>
<b>I. DATA SELECTION</b> .....	<b>30</b>
<b>II. DATA PARAMETERS</b> .....	<b>33</b>
SKILL BUILDER .....	37

# TABLE OF CONTENTS

---

<b>III. NORMAL DISTRIBUTION</b> .....	<b>37</b>
<b>IV. APPLICATION OF DATA SELECTION AND DATA COLLECTION FOR APPRAISING</b> .....	<b>39</b>
<b>CHAPTER SUMMARY</b> .....	<b>40</b>
<b>CHAPTER QUIZ</b> .....	<b>41</b>
<b>CHAPTER 4: USING SAMPLE DATA TO DRAW CONCLUSIONS</b> .....	<b>43</b>
<b>I. STATISTICAL INFERENCE</b> .....	<b>44</b>
<b>II. MEASUREMENTS OF CENTRAL TENDENCY AND MARKET VALUE</b> .....	<b>45</b>
<b>MARKET VALUE AND THE THREE APPROACHES TO VALUE</b> .....	<b>46</b>
<b>APPLICABILITY OF MEASUREMENTS OF CENTRAL TENDENCIES IN SALES COMPARISON APPROACH</b> .....	<b>47</b>
<b>APPLICABILITY OF MEASUREMENTS OF CENTRAL TENDENCIES IN COST APPROACH</b> .....	<b>49</b>
<b>APPLICABILITY OF MEASUREMENTS OF CENTRAL TENDENCIES IN INCOME APPROACH</b> .....	<b>50</b>
<b>GROSS RENT MULTIPLIERS (GRM)</b> .....	<b>50</b>
<b>CAPITALIZATION OF NET INCOME (IRV)</b> .....	<b>51</b>
<b>CHAPTER SUMMARY</b> .....	<b>52</b>
<b>CHAPTER QUIZ</b> .....	<b>53</b>
<b>CHAPTER 5: THEORY OF REGRESSION MODELING</b> .....	<b>55</b>
<b>I. REGRESSION ANALYSIS</b> .....	<b>56</b>
<b>II. MULTIPLE REGRESSION ANALYSIS</b> .....	<b>59</b>
<b>ADVANTAGES AND DISADVANTAGES TO REGRESSION ANALYSIS</b> .....	<b>60</b>
<b>III. AUTOMATED VALUATION MODELS</b> .....	<b>62</b>
<b>CHAPTER SUMMARY</b> .....	<b>64</b>
<b>CHAPTER QUIZ</b> .....	<b>65</b>
<b>CHAPTER 6: PRACTICAL APPLICATION AND CASE STUDIES IN STATISTICAL ANALYSIS</b> .....	<b>67</b>
<b>EXERCISES</b> .....	<b>68</b>
<b>MATCH THE TERMS</b> .....	<b>68</b>
<b>STRIKE OUT</b> .....	<b>68</b>
<b>SKILL BUILDER</b> .....	<b>69</b>
<b>CASE STUDY: SMALL INCOME VALUATION</b> .....	<b>71</b>
<b>CHAPTER 7: INTRODUCTION TO REAL ESTATE FINANCE</b> .....	<b>77</b>
<b>I. WHY FINANCING TERMS ARE IMPORTANT TO THE APPRAISER</b> .....	<b>78</b>
<b>II. MACROECONOMICS</b> .....	<b>80</b>
<b>SUPPLY OF CAPITAL</b> .....	<b>80</b>
<b>INTEREST RATES</b> .....	<b>81</b>

TRENDS AS OF THE EFFECTIVE DATE .....	81
TEST YOUR KNOWLEDGE — ECONOMIC TRENDS .....	82
<b>III. MICROECONOMICS .....</b>	<b>82</b>
LOCAL FINANCIAL CONDITIONS .....	83
FINANCING TERMS OF THE COMPARABLES .....	84
TERMS OF SALE OF THE COMPARABLES .....	85
TEST YOUR KNOWLEDGE — TERMS OF SALE .....	85
<b>CHAPTER SUMMARY .....</b>	<b>86</b>
<b>CHAPTER QUIZ .....</b>	<b>87</b>
<b>CHAPTER 8: GOVERNMENT INFLUENCES ON REAL ESTATE FINANCE .....</b>	<b>89</b>
<b>I. GOVERNMENT INFLUENCES ON REAL ESTATE FINANCE .....</b>	<b>90</b>
HISTORY .....	90
MAJOR SECONDARY MARKET INVESTORS .....	92
HOW THE SECONDARY MARKET INFLUENCES FINANCING AND VALUES .....	92
<b>II. LONG-TERM TREASURIES VERSUS FEDERAL RESERVE BANK'S SHORT-TERM RATES .....</b>	<b>93</b>
<b>CHAPTER SUMMARY .....</b>	<b>95</b>
<b>CHAPTER QUIZ .....</b>	<b>96</b>
<b>CHAPTER 9: TYPES OF LOANS .....</b>	<b>97</b>
INTRODUCTION .....	98
<b>I. TYPES OF LOANS .....</b>	<b>99</b>
LONG-TERM VERSUS SHORT-TERM .....	100
FIXED RATE VERSUS ADJUSTABLE RATE .....	100
FULLY AMORTIZED VERSUS INTEREST ONLY .....	101
CONFORMING AND NON-CONFORMING .....	102
FHA AND VA LOANS .....	102
<b>II. ACTUAL COST OF BORROWING .....</b>	<b>103</b>
POINTS AND PREPAID INTEREST .....	104
<b>CHAPTER SUMMARY .....</b>	<b>106</b>
<b>CHAPTER QUIZ .....</b>	<b>107</b>
<b>CHAPTER 10: COMPOUND INTEREST: THE SIX FUNCTIONS OF A DOLLAR .....</b>	<b>109</b>
<b>I. SIX FUNCTIONS OF A DOLLAR .....</b>	<b>110</b>
USING TABLES .....	112
USING FINANCIAL CALCULATORS .....	113
SIX FUNCTIONS OF A DOLLAR — ANALYSIS AND EXAMPLES .....	116
FUTURE VALUE OF A DOLLAR .....	116

# TABLE OF CONTENTS

---

FUTURE VALUE OF A DOLLAR PER PERIOD .....	117
SINKING FUND FACTORS .....	118
PRESENT VALUE OF A DOLLAR .....	120
PRESENT VALUE OF A DOLLAR PER PERIOD .....	121
AMORTIZATION .....	122
<b>CHAPTER SUMMARY .....</b>	<b>124</b>
<b>CHAPTER QUIZ .....</b>	<b>125</b>
<b>CHAPTER 11: FINANCING TERMS ANALYSIS .....</b>	<b>127</b>
<b>I. RESIDENTIAL LOAN TERMS AND CASH EQUIVALENCY .....</b>	<b>128</b>
<b>II. INVESTMENT LOAN TERMS AND CASH EQUIVALENCY .....</b>	<b>130</b>
CASH EQUIVALENCY — SELLER FINANCING .....	130
YIELDS AND LEVERAGING .....	132
LOAN TERMS AND LEVERAGE .....	135
<b>CHAPTER SUMMARY .....</b>	<b>137</b>
<b>CHAPTER QUIZ .....</b>	<b>137</b>
<b>CHAPTER 12: SKILL BUILDING: FINANCE .....</b>	<b>141</b>
WHO AM I? .....	142
TRUE OR FALSE .....	142
<b>SKILL BUILDER .....</b>	<b>143</b>
SIX FUNCTIONS OF A DOLLAR PROBLEMS .....	143
<b>CASE STUDY: THE WALKER FAMILY INVESTMENT PORTFOLIO .....</b>	<b>144</b>
<b>APPENDIX .....</b>	<b>147</b>
<b>FORMULAS .....</b>	<b>148</b>
<b>COMPOUND INTEREST CHARTS .....</b>	<b>150</b>
<b>GLOSSARY .....</b>	<b>167</b>

**T**he valuation of real property is part art and part science. On one hand, since every property is unique, the “art” of applying sound judgment is a required skill in situations where limited data is available. And on the other hand, when data is sufficient, the “science” of statistics can provide concrete guidance when making adjustments to value. For the appraiser, understanding the delicate balance between the “art” and “science” is key to providing accurate values to clients.

*Statistics, Modeling, & Finance*, equips appraisers to successfully incorporate the use of statistics into their appraisals. It provides both the *theory* and *practice* of **statistics**, **real estate finance**, and **valuation** modeling for today’s residential appraiser. The first half of the text outlines **terminology** and **basic principles** of statistics, including *practical applications in statistical analysis*. The second half presents **real estate markets**, **terms of financing**, and **real-world examples** of how financing affects the market value of real property. This study of statistics is presented in a *clear, logical format* and teaches not only why statistics are important in appraisal work, but also how to apply the various analysis methods to it.

*Statistics, Modeling, & Finance* provides valuable insight into the relationship between the “art” and “science” of appraisal and hones the appraiser’s skills for successfully applying both in the appraisal process.

## About the Author

Rick Walkenhorst began his real estate career in 1976 as a licensed Ohio real estate sales agent and became a broker in 1989. He has directed operations and developed educational materials for a national real estate appraisal trade association of nearly 3,000 members, and founded his own brokerage firm—one of the first in Cincinnati to offer single agency buyer representation.

During his 20-year career at Hondros College, Rick taught more than 15 different courses in both real estate appraisal and real estate sales to thousands of students, and was a three-time recipient of the College’s “Instructor of the Year” award. He is co-author of the *American Realty Forms’ Guide to the Uniform Residential Appraisal Report*, and has edited and provided materials to many real estate textbooks.

Currently he owns and manages an independent real estate brokerage, appraisal, and property management company in the Cincinnati area.

## **Reviewer Acknowledgments**

Hondros Learning™ thanks the following expert reviewer for his valuable contribution and assistance in developing this text:

James Christopher Jones

MBA, University of Phoenix, BS, Louisiana State University, BS, Franklin University

Hondros College Faculty

Member, Institute of Management Accountants

## **Hondros Learning**

Hondros Learning™ is a leading provider of educational materials for the appraisal, real estate, mortgage, home inspection, and financial services industries. Together with Hondros College, we have provided training for more than one million students, many of whom are among the most successful in their field.

For more information on this, or any of our other products, please visit [www.hondroslearning.com](http://www.hondroslearning.com).